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Contents

Macroeconomic Volatility and Macroeconomic Indicators among Sub-Saharan African Economies <i>Rexford Abaidoo</i>	1
The Proportion of Non-operating Income, and Analysts' Forecasts <i>Andrew Ayimbila Anabila</i>	15
Multiple Asymmetries and Exchange Rate Exposure at Firm Level: Evidence from Taiwan Stock Market <i>René Ferenc François (Franck) VARGA</i>	26
An Assessment of the Trade Effects of the East African Community Customs Union on Member Countries <i>Steven Buigut</i>	41
Sources of Economic Growth in 31 Sub-Sahara African Countries for the Period 1975–2008: A Growth Accounting Approach <i>Girma Zelleke & Abdulwahab Srarheen</i>	54
Investigating Equilibrium Relationship between Macroeconomic Variables and Malaysian Stock Market Index through Bounds Tests Approach <i>Hussain Ali Bekhet & Mohamed Ibrahim Mugableh</i>	69
Debt Overhang and Economic Growth in HIPC Countries: The Case of Southern African Development Community (SADC) <i>Musebu Sichula</i>	82
A Study of "Inflation Indexed Bonds" in Indian Debt Market <i>Vaibhav Jain</i>	93
Foreign Private Capital, Economic Growth and Macroeconomic Indicators in Nigeria: An Empirical Framework <i>Ogujiuba Kanayo & Obiechina Emeka</i>	111
Investigating the Effect of Fundamental Accounting Variables on the Stock Prices Variations <i>Mahmood Moein Aldin, Hassan Dehghan Dehnavi, Mohammadreza Hajighasemi & Ali Hajighasemi</i>	125
Management Models of Municipal Solid Waste: A Review Focusing on Socio Economic Factors <i>Jacob Cherian & Jolly Jacob</i>	131
The Relationship between Economic Freedom, State Growth and Foreign Direct Investment in US States <i>Dennis Pearson, Dong Nyonna & Kil-Joong Kim</i>	140
East African Regional Integration: Challenges in Meeting the Convergence Criteria for Monetary Union: A Survey <i>Annette Kuteesa</i>	147
What Do Managers Mean When They Say 'Firms Like Theirs' Pay Bribes? <i>George R. G. Clarke</i>	161
Adjusting the Currency Composition of China's Foreign Exchange Reserve <i>Kai Shi & Li Nie</i>	170
VAR Analysis of the Determinants of the Foreigners' Transactions in Istanbul Stock Exchange <i>Bora ÖZKAN & Ali HEPŞEN</i>	180

Contents

- The Altruistic Motive of Remittances: A Panel Data Analysis of Economies in Sub Saharan Africa 192
Dobdinga Cletus Fonchamnyo
- The Quantity and Quality of Environmental Disclosure in Annual Report of National Oil and Gas Companies in Middle East and North Africa 201
Kamal Mehemed Eljayash, Kieran James & Eric Kong

Macroeconomic Volatility and Macroeconomic Indicators among Sub-Saharan African Economies

Rexford Abaidoo

Correspondence: Rexford Abaidoo, School of Business and Technology, University of Maryland Eastern Shore, USA.

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Abstract

This study explored how disaggregated macroeconomic volatility parameters impact key macroeconomic indicators in Sub-Saharan Africa. The study employed a number of external and regional macroeconomic volatility parameters derived from macroeconomic data sourced from the IMF in its empirical analysis. Dynamic Panel fixed effect model employed show that regional macroeconomic volatility parameters tend to have more statistically significant impact (positive and negative) on performance indicators in the sub-region than external macroeconomic volatility parameters. This study also finds that among regional macroeconomic volatility parameters shaping growth conditions in the sub-region, investment growth volatility is the dominant condition with statistically significant impact on key macroeconomic indicators in the sub-region. Results further point to evidence of significant moderating effects in how external and regional macroeconomic volatility parameters impact regional macroeconomic indicators.

Keywords: Macroeconomic Volatility, international trade, economic performance indicators, sub-Saharan African economies

JEL Classification: F1, F3, F4, E1

1. Introduction

Growing interactions among economies with varied domestic macroeconomic structures, a feature of evolving trends in international commerce, continues to be a key macroeconomic trend responsible for significant growth in most developed and developing economies. Although Smithian and Ricardian theories, as well as modern adaptive theories of international trade differ somewhat, on how international trade and economic interactions impacts participating economies, the general consensus suggests most participating economies benefits from such interactions. These benefits, according to the literature, stems from access to broader markets, and ensuing exchanges due to differences in resource endowments and technological knowhow. Expansion in cross-national trade necessitated by such fundamental disparities has also been found to be crucial in bridging major economic gaps among participating economies with varied domestic macroeconomic structures. These benefits notwithstanding, present trends in international commerce suggests the drive to major on country specific comparative advantages, a central tenet in international commerce, had led to, and continues to foster economic interdependence especially among developing economies. This drive to gain access to external markets in order to support regional export oriented policies, has also inadvertently exposed most less developed economies to macroeconomic volatilities inherent in the global market place (mostly dominated by advanced and emerging economies). Related literature for instance suggest that, less developed economies (Note 1) who have been mostly insulated from extreme swings in global commerce due to limited interactions and exposure, are now becoming increasingly susceptible to occasional shocks associated with international commerce due to growing interactions. Understanding effects of this growing interaction and exposure to global markets on developing economies is thus crucial; in that, the condition defines how key performance indicators in the sub-region ultimately influence economic growth and living standards. For instance, Addison et al (2007) showed that volatilities inherent in global markets have significant impact on both regional and country specific macroeconomic indicators of participating economies.

Empirical findings however, on the extent to which (external) macroeconomic volatility impact key macroeconomic indicators of participating economies, and how such economies cope with the condition differ significantly. Analysts for instance, differ sharply on what makes some economies more susceptible to external

macroeconomic perturbations than others. Empirical studies nevertheless, suggest that effects of occasional volatility and shocks associated with international commerce might be more severe on less developed economies than their developed counterparts; Kraay and Ventura (2007). Referencing this conclusion, some analysts have argued that SSA economies are more prone to external volatilities resulting from increasing involvement in global commerce due to relatively weak regional economic structures and constrained economic policies needed to manage the condition. Analysis of historical trade dynamics on Sub-Saharan Africa show that until recent decades, the sub region, compared to other economic blocks around the world had minimal interactions and limited access to global markets due to trade barriers and socio-political constraints. Recent trends however, suggest most economies in the sub-region are becoming more and more integrated into the global market economy through expansion in exports, foreign direct investments, networked financial systems etc. Apart from these known traditional means of forging and expanding economic interactions, available evidence further suggest that recent growth in economic interactions for most economies in the region has resulted from mutually beneficial socio-economic and political factors. For instance, trade agreements aimed at promoting export base of economies in the sub-region to support poverty alleviation programs, and access to internet based financial network systems which have made it possible to integrate financial and banking operations into the global financial system are but few of these emerging factors. These evolving conditions coupled with other macroeconomic drivers in the sub-region continue to expose the sub-region to potentially risky macroeconomic conditions associated with global commerce.

The view that most participating economies benefits from international commerce is not in dispute in this study; this study only seeks elicit discussions on whether such benefits outweighs constant risk of exposure to shocks with potential to stall growth or bring about total economic collapse for mostly ill-prepared developing economies. Studies show that external macroeconomic volatility has the potential to exert significant positive or negative influence on performance indicators of participating economies. Further evidence suggest that depending on the nature and trigger of economic volatility or shock, the condition could enhance critical macroeconomic indicators of participating economies bringing about badly needed growth; or suppress them, leading to constrained economic performance. Aghion et al. (2004) for instance, showed that, financial openness (a feature of growing market exposure and interactions) has the potential to destabilize domestic economy of less developed economies by inducing massive swings in capital inflows and outflows during economic booms and downturns. Easterly et al. (2001) additionally showed that increase trade openness (another key feature of growing economic interactions) has significant impact on output volatility among developing economies. Buch et al. (2005) further determined that the link between financial openness (an element of exposure) and business cycle volatility among economies depend on the nature of underlying shocks economies are exposed to.

Additionally, Bekaert, Harvey and Lundblad (2001), who examined effects of financial market liberalization on economic growth, also submitted that the condition has significant positive impact on per capita GDP growth. Focusing on the link between foreign direct investment (FDI) inflows and per capita income among selected SSA economies, Fotso (2003) further concluded that FDI-related technology transfers (due to economic interactions) has positive effects on growth conditions among SSA economies. Delechat et al (2009) also found that net capital flows resulting from economic exchanges correlates positively with growth rate in 44 SSA economies. Edison, Levine, Ricci and Sløk (2002) however, found no significant relationship between financial/economic integration and economic performance. This succinct empirical review to some extent, highlights prevailing views on how financial/trade openness or exposure influence performance indicators among participating economies.

This study evaluates effects of macroeconomic volatility on macroeconomic indicators in SSA using disaggregated volatility approach; this approach derives a number of macroeconomic volatility parameters - both external and regional, and tests how each parameter affects key macroeconomic indicators in SSA. Following Delechat et al (2009), this study subscribe to the view that expansion in international trade, and integration of economies in the sub-region into the global economy has been crucial for growth in the sub-region. Available data further supports this view that the sub-region owes much of its recent economic success to sustained growth in exports and FDI inflows; a direct product of growing interactions and access to global capital flows. However, this study is of the view that unlike most advanced economies that are well equipped with robust macroeconomic structures and strong policy expertise to cope with shocks associated with global commerce, the SSA economy might not be well equipped to deal with economic threats from growing access and exposure to global commerce. This study consequently estimates relationships between disaggregated fundamental volatility parameters and

key performance indicators for SSA; with emphasis on verifying how selected macroeconomic indicators in the sub-region respond to or are shaped by regional and external macroeconomic shocks or volatility.

External macroeconomic volatility in this study defines variability associated with macroeconomic indicators among advanced economies around the world as defined by the IMF. This definition presumes that macroeconomic activities among advanced economies such as the USA, most economies in the European Union etc, to a greater extent, drives much of global commerce and as such, the volatilities involve. This study hypothesizes that macroeconomic volatility and shocks inherent in international commerce dominated by advanced economies could be responsible for depressed growth among exposed less developed economies like those in SSA. Consequently, this study is modeled to estimate how specific volatility parameters – both external and domestic, influence performance indicators in the sub-region. Currently, two views dominate ongoing debate about the relationship between external macroeconomic volatility and performance indicators among economies in the sub-region. The first view surmise that, despite growing integration and purported exposure, financial market operations and economic structures in the sub-region are still less developed and relatively detached from the global financial system to be significantly impacted by external macroeconomic shocks. Proponents of this view for instance, argue that most economies in the sub-region still operates at the subsistence level, with most resources obtained domestically; consequently, external macroeconomic shocks may have little or no significant impact on key regional performance indicators as some have argued. Advocates further argue that compared to most advanced economies, consumption patterns in the sub-region are less credit dependent, a condition which makes economies in the sub-region less susceptible to credit and financial market shocks. Thus, to proponents of this view, external macroeconomic volatility or shocks may have relatively minor impact if any, on key macroeconomic indicators among economies in the sub-region. Opponents however, point out that, growing exposure to external market coupled with weak regional macroeconomic structures and policies capable of absorbing such shocks, constitutes significant threats to long term growth conditions in the sub-region.

This study projects significant relationship between both external and regional macroeconomic volatility parameters and key macroeconomic indicators from the sub-region; it is further anticipated that varied macroeconomic indicators from the sub-region will respond differently to various volatility parameters in this study. To verify these projections, this study provide empirical examination of the nexuses between external and regional macroeconomic volatility parameters generated and selected macroeconomic indicators for SSA. Empirical approach adopted in this study has been motivated in part by lack of empirical study focusing on how disaggregated macroeconomic volatility parameters influence macroeconomic indicators in SSA. This study is also part of evolving literature exploring associations between distortions in macroeconomic condition and growth performance among less developed economies. Macroeconomic performance in the sub-region is modeled using five economic indicators; namely, Gross Domestic Product (GDP) growth, inflation rate, investment growth, gross national savings and current account balance condition. External and regional/domestic Macroeconomic volatility parameters on the other hand are estimated from selected macroeconomic indicators associated with advanced economies as defined by the IMF.

The rest of the study is structured as follows; section two discuss macroeconomic dynamics in Sub-Saharan Africa with specific emphasis on selected performance indicators employed in this study. Section three presents succinct account of empirical literature on the general relationship between fundamental macroeconomic volatility and macroeconomic indicators. Section four estimates external macroeconomic volatility as define in this study and describe sources and data type use in this study. Section five derives and states empirical model as well as auxiliary tests procedures employed in the study. Analysis of test results, possible policy implications of study findings and conclusions are presented in the final section.

2. Macroeconomic Conditions among SSA Economies and External Volatility

The extent to which external macroeconomic volatility parameter impacts performance indicators among economies in the sub-region is projected to depend on two key conditions. Following Watts and Bohle's (1993) and Moser (1998) on the concept of vulnerability; this study projects that, the extent of vulnerability to macroeconomic shocks associated with economies in the sub-region depends on two main conditions:- degree of exposure and relative inbuilt capacity to cope or minimize the condition. According to Watts and Bohle's (1993) and Moser (1998), the degree of exposure to an external threats or shock, and the relative capacity to cope or the resilience of an entity to external threats or shock, are the dominant factors determining vulnerability or how variables responds to or are impacted by an external condition. In order words, this approach suggests that performance of macroeconomic indicators in SSA in the face of external shocks depends on how exposed the region is to the specific shock, and inbuilt regional capacity to cope with the shock or threat. Following this reasoning, this study again projects that modeled macroeconomic volatility parameters will have significant

impact on key macroeconomic indicators from the sub-region due to growing exposure to volatilities in the global market place. This threat from external macroeconomic volatility due to increasing exposure is further expected to be aggravated by weak regional economic policies and structures crucial in coping with potential effects of volatility or shocks. The following section discusses historical trends in key macroeconomic indicators employed in this study.

2.1 GDP Growth

Regional GDP growth data indicates growth conditions among economies in the sub-region differ significantly. Specific domestic factors such as differences in natural resource endowment etc. continue to influence regional conditions leading to disparities in economic growth. Oil producing economies in the region for instance, tend to experience relatively higher GDP growth than economies lacking the resource. Aggregate IMF GDP growth data for the sub-region as a whole, further document significant uneven growth conditions over the past decades. The data for instance shows the sub-region has witnessed significant fluctuations in GDP growth over the past two decades. Much of the fluctuations according to analysts have been driven by persistent variability in exports from the region, foreign direct investments inflow, as well as regional socio-political conditions. IMF data on regional economic outlook shows that with the exception of the mid 1980s and the early 1990s when GDP growth in the sub-region trended weakly, GDP growth trajectory for the region after the year 2000 were positive and relatively high until the onset of 2008 global economic slowdown. The data shows GDP growth in the sub-region declined from an average of over 6% per year prior to the recession to a little over 3% in periods just afterwards. From growth rate of 2.82% recorded in 2009 after the economic shock, the data now reports average GDP growth rate of over 5% for the sub-region as a whole. A condition which suggests the sub-region has recovered relatively faster after the global recession compared to the USA. Figure 1 charts regional growth dynamics between 1980 and 2011; as well as projected growth trend until 2016. It also shows the effects of the 2008 global financial crisis on growth conditions in the sub-region.

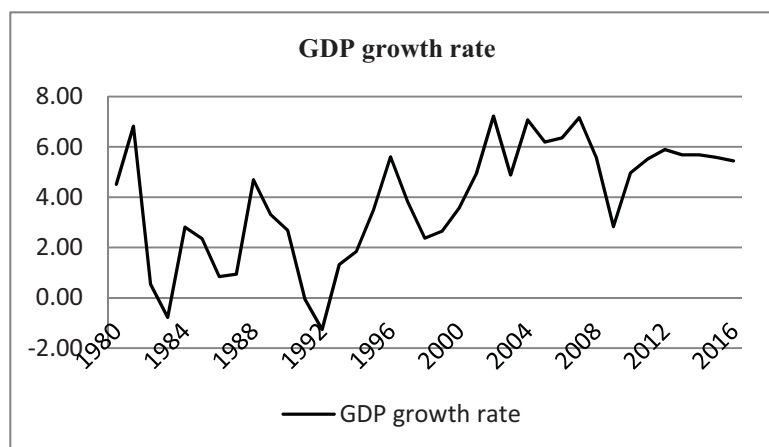


Figure 1. Sub-Saharan GDP growth Conditions (1980-2011) with projections to 2016

Data Source: IMF data

2.2 Inflation Rate

Compared to other developing and advanced economies, inflationary conditions in SSA tend to be relatively high with significant negative impact on regional financial system and macroeconomic conditions. IMF regional economic outlook data indicates on the average, inflationary rate for the sub-region hovered around 10% between 1980 and 1988. This relatively high inflation rate rose significantly between 1991 and 1996, with highest rate over the period reaching over 40% on average for the sub-region. Inflationary conditions in the sub-region after 2000 however, have been relatively low by regional standards with the exception of the period leading to 2008 global financial crisis. Recessionary pressures due to the 2008 financial crisis led to minor increase in inflation rate over the period as evidenced by a rise in trend around the recessionary period in figure 2. This condition, coupled with the fact that the highest inflationary condition over the period under study also happened to have coincided with the 1990-1991 global recession, one of the worst on record, suggest that to

some degree, inflationary trends in the sub-region are influenced by external macroeconomic distortions. Figure 2 illustrates inflationary conditions over a 30 year period for the region and shows effects of recessionary pressures on inflation rate.

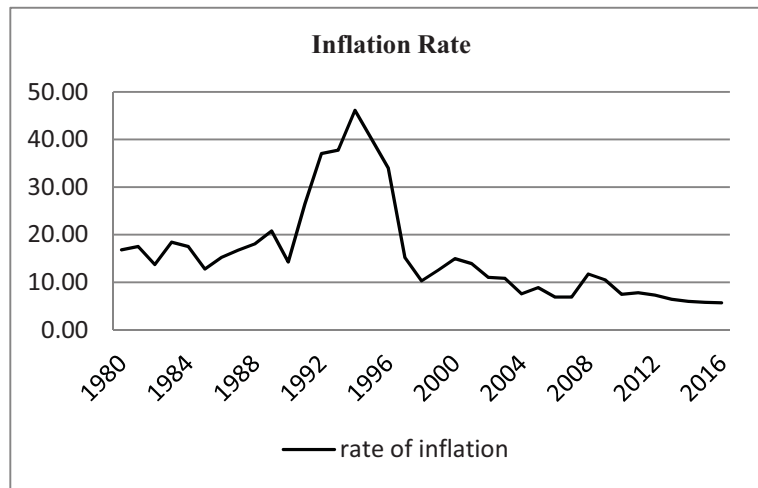


Figure 2. Sub-Saharan Inflation rate Conditions (1980-2011) with projections to 2016

Data Source: IMF data

2.3 Investment Growth (% of GDP)

Investment growth conditions in the sub-region over the past two decades have been relatively strong; available data indicates investment growth over the period under study accounts for over 15% of regional GDP growth. According to IMF regional economic outlook, investment growth as a percentage of GDP growth averaged over 20% between 1980 and 1990. The trend however, declined slightly in the early 1990s, and has since ranged between 16% and 21% of GDP growth. Compared to other macroeconomic indicators used in this study, investment growth as a percentage of GDP growth for the sub-region has been fairly stable over the years by regional standards. Although the 2008 economic recession had significant negative impact on individual economies in the sub-region, aggregate data indicates the region as a whole showed little sign of the condition. Figure 3 illustrates sub-regional investment growth as a percentage of GDP between 1980 and 2011.

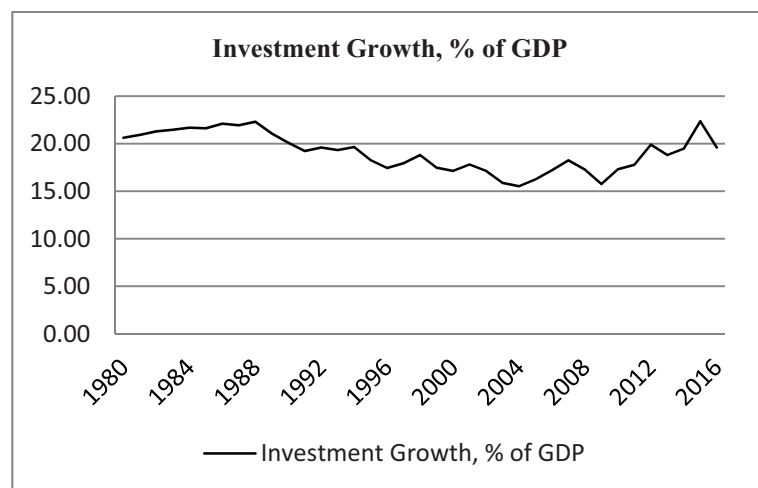


Figure 3. Sub-Saharan Investment growth rate Conditions (1980-2011) with projections to 2016

Data Source: IMF data

2.4 Gross Regional Savings (% of GDP)

According to historical regional economic outlook data, gross regional savings as a percentage of GDP, experienced significant decline in the early 1980s. This decline led to regional savings growth falling sharply below a 20% threshold; growth trend since this decline averaged between 14% and 18% until 2005. Early part 2005 however, witnessed significant growth in gross national savings with average growth rate well over the 20% growth rate for the first time since 1980. A key feature about gross regional savings rate over the period under study is its relatively even growth over the period. Trend analysis based on sub-regional macroeconomic data further show that post 2008 recession regional savings growth has perform better on the average, compared to periods prior to the recession. Figure 4 illustrates sub-regional savings growth as a percentage of GDP growth.

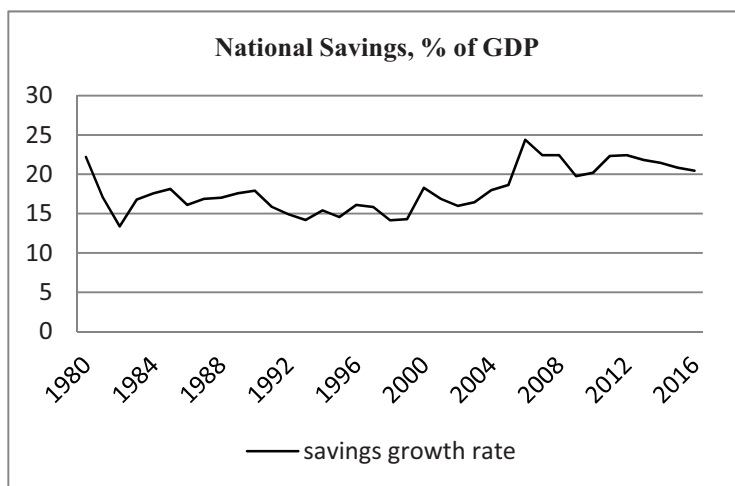


Figure 4. Sub-Saharan National Savings rate Conditions (1980-2011) with projections to 2016

Data Source: IMF data

2.5 Current Account Balance

Among sub-regional macroeconomic indicators explored in this study, regional current account balance as a percentage of GDP growth, like GDP growth trend, also exhibits significant trend volatility. Regional data shows current account balance as a percentage of GDP growth over the past two decades has fluctuated significantly between extremes of - 6% and 4.2%. Further trend analysis indicates early part of 1980s witnessed the worse episode in the sub-region's current account balance condition. Between 1980 and 2005, current account as a percentage of GDP growth hardly recorded positive growth. The best period however in current account condition over the period under study occurred just before the 2008 recession, reaching a peak of 4.2%. As expected, this growth condition was short-lived because of recessionary pressures at the time. Figure 5, illustrates regional current account balance trends as presented by IMF regional economic outlook data.

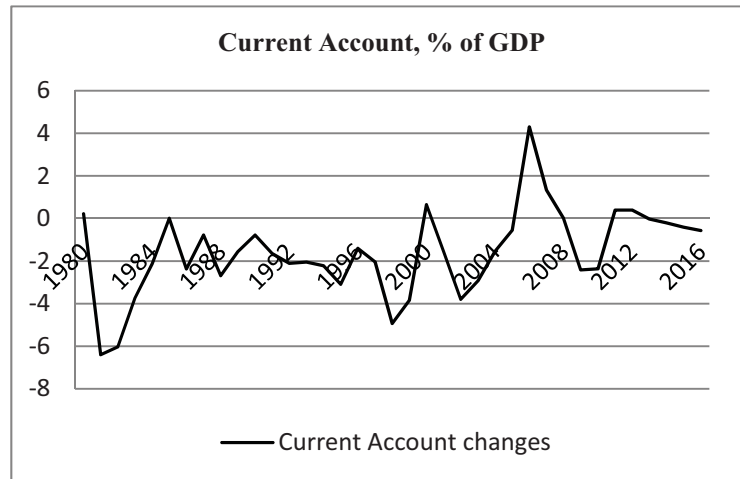


Figure 5. Sub-Saharan Current Account Conditions (1980-2011) with projections to 2016

Data Source: IMF data

2.6 Export Growth

Regional time series data on trends in export growth shows extensive growth between 1993 and 1996. This positive growth trend however fluctuated significantly until a major decline just after the 2008 economic downturn. Since this decline following the 2008 recession, exports from the sub-region have experienced significant growth to date; it is projected that the current trend could be sustained as foreign direct investments into the region grows with substantial portion of these investments augmenting domestic export base. Export growth trend over the period under study to some extent, further support the condition that global macroeconomic condition such as the 2008 recession, tend to have significant impact on key macroeconomic indicators in the sub-region. Figure 6 illustrates export growth dynamics for the region between 1990 and 2011 as documented by IMF regional economic outlook data (Note 2).

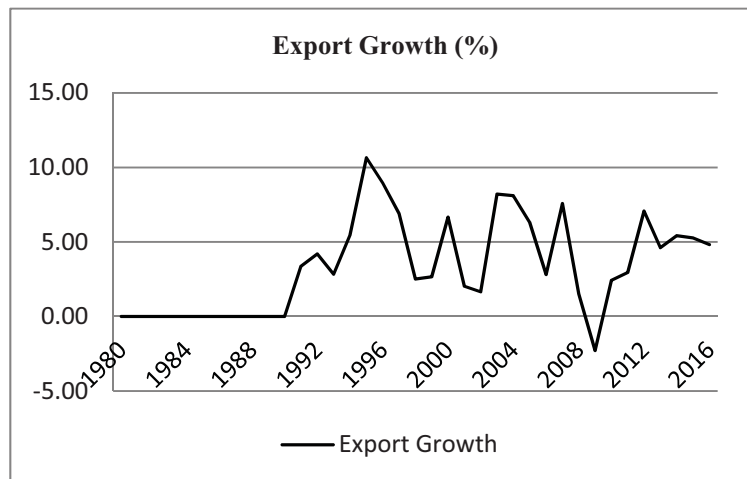


Figure 6. Sub-Saharan Export Growth rate Conditions (1990-2011) with projections to 2016

Data Source: IMF data

3. Overview of Empirical Literature: Macroeconomic Volatility and Macroeconomic Indicators

The fundamental view that volatility exerts significant influence on macroeconomic indicators in both developed and developing economies is highly supported by existing literature focusing on the relationship. Empirical studies reviewed so far, largely supports the view that macroeconomic volatility has significant negative impact on macroeconomic indicators all things being equal. Studies focusing on the relationship between fundamental

volatility and economic performance such as Bernanke (1983), Pindyck (1991) and Ramey and Ramey (1991) have all arrive at similar conclusions; providing evidence in support of negative relationship between volatility and economic growth. Additionally, Henry and Olekalns (2002) also found negative relationship between economic volatility and real GDP growth for the U.S economy. Again, using panel data for 59 industrialized and developing economies, Asteriou and Price (2005) further showed that output volatility due to uncertainty reduces both investment and economic growth; further supporting negative relationship between macroeconomic volatility/uncertainty and economic growth. Furthermore, employing a sample of 128 countries, Badinger (2010) also found evidence of negative effect of volatility on economic growth. Giovanni and Levchenko (2006) additionally documented that, countries whose economies are more open to trade tend to experience more volatility; and are more susceptible to inimical external macroeconomic conditions with the potential to negatively impact domestic economic indicators.

Aizenman and Marion (1999) also found evidence in support of negative relationship between volatility and economic performance indicators among developing countries; for instance, the study showed that volatility negatively affects private investment growth in developing economies. Kharroubi (2007) additionally provided empirical evidence in support of inverse relationship between economic growth and volatility; Kharroubi further surmised that negative relationship between growth and volatility observed in developing countries could be traced to shortcomings or weakness associated with domestic financial system. Using a sample of 79 developed and developing economies, Hnatkowska and Loayza (2005) studied the growth-volatility relationship over the period 1960–2000, and found volatility to be inimical to economic growth. However, contrary to conclusions from most studies reviewed, Kose, Prasad, and Terrones (2005) found positive relationship between growth and volatility among industrialized economies; the case among developing economies in the same study was however, found to be negative. If these findings on the relationship between volatility and economic growth among developing economies especially are indication of a general trend, then all things being equal, findings of the current study might mimic this trend despite the use of disaggregated volatility parameters.

4. Estimating Macroeconomic Volatility

External macroeconomic volatility in this study defines volatilities inherent in specific macroeconomic indicators associated with advanced economies around the world as classified by the IMF. This study employs aggregate data on real GDP growth, investment growth as well as output gap conditions for advanced economies in estimating external macroeconomic volatility parameters. In all, GDP growth, Investment growth and output gap data for 34 advanced economies are use in estimating this study's external volatility parameters. External volatility in this study is measured as the standard deviation of stated macroeconomic indicators. Regional macroeconomic volatility parameters for SSA are also derived using similar procedure.

4.1 Data and Variables

Empirical analysis verifying effects of external and regional macroeconomic volatility on selected sub-regional macroeconomic indicators such as investment and GDP growth are estimated using a panel of 39 sub-Saharan African economies; the data sets span the period 1980 to 2011. Key macroeconomic variables from the sub-region employed in this study include, GDP growth, investment growth, inflation rate, current account balance conditions, and gross regional savings conditions. External macroeconomic volatility parameters are estimated from variables already stated. All data sets are sourced from the IMF regional economic outlook database.

5. Econometric Specification

This study adopts empirical estimation approach which relies heavily on empirical methodology used extensively in the macroeconomic volatility-growth nexus literature. This study however examines specific dynamic relationships at the micro-level using disaggregated regional and external volatility parameters via panel fixed effects regression instead of a single volatility variable often found in the literature. This study projects that, holding all else constant, (i.e. all growth augmenting conditions, technology, socio-political conditions etc.) growth conditions associated with macroeconomic indicator y_t , in a sub-region made up of t varied economies, could be modeled as a function of the degree to which such variable cope with regional and external macroeconomic volatilities. In other words, growth conditions characterizing key macroeconomic variables in SSA are projected to depend on how the variables fair in the face of volatile regional and external macroeconomic conditions. In this line of argument, growth conditions associated with key macroeconomic indicators in SSA are said to be defined by occasional macroeconomic volatilities; both regional and external. To this end, this study models performance of key macroeconomic indicators among economies in the sub-region as a function of regional and external macroeconomic volatility as follows:

$$y_t = f\left[\sum_{i=1}^t dom\sigma^2 + \sum_{i=1}^t \sum_{i=1}^t Ext\sigma^2\right] \quad (1)$$

Where y_t estimates overall growth performance associated with specific sub-regional macroeconomic indicator; $dom\sigma^2$ captures portion of overall macroeconomic volatility experienced from the regional (domestic) economy, and $Ext\sigma^2$ estimates external volatility in the global market place. Equation 1 suggests that all things being equal, performance of key macroeconomic indicators in the sub-region depend on how the sub-region manages regional and external macroeconomic volatilities or shocks. In other words, this estimation process holds constant other known factors influencing key economic indicators in the sub-region, in order to assess how macroeconomic volatilities or shocks influence regional economic indicators. The following section determines appropriate empirical approach to adopt in verifying the relationship between disaggregated volatility parameters and selected macroeconomic indicators from SSA modeled in equation 1.

Hausman test determining appropriate model for this study based on type of data employed, supports fixed effects approach for this study; consequently, fixed effect model estimating effects of domestic/regional and external macroeconomic volatility on key macroeconomic indicators in SSA is formulated. Fixed effects method used in this study is modeled to correct for parameter endogeneity which could skew test results. Fixed effect model estimating effects of macroeconomic volatility parameters on key economic indicators is specified as follows (Note 3):

5.1 The Fixed Effect Model

$$y_{it} = \delta_0 + \delta_1 EOutput_{vit} + \delta_2 EInvest_{vit} + \delta_3 EGDP_{gvit} + \delta_4 Dgdvp_{vit} + \delta_5 Dinvest_{vit} + \delta_6 Dinfl_{vit} + q_i + q_t + e_{it} \quad (2)$$

where

– y_{it} captures dependent variables (macroeconomic indicators) of sub-region i , at time t .

– δ_0 ($i=1 \dots n$) is the unknown intercept.

– $E-Ouptv$, $E-Invst$, $E-GDPgv$, $D-gdvp$, $D-invest$, $D-infl$, $D-cabl$ etc captures independent variables (E -external and D -domestic (regional) volatility as measured by standard deviations of selected variables)

– $\delta_1 \dots \delta_6$ are the coefficients for independent variables tested

– q_i Controls for unobserved country heterogeneity

– q_t Time (year) fixed effects

– e_{it} The error term

Equation 2 models effects of domestic/regional and external macroeconomic volatility on selected regional macroeconomic indicators from SSA using data from 1980 to 2011. As defined earlier, q_i and q_t from equation 2 defines vectors of country and time fixed effects and e_{it} the error term. Country fixed effects in this instance controls for unobserved country specific heterogeneity while time fixed effects controls for variations in time periods. Table 1, 2 and 3 report fixed effects estimates (coefficients and standard errors) of relationships between macroeconomic volatility parameters and selected regional macroeconomic indicators. Table 1 estimates highly plausible scenario where both regional and external macroeconomic volatility parameters concurrently influence key performance indicators among economies in the sub-region. Tables 2 and 3 on the other hand, verify how macroeconomic volatility (domestic/regional or external) independently influence regional macroeconomic indicators. Separate tests results presented in tables 2 and 3, are meant to highlight how key regional macroeconomic indicators relates to specific volatility parameters in the absence of others. These highly unlikely scenarios (the presence of only domestic/regional or external macroeconomic volatility), are meant to afford this study a means of weighing the case for, and against orienting regional policies towards reducing specific form of macroeconomic volatility. For instance, if specific sources of volatility are determined to have significant constraining effects on regional economic performance, such information could help policy makers design policies specifically geared towards minimizing such sources of volatility. Outcome of such analysis could further help utilize resources efficiently by focusing on specific sources of volatility projected to have significant negative impact on key regional macroeconomic variables. Table 1 present results of a combined scenario; i.e. how both regional and external macroeconomic volatility parameters impact key macroeconomic variables in the sub-region.

Table 1. Fixed Effect Estimates: Effects of Volatility on Macroeconomic Indicators

Volatility Parameter	(1) GDP Growth	(2) Investment Growth	(3) Gross National Savings	(4) Inflationary Conditions	(5) Current Account Balances
<i>E-Outputv</i>	1.5581* (0.70)	0.4327 (0.29)	-0.200 (0.41)	-0.2776 (23.54)	-0.560 (0.36)
<i>E-Invstv</i>	-1.131 (0.71)	0.924** (0.29)	0.146 (0.41)	-11.006 (23.63)	-0.740* (0.36)
<i>E-GDPv</i>	-1.389* (0.66)	-0.641* (0.27)	0.623 (0.38)	-116.93*** (22.00)	1.047** (0.33)
<i>D-GDPv</i>	0.299*** (0.04)	0.0030 (0.02)	-0.008 (0.02)	0.234 (1.42)	-0.003 (0.02)
<i>D-Invstv</i>	-0.770*** (0.16)	0.731*** (0.06)	-0.499*** (0.09)	-1.707 (5.34)	-0.973*** (0.08)
<i>D.Infv</i>	-0.0001 (0.00)	0.001 (0.00)	0.001 (0.00)	0.545*** (0.03)	-0.000 (0.00)
_cons	13.00*** (1.82)	16.34*** (0.74)	15.03*** (1.07)	171.71** (61.07)	-1.819* (0.92)
Obs	1239	1239	1239	1239	1239
r2	.0303481	.0738676	.0073496	.1893524	.0869733

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

6. Empirical Results

6.1 External Volatility and Performance of Sub-regional Macroeconomic Indicators

Fixed effects coefficients reported in table 1 demonstrate that external macroeconomic volatility has statistically significant effect on key sub-regional macroeconomic indicators. Coefficients estimates for instance, indicate external GDP growth volatility has significant negative effect on GDP growth in the sub-region. A review of related time series data suggest that this negative association may reflect export oriented nature of most economies in the sub-region. Analysts for instance, are of the view that being predominantly export dependent increases the likelihood for anemic regional growth during periods of global economic shocks or volatility (external GDP growth volatility). This study also finds that external GDP growth volatility (*E-GDPv*) negatively impacts regional investment growth among economies in the sub-region. The same condition, (*E-GDPv*) is further found to have significant negative impact on inflationary conditions in the sub-region; but a positive impact on regional current account balance conditions. These findings to a large extent suggest that, volatility associated with external economic growth (GDP growth) has significant negative impact on key performance indicators among SSA economies. Apart from these relationships (between external GDP growth volatility and key indicators in the sub-region), this study also finds positive association between external investment growth volatility and investment growth in SSA. To verify underlying factors responsible for this positive association, the literature on foreign direct investment and regional economic growth nexus is reviewed for clues. The evidence suggests this positive link between external investment growth volatility and regional investment growth could be explained by two key factors. The first factor revolves around relatively lower cost of production in most economies in the sub-region which makes it possible to attract specific investments even during periods of declining or constrained investment conditions in most external economies. Some analyst also suggest that highly inelastic demand for resources from most parts of the sub-region helps to attract and sustain investments growth even during periods of general global investment decline. These conditions according to the literature explain to some degree why external investment growth volatility rather induces investment growth in the sub-region.

This study further finds that external investment growth volatility has significant negative effects on regional current account balance; a condition which suggests persistent external investment growth volatility constrains current account balance conditions in SSA. External output gap volatility (*E-Outputv*) in this study measures fluctuations in productivity level in the global market place. This study surmised that extreme volatility in this indicator will be beneficial to economies in the sub-region; in that, the condition has the potential to increase

demand for exports from the sub-region to compensate for short falls in global market productivity. Coefficients estimates accordingly show that external output gap volatility correlates positively with GDP growth in the sub-region. Reported results however suggest external macroeconomic volatility parameters moderated by domestic/regional conditions have no statistically significant impact on gross regional savings.

6.2 Regional/Domestic Volatility and Performance of Macroeconomic Indicators

Results featured in Table 1 further shows that in an environment characterized by some form of external macroeconomic volatility, regional investment growth volatility is the dominant macroeconomic condition with significant impact on key regional macroeconomic indicators. Although regional GDP growth and inflation rate volatility also have significant impact on some regional macroeconomic variables, effects of regional investment growth volatility on regional macroeconomic indicators tend to be pervasive; impacting almost all regional macroeconomic indicators tested in this study. Regional investment growth volatility in this case is found to have negative effects on gross regional savings, current account balance conditions and GDP growth; this study however finds that regional investment growth volatility has positive effects on regional investment growth all things being equal. In other words, regional investment growth volatility ultimately promotes investment growth in the sub-region. This positive relationship between regional investment growth volatility and investment growth is thought to reflect a long run investment drive phenomenon; where short run investment growth volatility due to unique regional factors ultimately necessitates and generates the needed impetus for sustained regional investment growth in the long run.

Table 2 report effects of external macroeconomic volatility parameters on selected regional macroeconomic indicators holding regional/domestic volatility parameters constant.

6.3 Effects of External Macroeconomic Volatility on Regional Macroeconomic Indicators

Table 2. Fixed Effect Estimates for External Macroeconomic Volatility

	(1)	(2)	(3)	(4)	(5)
Volatility Parameter	GDP Growth	Investment Growth	Gross National Savings	Inflationary Conditions	Current Account Balances
E-Outpv	1.9845** (0.72)	0.1596 (0.30)	-0.0421 (0.41)	-16.7039 (26.28)	-0.2148 (0.37)
E-Invstv	-1.0568 (0.72)	0.7842** (0.30)	0.1619 (0.41)	-65.128* (26.27)	-0.6129 (0.37)
E-GDPv	-1.1859 (0.66)	-0.6735* (0.28)	0.7360 (0.38)	-52.8176* (24.31)	1.1597*** (0.35)
_cons	9.794*** (1.70)	19.914*** (0.71)	12.664*** (0.98)	224.434*** (62.16)	-6.515*** (0.89)
r2_a	.021168	.025654	.029988	.019677	.023981
Obs	1,239	1,239	1,239	1,239	1,239

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2 presents coefficients and standard error estimates of a scenario where regional macroeconomic indicators are only influenced by external macroeconomic volatility parameters. Although regional macroeconomic environment devoid of any domestic economic influence is farfetched, this approach allows this study to verify the extent to which effects of external macroeconomic volatility on key growth indicators are moderated or otherwise; by comparing results with those reported in table 1. Table 2 results show that, holding effects of domestic macroeconomic volatility parameters constant significantly influence the extent to which external volatility influence key macroeconomic indicators in the sub-region. For instance, coefficient estimates, show that in the absence of domestic/regional macroeconomic volatility, external GDP growth volatility fails to have significant impact on GDP growth in SSA. A similar condition is also found in the relationship between external investment growth volatility and regional/domestic current account balance. This study further finds that external investment growth volatility has statistically significant negative impact on domestic/regional inflation rate although results in table 1 suggested otherwise. These results (Table 2) suggest that in an environment of minimal or no regional macroeconomic volatility threats, external macroeconomic volatility (as measure by

various parameters already stated) tend to influenced regional economic indicators differently; a condition which suggests some moderating effects from regional macroeconomic volatility in table 1. For instance, external GDP growth volatility in this scenario is found to have relatively weaker negative impact on inflationary conditions compared to condition reported in table 1.

Results presented in table 3 focuses on a reverse condition where regional macroeconomic indicators are modeled as a function of only domestic/regional macroeconomic volatility parameters.

6.4 Effects of Domestic Macroeconomic Volatility on Regional Macroeconomic Indicators

Table 3. Fixed Effects Estimate for Domestic Macroeconomic Volatility

Volatility Parameter	(1) GDP Growth	(2) Investment Growth	(3) Gross National Savings	(4) Inflationary Conditions	(5) Current Account Balances
D-GDPv	0.2996*** (0.04)	0.0031 (0.02)	-0.0072 (0.02)	-0.0276 (1.44)	-0.0023 (0.02)
D-Invv	-0.769*** (0.16)	0.721*** (0.06)	-0.504*** (0.09)	-0.060 (5.38)	-0.968*** (0.08)
D-Inflv	-0.0004 (0.00)	0.0002 (0.00)	0.0006 (0.00)	0.5231*** (0.03)	0.0003 (0.00)
_cons	12.870*** (0.80)	17.654*** (0.33)	15.561*** (0.47)	20.289 (27.12)	-2.665*** (0.41)
r2_a	.020303	.064494	.008060	.167966	.078579
Obs	1,239	1,239	1,239	1,239	1,239

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Coefficient estimates in this case verifies how domestic/regional macroeconomic volatility parameters independently influence critical regional macroeconomic indicators. These estimates presume a relatively closed regional economic enclave devoid of any major external macroeconomic influence. Coefficients estimates in this case show that key macroeconomic indicators in the sub-region are influenced predominantly by volatility associated with regional investment growth. The results further show that the relationship between regional investment growth volatility and the various regional economic indicators are statistically identical to those reported in table 1. This outcome suggest that regional investment growth volatility constitutes a dominant feature influencing key macroeconomic variables in the region with or without moderating effects of other volatility parameters. It also suggest that apart from socio-cultural and geo-political conditions which often perturbs growth dynamics in the region, regional investment growth volatility should be a variable of interest for policy makers in the sub-region. These results further imply that all things being equal, effects of domestic/regional macroeconomic volatility parameters on key macroeconomic indicators are hardly moderated or influenced by external macroeconomic conditions; since coefficients of various indicators barely changes in the two cases tested; (comparing table 1 and 3 estimates for domestic investment volatility).

7. Concluding Remarks

This study verified the dynamic interactions between disaggregated macroeconomic volatility parameters and key macroeconomic indicators for the SSA region. I find that on average, macroeconomic volatility parameters have statistically significant negative impact on selected macroeconomic indicators for the sub-region. Estimated coefficients also show that in a hypothetical scenario where regional macroeconomic indicators are only exposed to either external or domestic/regional macroeconomic volatility parameters, external macroeconomic volatility parameters tends to have more influence on macroeconomic indicators in the sub-region than domestic/regional macroeconomic volatility parameters. Finally, this study also finds that effect of domestic/regional macroeconomic volatility on performance indicators in the region is mostly dominated by volatility associated with domestic/regional investment growth. These findings suggests that, in order to ensure sustained regional growth, policies geared towards fostering macroeconomic stability should target minimizing effects associated with specific external macroeconomic volatility parameters and instability in regional investment growth. Successful implementation of such policies could help the sub-region manage effects of such macroeconomic

conditions; and augment efforts aimed at creating the necessary environment critical for sustained economic growth.

References

- Addison, Douglas, & Wodon, Quentin. (2007). Macroeconomic Volatility, Private Investment, Growth, and Poverty in Nigeria. Published in: *Growth and Poverty Reduction: Case Studies from West Africa* (edited by Quentin Wodon, published in World Bank Working Paper No. 79) (January): pp. 123-137.
- Aghion, Philippe, Bacchetta, Philippe, & Banerjee, Abhijit. (2004). Financial development and the instability of open economies. *Journal of Monetary Economics*, 51, 1077-1106. <http://dx.doi.org/10.1016/j.jmoneco.2003.12.001>
- Aizenman, J., & N. Marion. (1993). Policy Uncertainty, Persistence, and Growth. *Review of International Economics*, 1, 145-163. <http://dx.doi.org/10.1111/j.1467-9396.1993.tb00012.x>
- Aizenman, J., & N. Marion. (1999). Volatility and Investment: Interpreting Evidence from Developing Countries. *Economica*, 66, 157-79. <http://dx.doi.org/10.1111/1468-0335.00163>
- Asteriou, D., & Price, S. (2005). Uncertainty, Investment and Economic Growth: Evidence from a Dynamic Panel. *Review of Development Economics*, 9(2), 277-288. <http://dx.doi.org/10.1111/j.1467-9361.2005.00276.x>
- Badinger, H. (2010). Output volatility and economic growth. *Economics Letters*, 106, 15-18. <http://dx.doi.org/10.1016/j.econlet.2009.09.012>
- Bekaert, G., Harvey, C. R., & Lundblad, C. (2001). Does Financial Liberalization Spur Growth? NBER Working Paper No. 8245 (Cambridge, Massachusetts: National Bureau of Economic Research).
- Bernanke, B. (1983). Irreversibility, uncertainty, and cyclical investment. *Quarterly Journal of Economics*, 98, 85-106. <http://dx.doi.org/10.2307/1885568>
- Buch, C.M., Dopke, J., & Pierdzioch, C. (2005). Financial openness and business cycle volatility. *Journal of International Money and Finance*, 24, 744-765. <http://dx.doi.org/10.1016/j.jimonfin.2005.04.002>
- Constantinos Katrakilidis et.al. (2011). Dynamic Linkages between Output Growth and Macroeconomic Volatility: Evidence using Greek Data. *International Journal of Economic Research*, 2(1), 152-165
- Delechat, Ramirez, Wagh, & Wakeman-Linn. (2010). How Global Financial Markets Affect SubSaharan Africa. *IMF Staff Papers*, 57(1), 172-208. <http://dx.doi.org/10.1057/imfsp.2009.29>
- Easterly, W., Islam, R., & Stiglitz, J. E. (2001). Shaken and stirred: Explaining growth volatility in B. Pleskovic and N. Stern (eds.), *Annual World Bank Conference on Development Economics*.
- Edison, H., Klein, M., Ricci, L., & Sløk, T. (2002). Capital Account Liberalization and Economic Performance: A Review of the Literature. IMF Working Paper 02/120 (International Monetary Fund, Washington).
- Fotso Ndefo, N. (2003). Impact des investissements directs étrangers sur la croissance: quelques résultats sur les pays africains au sud du Sahara, Série Notes d'Etudes et Recherche n° 3, BEAC, Yaoundé.
- Giovanni, J., & A. Levchenko. (2006). *Openness, Volatility and the Risk Content of Exports*. International Monetary Fund, Washington, D.C.
- Hausman, J. A. (1978). Specification Tests in Econometrics. *Econometrica*. 46, 1251-71. <http://dx.doi.org/10.2307/1913827>
- Henry, O., & Olekalns, N. (2002). The effect of recessions on the relationship between output variability and growth. *Southern Economic Journal*, 68, 683-692. <http://dx.doi.org/10.2307/1061726>
- Hnatkovska, Viktoria Loayza, Norman. (2004). Volatility and growth. Policy Research Working Paper Series 3184, The World Bank.
- Kharroubi, E. (2007). Illiquidity, Financial Development and the Growth-Volatility Relationship. *World Bank Economic Review*. <http://dx.doi.org/10.1093/wber/lhm015>
- Kose, Prasad, & Terrones. (2005). How Do Trade and Financial Integration Affect the Relationship between Growth and Volatility? IMF Working Paper 05/19, Jan 01.
- Kraay, Aart, & Jaume Ventura. (2007). Comparative Advantage and the Cross-Section of Business Cycles. *Journal of European Economic Association*, 5(6), 1300-1333.
- Moser, C. (1998). The Asset Vulnerability Framework: Reassessing Urban Poverty Reduction Strategies. *World*

Development, 26(1), 1-19. [http://dx.doi.org/10.1016/S0305-750X\(97\)10015-8](http://dx.doi.org/10.1016/S0305-750X(97)10015-8)

Pindyck, R. (1991). Irreversibility, uncertainty, and investment. *Journal of Economic Literature*, 29, 1110-1148.

Ramey, G., & Ramey, V. (1991). Technology commitment and the cost of economic fluctuations, NBER Working Paper No. 3755.

Ricardo, D. (1817). *Principles of Political Economy and Taxation*. (Cambridge, Cambridge University Press 1951)

Smith, A. (1776). *An Inquiry into the Nature and Causes of The Wealth of Nations*, Chicago. The University of Chicago Press.

Watts, M. J., & Bohle, H. G. (1993). The Space of Vulnerability: The Causal Structure of Hunger and Famine. *Progress in Human Geography*, 17(1), 43-67. <http://dx.doi.org/10.1177/030913259301700103>

Notes

Note 1. Especially those in Sub-Saharan Africa (SSA)

Note 2. Data from 1980 to 1989 were unavailable for the sub-region as a whole

Note 3. Export growth is omitted from the model due to missing data for the first ten years of the period under study

The Proportion of Non-operating Income, and Analysts' Forecasts

Andrew Ayimbila Anabila

Correspondence: Andrew Ayimbila Anabila, Room 220C College of Business Administration, 1201 West University Drive, University of Texas – Pan American, Edinburg, Texas 78539, USA. Tel: 1-956-665-8084. E-mail: anabilaaa@utpa.edu

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Abstract

The US Senate Committee that investigated the Enron disaster assessed the role of analysts. At issue was whether analysts misled the public by ignoring warning signals that included a high proportion of non-operating income. Non-operating income derives from secondary activities like investments, but operating income is from the primary business activities like manufacturing. While the analysts admitted their limited ability to forecast Enron's earnings, they denied any intentional deceit and claimed that they were misled by Enron. This study asks whether analysts' ability to predict earnings is generally negatively associated with the proportion of non-operating income. The rationale is to determine whether the limited ability of analysts to predict earnings for Enron was an isolated incident or a pervasive one that applies to other firms. If pervasive, then another such disaster could occur without a warning from analysts. First, I examine the incentives for firms to resort more to non-operating income rather than focus on Operating income. Then I examine the association between analysts' forecast attributes and the ratio of nonoperating to operating income. The results show that non-operating income and operating income are negatively associated, suggesting that firms use non-operating income to manage their operating results. Also, analysts' forecast inaccuracy and dispersion are positively associated with the ratio of non-operating income to operating income. These results imply that analysts are generally inefficient in predicting earnings of firms with a high proportion of non-operating income.

Keywords: operating, non-operating, income, analysts, forecasts, accuracy, dispersion, bias

JEL Classification: M40

1. Introduction

To forestall future corporate scandals like Enron's collapse, the Senate committee that investigated the Enron failure assessed the roles of various parties, including financial analysts. During the committee hearings, its members charged that analysts intentionally failed to warn the public of poor future earnings for Enron, and even misled them into expecting the opposite. The committee, supported by experts, argued that the analysts had ignored vital signals such as an increasing proportion of non-operating income. (Note 1) The analysts admitted inefficiency, but denied intentionally misleading the public.

Like Enron, firms have the discretion to focus on their primary operations (like manufacturing) or add non-operating activities (like investments in securities, etc). (Note 2) Fairfield, Sweeney, & Yohn, (1996), use time-series analysis to show that non-operating (compared to operating) income is less related to future bottom-line earnings. Thus the two classes of income have different implications for future earnings. However, the implication of each class of income for analysts' forecasts has not been examined.

In this study, I ask if analysts' forecast attributes are negatively associated with the proportion of non-operating income. By forecast attributes, I am referring to the forecast accuracy and precision (opposite of dispersion, which is a proxy for information asymmetry). The objective is to ascertain whether the analysts' inability to predict Enron's earnings, because of the firm's high proportion of non-operating income, was an isolated rather than a widespread phenomenon. That is, are managers generally using non-operating income to mask their systematic poor operating performance from the analysts and the public? The latter reason would suggest that another disaster similar to Enron's could occur, without the slightest hint from analysts. To avert this, it is necessary to improve disclosure quality and increase pressure on analysts so that they will conduct adequate research and be more responsible for their research outputs.

To address the research question, I compute the proportion of non-operating income relative to (divided by) operating income. For the purpose of this exposition, I refer to this ratio as “Discretion” ratio hereafter. (Note 3) This ratio is also computed and used in Bowen (1981) to examine properties of non-operating income in the electric utility industry. (Note 4) I then examine the association between the ratio and analysts’ forecast attributes. I Use firm years at the intersection of *Compustat* annual active and research files and *FirstCall* earnings estimates and actual files, from 1990 through 2004 fiscal years. In my tests for the association between the Discretion ratio, analysts’ forecast errors and dispersion, I first use simple statistical tests. I then support these tests with multivariate regressions that control for the following determinants of forecast error and dispersion identified by prior research: size (Brown, Richardson & Schwagger, 1987), analyst following (Lys & Soo 1995), performance or profitability (Brown, 2001), business segment diversification (Thomas, 2002) and international or geographic segment diversification (Duru & Reeb, 2002).

I find a negative association between non-operating and operating income. This suggests that firms use non-operating income to smooth their operating income. The results of my main analyses are as follows: First, forecast optimism bias and inaccuracy are positively associated with the discretion ratio. Second, forecast dispersion is positively associated with the discretion ratio. The findings are consistent with my expectations, and are robust to the forecast horizon (one, two, etc periods ahead).

The foregoing results suggest that management’s use non-operating income to smooth earnings, and this tends to mislead analysts. This is because first non-operating income has a weaker relation than operating income, to the operating expertise of the investing management, since the latter does not operate its nonoperating assets. (Note 5) Second, non-operating income increases the complexity of the earnings prediction activity since they add to the classes of income that analysts should research into. Therefore, analysts forecasting ability is negatively associated with the proportion of non-operating income.

These findings explain why, like Enron, firms that are performing poorly in their primary operations, engage in non-operating activities such as investments for which they can avoid consolidation. The results show that analysts provide overly optimistic (overstated) forecasts for such firms, which leads to their overvaluation as happened for Enron, since prices are driven by analysts’ forecasts (Liu, Nissim & Thomas, 2002). Further, the high forecast dispersion associated with such firms is associated with overvaluation. This is because higher divergence of opinion is positively associated with overpricing (see Diether, Malloy & Scherbina, 2002; Miller, 1977, 2001).

This study draws attention to a source of analysts’ inefficiency. It shows that analysts have significant cognitive limitations for firms with a high proportion of non-operating income. Therefore, such firms need more scrutiny by analysts, otherwise like Enron, firms that wish to elude analysts could resort more to non-operating activities to increase the proportion of their non-operating income. Also, accounting rules that seek to ensure that de facto control or risk exposure is reported would help arouse increased attention and scrutiny of analysts to what would otherwise be reported as non-operating income for these firms. In this regard, FIN 46 (R.) which requires consolidation on the basis of majority exposure to benefits and risks is a welcome pronouncement that should be strongly enforced.

The remainder of the study proceeds as follows. Section 2 links this study to prior research. Section 3 describes the methods, data and sample used in this study. Section 4 presents the detailed results and sensitivity tests, and section 5 presents the summary and conclusion of the study.

2. Relation to Prior Literature

Analysts’ forecasts are used for valuation and as a proxy for investors’ expectations. The determinants of forecast accuracy and dispersion are of interest to academics and practitioners alike. For example, if the determinants of the forecast accuracy are related to financial reporting or disclosure, the accounting profession could consider reducing forecast errors and dispersion by prescribing appropriate financial reporting standards. Also, identifying the determinants of forecast accuracy would guide academics to determine appropriate control variables when examining the relation between forecast attributes and other variables of interest (Duru & Reeb, 2002).

Brown et al. (1987) show that the superiority of analysts’ forecasts relative to time series forecasts increases in firm size (a proxy for the dimensionality of the disclosure information set and complexity), and inherent uncertainty (dispersion of analysts’ forecasts) of the firm. Wiedman (1996) show that because of these attributes identified in Brown et al. (1987), analysts’ forecasts constitute a better proxy for investor’s expectations than time series forecasts. Duru & Reeb (2002) show that international diversification is positively associated with mean optimism bias and inaccuracy of analysts’ forecasts. They argue that international diversification increases

the complexity of forecasting since analysts may not possess the expertise for the foreign environments in which the diversified firm operates.

The following describe the contribution of this study to the literature. First, studies have shown the importance of analysts' forecast dispersion for firm value. Gebhardt, Lee & Swaminathan (2001) shows that forecast dispersion is associated with lower returns premium. Similarly, Diether et al. (2002), show that future returns are negatively associated with dispersion. Miller (1977, 2001) show that divergence in opinion is associated with overpricing, since prices clear beginning with the highest bidder, downwards. (Note 6) The foregoing studies generally describe dispersion as being a result of differing opinions among analysts, without specifying the fundamental operating circumstances underlying variations in forecast inaccuracy and dispersion across firms. This study relates the dispersion to the mix of non-operating and operating income.

Duru & Reeb (2002) suggest that international diversification is associated with inaccuracy of forecasts for future earnings, but do not examine divergence of opinion among analysts, and its fundamental determinants. Thomas (2002) links forecast dispersion to lines of business diversification but ultimately concludes that this link is at best a weak one. Studies that examine diversification focus on attributes of the operating income. This study focuses on two different classes of income from continuing operations: the mix of non-operating relative to operating income.

Second, Fairfield et al. (1996) show that for a time series model, the position of an item in the income statement determines its ability to help predict the bottom line earnings of the firm. Specifically, the study shows that operating, non-operating income and special items are useful for predicting bottom line income in decreasing order. This study does not examine special items because they are one-off in nature and tend not to be the focus of analysts (Philbrick & Ricks, 1991). Operating income and non-operating income are both of a continuing nature and so it would seem puzzling that they differ in their predictive ability for income from continuing operations. As per the introduction this study identifies attributes of non-operating income that explain why it is associated with analysts' forecast attributes.

Fourth, it has been quite puzzling to many that the recent financial scandals such as involving Enron Corporation came to pass without any advance warning by financial analysts who are supposed to predict the future earnings. Admittedly, the financial reporting was replete with falsehood, but were there signals that should have aroused analysts' curiosity? This study shows that analysts' inefficiency generally increases in the proportion of non-operating income relative to operating income.

3. Methodology, Data and Sample

I examine the relation between the Discretion ratio, and the following attributes of analysts' forecasts: forecast bias, inaccuracy, and dispersion. For each firm year, I define forecast bias ($FBIAS_j$) and forecast inaccuracy ($FACCU_j$) as follows:

$$FBIAS_j = (FACT_j - FEPS_j) / \text{abs}(FACT_j); \quad FACCU_j = \text{Absolute}\{FBIAS_j\} \quad (1)$$

I also define forecast dispersion ($FDISP_j$) as;

$$FDISP_j = \{Stdev_j / \text{absolute}(FEPS_j)\} \quad (2)$$

The variable $FACT_j$ represents the FirstCall reported actual EPS for the year, $FEPS_j$ represents the mean earnings forecast ('Meanest' in FirstCall) as of j months from the earnings announcement. Next, I define Discretion ratio (DISCRET) as:

$$DISCRET = (\text{Non-operating Income} / \text{Operating Income}) \quad (3)$$

Non-operating income is Compustat annual data61. Operating income is Compustat annual data178. Size (SIZM) is the log of total market value in millions of dollars (absolute value of Compustat annual data199 x data25). Business segment concentration (BADEX) is the sum of the squares of the assets of business segments divided by the square of the total of the assets for the firm year; and geographic (also known as international or global) segment concentration (GADEX) equals the sum of the squares of the assets of the geographic segments divided by the square of the total assets for the firm year. (Note 7) For analyst following ($ANAFO_j$), I use the number of estimates reported in FirstCall. I proxy for overall firm level profit using the FirstCall reported actual EPS scaled by lagged market value. (Note 8) I report the definition and computation of all the variables in Appendix 1.

I compute summary statistics and correlations coefficients. I also use multivariate analyses in which I control for the determinants of forecast attributes identified in prior research. I estimate cross-sectional regressions using the following models:

$$'FORP'_{i,t} = \beta_0 + \beta_1 DISCRET_i + \beta_2 ROEIM_i + \beta_3 SIZM_{j,i} + \beta_4 BADEX_i + \beta_5 GADEX_i + \beta_6 ANAFO_i + \varepsilon_i \quad (4)$$

$$D'FORP'_{i,t} = \beta_0 + \beta_1 DDISCRET_{i,t} + \beta_2 DROEIM_{i,t} + \beta_3 DSIZM_{i,t} + \beta_4 DBADEX_{i,t} + \beta_5 DGADEX_{i,t} + \beta_6 DANAF_{i,t} + \varepsilon_i \quad (5)$$

Where 'FORP'_i equals the values FBIAS_i, FACCU_i and FDISP_i respectively in each set of analysis. Model (4) examines the levels and model (5) examines the first difference of all these variables.

I estimate the regressions for each year, and then summarize the results for all the years. This is because the sample covers many (15) years and it is the fashion in recent academic literature to use the annual regressions when many years are studied, so as to control for serial correlation of the independent variables. I also confirm that instead of estimating annual regressions and then summarizing the parameters, estimating the regressions for the pooled sample yields results that point to the same conclusion.

The sample comprises of US firm year observations at the intersection of Compustat annual active and research files, and FirstCall detailed estimates file (which I summarize for the mean, standard deviation and number of forecasts), for the 15 years from 1990 through 2004. I include firms of all industry categories (industrial/commercial, financial services and utilities) so that the results may be as generalized as possible.

For inclusion in my sample, firms must have positive values for shareholders' equity, total assets and operating income. (Note 9) Firms must also have dispersion of analysts' forecast, in the month preceding the earnings announcement. A total of 50,003 firm years from Compustat have the relevant financial variables, but of these only 25,976 meet the requirements for forecast data outlined above. (Note 10) I winsorize the discretion ratio, forecast bias, inaccuracy and dispersion, at the top and bottom 1 percent. Without winsorizing, I find that the regression parameters are directionally similar but less precise due to extreme values. The analysts' forecast attributes are based on the analysts' forecasts as of the month before earnings announcement. Following Thomas (2002), I choose this horizon for the analysts' forecasts to minimize the generally high analysts' optimism bias in forecasts at earlier horizons. I present summary statistics of the variables in Table 1.

Table 1. Descriptive statistics

Variable	Definition	Mean	Stdev	P25th	P50th	P75th
ANAFO _t	Analyst following	6.984	5.317	3.000	5.000	9.000
FBIAS _t	Forecast error	-0.026	0.259	-0.012	0.006	0.031
FACCU _t	Forecast (in)accuracy	0.106	0.289	0.008	0.024	0.067
FDISP _t	Forecast dispersion	0.066	0.179	0.008	0.017	0.042
DFBIAS _t	FBIAS _t -FBIAS _{t-1}	-0.006	0.381	-0.038	-0.002	0.030
DFACCU _t	FACCU _t -FACCU _{t-1}	-0.010	0.343	-0.029	-0.001	0.020
DFDISP _t	FDISP _t -FDISP _{t-1}	-0.008	0.214	-0.015	0.000	0.012
DISCRET _t	Discretion ratio	0.150	0.289	0.015	0.054	0.163
DDISCRET _t	DISCRET _t -DISCRET _{t-1}	-0.007	0.301	-0.026	0.000	0.021
TMV _t	Market capitalization (\$m)	4,300	17,154	279	774	2,413
SIZM _t	Size (Log of TMV _t)	6.774	1.598	5.632	6.652	7.789
DSIZM _t	SIZM _t -SIZM _{t-1}	0.152	0.462	-0.102	0.143	0.395
BADEX _t	Business concentration	0.840	0.252	0.649	1.000	1.000
GADEX _t	Geographic concentration	0.914	0.181	1.000	1.000	1.000
DBADEX _t	BADEX _t -BADEX _{t-1}	0.006	0.123	0.000	0.000	0.000
DGADEX _t	GADEX _t -GADEX _{t-1}	-0.006	0.084	0.000	0.000	0.000
ROEIM _t	FirstCall actual EPS scaled by price	0.045	0.101	0.020	0.039	0.063
DROEIM _t	ROEIM _t -ROEIM _{t-1}	0.005	0.037	-0.007	0.002	0.016
ROMO _t	Operating income scaled by price	0.116	0.082	0.062	0.099	0.147
DROMO _t	ROMO _t -ROMO _{t-1}	0.003	0.066	-0.025	0.000	0.026
ROMN _t	Non-operating income scaled by price	0.023	0.024	0.000	0.008	0.072
DROMN _t	ROMN _t -ROMN _{t-1}	0.001	0.016	-0.002	0.000	0.003
CINVEST _{t-1}	Beginning investments to total assets	0.158	0.190	0.015	0.103	0.221

The sample comprises of US firms at the intersection of Compustat and FirstCall Databases. The statistics are computed for the just announced earnings, from 1990 through 2004. The sample comprises 25,976 firm years, of which 19,680 are industrial and commercial firms, 4,830 are financial and 1,466 are utility firms respectively. Appendix 1 describes in detail the sources of the data and the computation of the variables.

In Table 1, the firms have quite high analysts' following (mean and median ANAFO 6.984 and 5), because of the requirement that they should have all forecast attributes such as dispersion (which requires at least two forecasts). For this reason, the sample firms are also big on average, with market capitalization in billions of dollars for most firm years. The forecasts are optimistic (negative mean FBIAS of -0.026) but the typical firm's earnings beats the analysts' forecast (median FBIAS equals 0.006). The median value suggests that at least half the sample firm years' actual earnings beat analysts' forecast. The FDISP (forecast dispersion) has mean and median of 0.066 and 0.017 respectively, suggesting that the values are negatively skewed.

The business and geographic concentration indices have median values of 1, suggesting that the majority of firms are focused. The discretion ratio (DISCRET) shows that on average, non-operating income is small relative to operating income (mean of 0.15), but for some firms, non-operating income could be twice the operating income (the 99 percentile of DISCRET which is not included in the table, equals 2.101 times the operating income). Accordingly, the non-operating income values scaled by lagged market values (ROMN) are less on average than the operating income scaled by market value (ROMO).

The overall firm level profit (ROEIM) scaled by price at the beginning of the year is generally positive for the majority of firm years. Like most studies that require analysts' forecast attributes, it is not practicable to ascertain the results for those firms that are not followed by analysts.

3.1 Correlation between the Variables

In Table 2, I report coefficients for the correlation between the forecast attributes and the other financial variables. The Pearson (Spearman) coefficients are to the lower left (upper right) of the diagonal.

Table 2. Correlations

Variable	ANAFO _t	FDISP _t	FBIAS _t	FACCU _t	CINVEST _{t-1}	DISCRET _t	SIZM _t	BADEX _t	GADEX _t	ROMO _t	ROMN _t
ANAFO _t	1	0.024	-0.027	-0.165	0.111	0.023	0.725	-0.117	-0.060	-0.061	0.016
p-Value		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
FDISP _t	-0.028	1	-0.020	0.556	-0.030	0.172	-0.088	-0.028	-0.032	-0.096	0.148
p-Value	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FBIAS _t	0.035	-0.271	1	0.138	-0.008	0.045	-0.003	0.037	0.032	-0.040	0.014
p-Value	0.00	0.00		0.00	0.22	0.00	0.67	0.00	0.00	0.00	0.03
FACCU _t	-0.085	0.524	-0.670	1	-0.050	0.150	-0.205	0.018	0.001	-0.106	0.115
p-Value	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.83	0.00	0.00
CINVEST _{t-1}	0.048	-0.020	0.025	-0.022	1	-0.011	0.178	0.039	0.070	-0.004	-0.048
p-Value	0.00	0.00	0.00	0.00		0.09	0.00	0.00	0.00	0.54	0.00
DISCRET _t	0.005	0.158	-0.020	0.110	-0.037	1	0.005	-0.069	-0.122	-0.394	0.932
p-Value	0.44	0.00	0.00	0.00	0.00		0.44	0.00	0.00	0.00	0.00
SIZM _t	0.724	-0.080	0.070	-0.131	0.099	-0.019	1	-0.244	-0.120	-0.094	-0.011
p-Value	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.08
BADEX _t	-0.088	-0.005	0.020	0.003	0.062	-0.060	-0.244	1	0.073	-0.101	-0.133
p-Value	0.00	0.38	0.00	0.66	0.00	0.00	0.00		0.00	0.00	0.00
GADEX _t	-0.061	-0.011	0.014	-0.002	0.125	-0.060	-0.148	0.076	1	0.081	-0.124
p-Value	0.00	0.06	0.03	0.71	0.00	0.00	0.00	0.00		0.00	0.00
ROMO _t	-0.068	-0.070	0.012	-0.054	0.012	-0.300	-0.110	-0.067	0.066	1	-0.146
p-Value	0.00	0.00	0.05	0.00	0.06	0.00	0.00	0.00	0.00		0.00
ROMN _t	0.010	0.044	-0.001	0.016	-0.179	0.650	0.038	-0.174	-0.112	-0.188	1
p-Value	0.10	0.00	0.89	0.01	0.00	0.00	0.00	0.00	0.00	0.00	

Pearson (lower left diagonal) and Spearman (upper right diagonal) correlations. The p-Values are the significance levels for the correlation coefficients in the preceding row. The correlations are computed using the 25,976 firm-year observations in a pooled setting. Appendix 1 describes in detail the sources of the data and the computation of the variables.

From the table, ROMO and ROMN (also DISCRET) are negatively correlated. This suggests that the outcome of non-operating activities are less linked to or dependent on management's operating expertise and so management use non-operating income to smooth operating income. Also, DISCRET, and FACCU and FDISP (FBIAS) are positively (negatively) correlated, suggesting that the discretion ratio is positively associated with inaccurate and diverging forecasts. However, these forecast attributes and the discretion ratio are also respectively correlated

with the business (BADEX) and geographic (GADEX) concentration indices, the levels of operating and non-operating profitability (ROMO and ROMN), size and analyst following. Therefore, a conclusive finding on the relation between the discretion ratio and the forecast attributes requires controlling for those other variables.

4. Findings

To ascertain the relation between the discretion ratio and the forecast attributes, I estimate regressions of each forecast attribute on the discretion ratio. I conduct this analysis for the levels and changes in the variables. The change regression analysis provides results that approximate an assessment of causal relations among the variables.

4.1 Incremental Relation between the Levels of Discretion Ratio and Forecasts

In Table 3, I report regression results for the levels of the variables. I use model (4) from the methods section, and report the results for MBIAS, FACCU and FDISP as dependent variables in three different panels. I estimate the regression for each year and then summarize and report the parameters from the 15 years. I also conduct the analysis for the pooled sample and find that the results are similar. I report the annual results, which is consistent with the current fashion in academic research spanning many years, because such regressions control for the effect of serial correlation among the independent variables on the parameters.

Table 3. Incremental relation between discretion ratio and forecast attributes

Exogenous Variables	Model 4 (1)			Model 4 (2)			Model 4 (3)		
	Slope	t-Value	p-Value	Slope	t-Value	p-Value	Slope	t-Value	p-Value
Panel A: Forecast attribute is mean forecast error (FBIAS_t)									
Intercept	-0.0187	-5.38	0.00	-0.2771	-6.95	0.00	-0.2658	-7.26	0.00
DISCRET _t	-0.0649	-3.14	0.01	-	-	-	-0.0362	-2.07	0.06
FOLLO _t	-	-	-	-0.0242	-2.71	0.02	-0.0210	-2.53	0.02
ROEIM _t	-	-	-	1.4064	9.10	0.00	1.3647	9.43	0.00
SIZM _{t-1}	-	-	-	0.0273	5.39	0.00	0.0256	5.46	0.00
BADEX _{t-1}	-	-	-	0.0585	8.74	0.00	0.0574	8.24	0.00
GADEX _{t-1}	-	-	-	-0.0023	-0.16	0.88	0.0002	0.02	0.99
AdjRsq	0.0091			0.0449			0.0496		
Panel B: Forecast attribute is forecast (in)accuracy (FACCU_t)									
Intercept	0.0832	17.43	0.00	0.4726	14.42	0.00	0.4315	16.20	0.00
DISCRET _t	0.1873	10.67	0.00	-	-	-	0.1458	8.80	0.00
FOLLO _t	-	-	-	0.0183	1.78	0.10	0.0116	1.43	0.18
ROEIM _t	-	-	-	-1.9637	-15.33	0.00	-1.7949	-15.65	0.00
SIZM _{t-1}	-	-	-	-0.0353	-6.41	0.00	-0.0313	-6.90	0.00
BADEX _{t-1}	-	-	-	-0.0604	-7.88	0.00	-0.0674	-7.36	0.00
GADEX _{t-1}	-	-	-	-0.0172	-1.37	0.19	-0.0172	-1.92	0.08
AdjRsq	0.0353			0.0737			0.0948		
Panel C: Forecast attribute is forecast dispersion (FDISP_t)									
Intercept	0.0489	15.74	0.00	0.2568	8.78	0.00	0.2170	8.48	0.00
DISCRET _t	0.1606	6.03	0.00	-	-	-	0.1351	5.12	0.00
FOLLO _t	-	-	-	0.0379	3.36	0.00	0.0321	3.35	0.00
ROEIM _t	-	-	-	-1.3017	-12.80	0.00	-1.1545	-14.32	0.00
SIZM _{t-1}	-	-	-	-0.0221	-4.21	0.00	-0.0190	-4.76	0.00
BADEX _{t-1}	-	-	-	-0.0358	-4.57	0.00	-0.0462	-5.64	0.00
GADEX _{t-1}	-	-	-	-0.0033	-0.55	0.59	0.0038	0.52	0.61
AdjRsq	0.0634			0.0737			0.1189		

Each year, I estimate a regression of each forecast attribute on DISCRET (absolute discretion ratio), with controls for variables identified in prior research to constitute drivers of the forecast attributes. I then summarize (compute mean of) the parameter estimates and report them with relevant test statistics in this table. All of these forecast attributes are computed in the month just before that in which the earnings for the year are announced. Only US firms (FIC=0 in Compustat) at the intersection of Compustat annual active and research files and the FirstCall detailed estimates files are studied. The operating income (Compustat annual data178) must be positive. A total of 25,976 observations over the fiscal years 1990 through 2004 are used. The minimum, average and maximum number of firm years over the 15 years from 1990 through 2004 are 90 (in 1990), 1732, and 2,349 (in 1997) respectively. Appendix 1 describes in detail the sources of the data and the computation of the variables.

In each panel, I estimate three models, the first model has only the DISCRET as independent variable, the second has only the control variables and the third has both DISCRET and the control variables. For each of the three panels, the sign and significance of the slope parameters in the first two models are confirmed in the third model, with virtually no exception. This suggests that dependence amongst the independent variables, if any, is minimal.

In Panel A, the negative relation between FBIAS and DISCRET ratio suggests that analysts are optimistically biased as the magnitude of non-operating income increases relative to operating income. This is consistent with analysts assuming erroneously that the non-operating income is linked to the operating expertise of management. It could also be an attempt by analysts to curry favor from management for deals such as relating to investment banking.

As expected, ROEIM is positively related to FBIAS, suggesting that high profitability enables firms to beat forecasts. This is consistent with Brown (2001) and Hwang (1996). Analysts' following (FOLLO) is associated with optimism bias and this suggests that for my sample the higher the number of analysts following a firm, the greater the competition for management favor. Also, bigger firms tend to beat forecasts because they disclose more to help analysts, manage forecasts down to avoid political costs if they miss forecasts, and tend to perform well (Brown et al., 1987; Wiedman, 1996). This is confirmed by the positive relation between SIZM and FBIAS. Business concentration (BADEX) is positively associated with FBIAS, suggesting that focused businesses tend to beat forecasts, and conversely analysts are optimistic about diversified businesses in order to curry disclosure favor and mitigate the information asymmetry associated with the diversified businesses. This extends Thomas (2002) who does not examine bias for business diversification. The relation between FBIAS and GADEX is not significant, and so cannot be said to corroborate Duru and Reeb (2002).

In panel B, FACCU increases in DISCRET ratio, suggesting that analysts are less accurate as non-operating income increases relative to operating income. The relation between FACCU, and FOLLO is not significant. The FACCU decreases in ROEIM, SIZM, BADEX, and GADEX, confirming the results in panel A and the prior research. My results show that geographic focus (GADEX) is not consistently significantly associated with forecast inaccuracy. This result does not conclusively support Duru & Reeb (2002).

Now consider Panel C, where the analysis has analysts' forecasts dispersion (FDISP) as the dependent variable. I find that FDISP is positively associated with DISCRET, and FOLLO. This suggests that analysts' opinions diverge more as non-operating income relative to operating income increases, and as analysts' following increases. A positive relation to FDISP suggests opinions amongst analysts diverges more, as they likely source their information from different sources and interpret the same disclosure and guidance from management differently. Therefore, higher non-operating income (relative to operating income) is positively associated with inherent uncertainty, likely due to analysts' lacking expertise in the non-operating activities, and wrongly linking non-operating activities to managerial expertise in operating activities. The higher the number of analysts', the more the differences in their opinions as they add their respective private information to the earnings forecast.

Still in Panel C, FDISP is negatively associated with ROEIM, SIZM, and BADEX, suggesting that analysts are more unanimous for firms that are more profitable, enjoy more disclosure from big firms (Brown et al., 1987), and do not suffer the information asymmetry associated with diversified businesses (contradicting Thomas, 2002). The relation between FDISP and GADEX is insignificant.

4.2 Incremental Relation between the Changes in Discretion Ratio and Forecasts

To be more conclusive about the relation between DISCRET and the forecast attributes, I move from an association perspective towards (but not exactly up to) a causal perspective. Using model (6) in the methods section, I estimate a regression of the first difference of each of the forecast attributes on the first difference of the discretion ratio and the control variables. Just as I did for the level regressions, I estimate and summarize the annual regressions in Table 4 below.

Table 4. Incremental relation between changes in discretion ratio and changes in forecast attributes

Exogenous Variables	Model 5 (1)			Model 5 (2)			Model 5 (3)		
	Slope	t-Value	p-Value	Slope	t-Value	p-Value	Slope	t-Value	p-Value
Panel A: Forecast attribute is change in mean forecast error (DFBIAS_t)									
Intercept	-0.0152	-1.55	0.15	-0.0169	-3.28	0.01	-0.0175	-3.38	0.00
DDISCRET _t	-0.0610	-2.66	0.02	-	-	-	-0.0068	-0.40	0.69
DFOLLO _t	-	-	-	-0.0670	-6.43	0.00	-0.0665	-6.60	0.00
DROEIM _t	-	-	-	2.5574	7.08	0.00	2.5399	7.13	0.00
DSIZM _t	-	-	-	0.0594	2.45	0.03	0.0584	2.42	0.03
DBADEX _t	-	-	-	0.0312	0.95	0.36	0.0285	0.90	0.38
DGADEX _t	-	-	-	0.1608	1.22	0.24	0.1555	1.17	0.26
AdjRsqr	0.0035			0.0604			0.0610		
Panel B: Forecast attribute is change in forecast (in)accuracy (DFACCU_t)									
Intercept	-0.0008	-0.11	0.92	0.0161	4.17	0.00	0.0156	4.12	0.00
DDISCRET _t	0.1319	10.65	0.00	-	-	-	0.0805	7.89	0.00
DFOLLO _t	-	-	-	0.0090	0.69	0.50	0.0075	0.59	0.57
DROEIM _t	-	-	-	-2.4960	-9.79	0.00	-2.3992	-9.36	0.00
DSIZM _t	-	-	-	-0.1034	-5.43	0.00	-0.0957	-5.01	0.00
DBADEX _t	-	-	-	-0.0840	-1.72	0.11	-0.0764	-1.63	0.13
DGADEX _t	-	-	-	0.0295	0.96	0.36	0.0384	1.28	0.22
AdjRsqr	0.0122			0.0743			0.0786		
Panel C: Forecast attribute is change in forecast dispersion (DFDISP_t)									
Intercept	-0.0069	-2.53	0.03	0.0109	1.84	0.09	0.0093	1.97	0.07
DDISCRET _t	0.1158	3.84	0.00	-	-	-	0.0816	3.49	0.00
DFOLLO _t	-	-	-	0.0315	1.44	0.17	0.0265	1.47	0.16
DROEIM _t	-	-	-	-1.2977	-7.27	0.00	-1.1968	-6.35	0.00
DSIZM _t	-	-	-	-0.0930	-3.20	0.01	-0.0828	-3.39	0.00
DBADEX _t	-	-	-	-0.0741	-1.26	0.23	-0.0610	-1.22	0.24
DGADEX _t	-	-	-	-0.0142	-0.36	0.72	0.0131	0.24	0.82
AdjRsqr	0.0264			0.0650			0.0789		

Each year, I estimate a regression of the change in each forecast attribute on DDISCRET (change in absolute discretion ratio), with controls for variables identified in prior research to constitute drivers of the forecast attributes. I then summarize (compute mean of) the parameter estimates and report them with relevant test statistics in this table. All of these forecast attributes are computed in the month just before that in which the earnings for the year are announced. Only US firms (FIC=0 in Compustat) at the intersection of Compustat annual active and research files and the FirstCall detailed estimates files are studied. The operating income (Compustat annual data178) must be positive. A total of 25,976 observations over the fiscal years 1990 through 2004 are used. The minimum, average and maximum number of firm years over the sample period of 1990 through 2004 are 90 (in 1990), 1732, and 2,349 (in 1997) respectively. Appendix 1 describes in detail the sources of the data and the computation of the variables.

In Panel A of the table, the change in the discretion ratio (DDISCRET) is positively associated with changes in optimism bias (DFBIAS) but this relation is not significant after controlling for changes in the determinants identified in prior research. In panel B, DDISCRET is positively related to DFACCU. This supports the results in panel B of Table 3. Therefore, increases (decreases) in non-operating income likely cause increases (decreases) in forecast inaccuracy. The results in Panel C show a positive relation between changes in DISCRET and changes in forecast dispersion. This supports those of the same panel in Table 3, showing that the change in DISCRET is positively associated with information asymmetry amongst analysts.

4.3 Sensitivity Tests

I discuss a number of robustness tests that I used to determine the sensitivity of the results to a number of factors. These relate to the definition of the discretion ratio, the effect of forecast horizon and industry categories respectively, on the results. Tables and figures for these results are available upon request.

In my definition of the discretion ratio, I did not adjust for interest expense (data15) from the non-operating income. In an alternative definition of the ratio, I adjusted for the non-operating income. I had more firm years with negative non-operating income after subtracting the interest expense. The results in this alternative analysis were quite similar to what I have reported. (Note 11)

Forecast attributes, especially for the year, vary as time proceeds towards the earnings announcement date (see also Das, Levine & Sivaramakrishnan, 1998). This is because interim results provide partial realizations for the year. Also, earnings news from other sources such as the industry, become available as the year progresses. My reported results control in part for the effects of the forecast horizon since I compute the forecast attributes using forecasts at the same time (the month before the earnings announcement) for all firm years.

Now, to assess the effect of the forecast horizon, I plotted the forecast attributes by quintiles of DISCRET using forecasts for the year as of each of the 12 months preceding the earnings announcement. I repeated this robustness analysis, using the fiscal year end rather than the earnings announcement month as the reference point in time. For each forecast attribute, the results of these analyses were not only similar to but strongly corroborated those based on the forecasts as of the month before earnings announcement.

Often, certain disclosure requirements have different information quality implications for industry categories. Bowen (1981) for example shows that income components could possess different qualities for the electric utility industry. Replicating the analysis for each industry group would be onerous and unnecessarily long. Therefore I repeated the analysis for each of three industry categories (industrial commercial, utilities, and financial services firms). The results for each industry category were similar, with slight variations that have no consequence on the inferences.

5. Summary and Conclusion

This study has examined the association between discretion in operations (the extent to which firms mix up primary and secondary sources of income) and forecast bias, inaccuracy, and dispersion. The results show that the magnitude of Discretion ratio (defined as non-operating income divided by operating income) is positively associated with forecast optimism bias, inaccuracy and forecast dispersion. The following account for the results: the non-operating activities are not operated by the investing managers and as analysts' incorporate managers' expertise to predict earnings, they make more errors due to the weak link between the earnings and the managers expertise; and, the non-operating activities add to the dimensions that analysts have to gather expertise in order to successfully predict firms' earnings. For these reasons, analysts also rely on the private information which leads to more diverging forecasts for firms that earn significantly more non-operating income relative to operating income.

This study has contributed to the determinants of forecast accuracy and dispersion. The results are robust to controlling for variables identified in prior research to constitute determinants of forecast accuracy and dispersion. It also draws attention to the incompleteness of the measures of diversification used in the literature. By 'diversifying' into non-operating activities, managers are trying to conceal their inefficiencies in their primary operations. However, this has the effect of more optimism and diverging opinions among analysts. The forecasts are less accurate for firms that have relatively significant non-operating income. These properties of the non-operating income explain the inability of analysts to detect the Enron failure at the beginning of the decade. Most of the mischief was implemented by Enron's executives through investments and partnerships that did not require consolidation, leading to the eventual collapse of the firm. Future research can examine the implications of the relations between the non-operating income and the forecast attributes for valuation.

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References

- Ackman, D. (2002). Enron analysts: We was duped, Available from <http://www.forbes.com>.
- Bowen, R. M. (1981). Valuation of earnings components in the electric utility industry. *The Accounting Review*, *LVI*(1), 1-22.
- Brown, L. D., Richardson, G., & Schwager, S. J. (1987). An information interpretation of financial analyst superiority in forecasting earnings. *Journal of Accounting Research*, *25*(1), 49-67. <http://dx.doi.org/10.2307/2491258>
- Brown, L. D. (2001). A temporal analysis of earnings surprises: profits versus losses, *Journal of Accounting Research*, *30*(2), 221-241. <http://dx.doi.org/10.1111/1475-679X.00010>

- Das, S., Levine, C. B., & Sivaramakrishnan, K. (1998). Earnings predictability and bias in analysts' earnings forecasts. *The Accounting Review*, 73(2), 277-294.
- Diether K. B., Malloy, C. J., & Scherbina, A. (2002). Differences of opinion and the cross section of stock returns. *Journal of Finance*, LVII(5), 2113-2141. <http://dx.doi.org/10.1111/0022-1082.00490>
- Duru, A., & Reeb, D. M. (2002). International diversification and analysts' forecast accuracy and bias. *The Accounting Review*, 77(2), 415-433.
- Fairfield, P. M., Sweeney, R. J., & Yohn, T. L. (1996). Accounting classifications and the predictive content of earnings. *The Accounting Review*, 71(3), 337-355.
- Gebhardt, W. R., Lee, C. M. C., & Swaminathan, B. (2001). Toward an implied cost of capital. *Journal of Accounting Research*, 39(1), 135-176. <http://dx.doi.org/10.1111/1475-679X.00007>
- Hwang L., Jan, C., & Basu, S. (1996). Loss firms and analysts' earnings forecast errors. *Journal of Financial Statement Analysis*, 18-30.
- Liu, J., Nissim, D., & Thomas, J. (2002). Equity valuation using multiples. *Journal of Accounting Research*, 40, 135-172. <http://dx.doi.org/10.1111/1475-679X.00042>
- Lys, T., & Soo, L. G. (1995). Analysts' forecast precision as a response to competition, *Journal of Accounting, Auditing and Finance*, 10(4), 751-765.
- Miller, E. M. (1977). Risk, Uncertainty, and Divergence of Opinion. *The Journal of Finance*, 32(4), 1151-1167. <http://dx.doi.org/10.1111/j.1540-6261.1977.tb03317.x>
- Miller, E. M. (2001). Why the low returns of beta and other forms of risk. *The Journal of Portfolio Management*, 40-54. <http://dx.doi.org/10.3905/jpm.2001.319791>
- Philbrick, D. R., & Ricks, W. E. (1991). Using Value Line and I/B/E/S analysts' forecasts in accounting research. *Journal of Accounting Research*, 29, 397-417. <http://dx.doi.org/10.2307/2491057>
- Thomas, S. (2002). Firm diversification and asymmetric information: evidence from analysts' forecasts and earnings announcements. *Journal of Financial Economics*, 74, 373-396. [http://dx.doi.org/10.1016/S0304-405X\(02\)00129-0](http://dx.doi.org/10.1016/S0304-405X(02)00129-0)
- Wiedman, C. I. (1996). The relevance of the characteristics of the information environment in the selection of a proxy for the market's expectations for earnings: An extension of Brown, Richardson, and Schwager [1987]. *Journal of Accounting Research*, 34(2), 313-324. <http://dx.doi.org/10.2307/2491505>

Notes

Note 1. Howard Schilit argued that for periods leading to the scandal, analysts ignored red flags in Enron's financial reports such as one billion dollars in related party revenues and two-thirds of company profits in one quarter coming from unconsolidated affiliates (Ackman, 2002).

Note 2. For example, Peoplesoft Inc.'s, primary operations involve the design, development, and marketing of software. In its fiscal year 2002 annual report, Peoplesoft discloses \$30.6million income from investments in debt and equity securities that had cost \$1.65billion. This investment, though of a continuing nature is secondary to the firm's primary business. For each of the 1990 through 2004 fiscal years, a minimum of 80 percent (not tabulated in this study) of firms in Compustat annual files report non-operating income.

Note 3. "Discretion" because management chooses what mix of operating or non-operating activities.

Note 4. This study does not consider Special items, Extraordinary Items, Discontinued Operations and Effects of Accounting Changes. This is because they are one-off items that are not expected to recur and so tend not to be predicted by analysts.

Note 5. If the assets are controlled by the investor, they will be consolidated under ARB 51 or FIN 46R. Though investments could be subject to significant influence due, say, to the investor being the biggest block owner, this does not amount to control and so is not consolidated under US GAAP.

Note 6. They argue that the over pricing is associated with lower subsequent returns for two reasons. First the prices will revert towards the true value by decreasing when the information asymmetry (the cause of the overpricing) resolves. Second, since the subsequent returns are computed relative to the overpriced values, they will be lower.

Note 7. I use assets to follow Duru & Reeb (2002). Some advantages accrue to the use of assets rather than sales to compute concentration indices. For example, use of assets avoids the problem of having to adjust for

inter-segment sales, and it also avoids the problems of distinguishing between export sales and foreign operating revenues.

Note 8. According to Philbrick & Ricks (1991), this measure of profit tends to include income from continuing operations (that is operating and non-operating income), that it adjusts for certain special items and income tax expense, but excludes separately reported items (discontinued operations, extraordinary items and changes in accounting principle for years before 2006).

Note 9. Since I define Discretion ratio as non-operating income divided by operating income, a negative denominator would render the ratio difficult to interpret.

Note 10. I lose a lot of firms because of lack of analysts' forecasts. The dispersion measure for example requires at least two analysts' forecasts in the month before earnings announcement.

Note 11. I report the results without adjusting for interest expense because views differ as to whether they are an operating or non-operating item. Since Compustat reports them separately, I rely on those reported numbers as is commonly done.

Appendix 1. Description of the computation of the variables

Variable	Definition	Source of data and Computation of variable
ANAFO _t	Analyst following	<i>FirstCall</i> : Number of earnings forecasts for the year t in the month before earnings announcement
FOLLO _t	Log of Analyst following	<i>FirstCall</i> : Natural logarithm of ANAFO _t
FDISP _t	Forecast dispersion	<i>FirstCall</i> : Standard deviation divided by the absolute of the mean of the earnings forecasts for the year t in the month before earnings announcement
FBIAS _t	Forecast error	<i>FirstCall</i> : Actual less mean forecast of earnings for year t in the month before earnings announcement, divided by the absolute actual earnings
FACCU _t	Forecast (in)accuracy	<i>FirstCall</i> : Absolute value of FBIAS _t
DISCRET _t	Discretion ratio	<i>Compustat</i> : Non-operating income (data61) divided by operating income (data178) for year t
TMV _t	Market capitalization	<i>Compustat</i> : Number of shares outstanding (data25) for year t times closing price per share (data199) for year t (\$m)
SIZM _t	Size	<i>Compustat</i> : Log of TMV _t
BADEX _t	Business concentration	<i>Compustat Segment</i> : Sum of square of assets ('at') of reported business segments divided by the square of the sum of the assets for year t.
GADEX _t	Geographic concentration	<i>Compustat Segment</i> : Sum of square of assets ('at') of reported geographic segments divided by the square of the sum of the assets for year t.
ROEIM _t	Net Income scaled by price	<i>FirstCall and Compustat</i> : FirstCall actual EPS for year t scaled by price (data199) for year t-1
ROMO _t	Operating income scaled by price	<i>Compustat</i> : Operating income (data178) for year t scaled by price (TMV) for year t-1
ROMN _t	Non-operating income scaled by price	<i>Compustat</i> : Non-operating income (data61) for year t scaled by price (TMV) for year t-1

Multiple Asymmetries and Exchange Rate Exposure at Firm Level: Evidence from Taiwan Stock Market

René Ferenc François (Franck) VARGA

Correspondence: René Ferenc François (Franck) VARGA, Department of Global Political Economy, Tamkang University, Lanyang Campus, 180 Linwei Road, Jiaosi, Yilan County, ROC 26247, Taiwan. Tel: 886-3-987-3088 ext. 7133. E-mail: 134378@mail.tku.edu.tw

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Abstract

It has been viewed as an unsolved puzzle that for only a small number of firms a significant impact of foreign exchange rate risk on firm value could be detected empirically even though the financial theory strongly supports that a change in the exchange rate should affect the value of the firm. We explain it by the facts that (i) previous studies mostly investigated mature and non-open economies and (ii) they mostly concentrated on one part of the relationship between exchange exposure and firm value. Our empirical results are based on a sample of 107 Taiwanese non-financial firms from 6th June 1990 to 14th July 2010 and the bilateral exchange rate USD / TWD. We use an orthogonalized model with conventional augmented CAPM specifications and asymmetric variables. Because the exposure cannot be viewed as a single coefficient, we also add GJR GARCH specifications to measure the asymmetric profile of the firms and the existence of asymmetric volatility of returns. Our findings show a strong exposure for most of our sample with exclusively a negative exposure (Taiwanese firms benefit from an appreciation of the domestic currency). We also find that exposure is non-linear. Moreover, the asymmetric profiles of the firms modify significantly their exposure. Finally, a high percentage of our monthly sample is affected by a positive coefficient of volatility of the stock returns associated with exchange rates changes but conversely for our daily sample. It means that the leverage of positive and negative shocks changes with the time horizon.

Keywords: economic exposure, exchange rate exposure, asymmetric exchange rate exposure, asymmetric volatility, open economy

1. Introduction

Since the breakdown of the Bretton Woods system in 1973, the volatility of exchange rates and its associated risks increase dramatically. Financial theory holds that exchange rate movements significantly affect firm value via their effects on the competitiveness of the firm's products, the cost of its inputs, the value of its foreign assets, its sensitivity to short-term cash flows (i.e. the probability of financial distress) and its cost of capital (i.e. growth opportunity).

But there is also much evidence from practitioners that exchange rate movements affect firms. Hung (1992) estimates for example that due to a strong dollar during the 1980s American manufacturers lost annually about USD23 billion, representing 10% of their gross profits. Rosenberg (2003) mentioned another survey which indicates that more than 45% of American companies are adversely affected by a strong dollar and later when the dollar weakened around 2002, various industries experienced higher exports and earnings.

This indicates that exchange rate movements affect both small and large firms. Without any doubt, similar observations have been made all around the world. The foreign exchange rate is even becoming a political tool. Academics and practitioners, all agree that fluctuations in foreign exchange rate are a source of uncertainty for the firm, regardless its size and whether the firm is domestically or internationally oriented. Empirical studies already document significant impacts of these fluctuations on firm cash flows, sales and competitive positions in product markets (Hung (1992), Williamson (2001)). Similarly, theoretical models predict that firms should display a significant exchange rate exposure (see for example Bodnar, Dumas and Marston (2002)).

A firm's exchange rate exposure refers to the sensitivity of its economic value (or stock price) to exchange rate changes (Heckman (1985)) or as stated by Adler and Dumas (1984), its economic exposure to exchange risk. If

the volatility of exchange rates affect firm value (stock price), the question is to know how sensitive is the value of the firms to exchange rate movements. In another word, it means how the market prices the currency risk.

However, empirical studies have tended to document weak relations between exchange rate changes and firms' stock prices, if any at all. These studies include Jorion (1990, 1991), Amihud (1994), Bodnar and Gentry (1993), Bartov and Bodnar (1994), Griffin and Stuls (2001) or Dominguez and Tesar (2006), just to name some. In most of the studies, the percentage of firms displaying statistically significant exposures tends to be only about twice the chosen level of statistical significance, hence the term "exposure puzzle".

Bartram and Bodnar (2007) argue that the puzzle is mostly the result of "overly optimistic prior assumptions of the part of the researcher about the extent of significant exposures within a population of firms". They explain that low percentages of exposed firms are the result from "exposure reducing actions" which include both financial and operational hedging activities. Bartram, Brown and Minton (2010) show empirically that firms pass through part of currency changes to customers, which combined with operational hedging, each reduce firms' exposure by 10% to 15%; moreover, financial hedging with foreign debt decreases exposure by about 40%.

It seems that is why most of the studies finding significant exposures report a level of exposed firms lower than what one could expect: in average, between 10% and 25% of the sample, except for the few studies focusing particularly on open economies and nonlinear exposures. Moran (2005) for example found that 25% of his Chilean sample is exposed to the American dollar at the 10% level of significance. He also found that 54.7% of his sample, display a nonlinear exposure but none was asymmetrically exposed.

So, small and open economies seem to be a better laboratory to explore the exposure puzzle which is the main reason why we chose Taiwan. Taiwanese economy is clearly an open economy according Friberg and Nydahl (1999) criteria: if we compare the total trade to the GDP, the ratio is above 140% in 2008 compared for example to the 24% in USA. It is therefore worthwhile to investigate firms' exposure in a country with such high trade involvement. Moreover, Taiwan launched starting from July 1987 a financial liberalization program relaxing its control on capital account transactions. Exchange rate volatility started to increase at that time making the firms more sensitive to exchange rate movements. Our sample's period starts on June 1990, extending up to July 2010. The reminder of the paper is organized as follows. The next section presents related papers. Sample and methodology are described in section 3. Section 4 analyzes the main empirical results and section 5 concludes the paper.

2. Asymmetric Exposure to Exchange Rate Risk: Related Papers

An extensive literature followed the paper of Adler and Dumas (1984) which introduced a simple model with the stock return as the dependant variable and the change in the exchange rate as the explanatory variable. The resulting coefficient is the sensitivity of the firm to exchange rate movements. In a seminal paper, Jorion (1990) investigates it using a sample of 287 American multinational firms and an augmented market model (See Jorion (1990) and Bodnar and Wong (2000) for a discussion of why it is important to include the market return in equation (1)):

$$R_{i,t} = \beta_{0,i} + \beta_{1,i}Rm_t + \beta_{2,i}FX_t + \varepsilon_{i,t} \quad (1)$$

With: $R_{i,t}$ denoting the stock return, Rm_t the return on the market index, and FX_t the change in the exchange rate. But as mentioned in our introduction, very few authors find statistically significant exposure.

Thus, several changes in methodology are proposed since the seminal paper of Jorion (1990) such as the introduction of the lag effect or the time varying factors. We focus here on one particular change in methodology, the use of nonlinear and asymmetric exposure components.

Financial theory indicates that exposure should be at least for one part nonlinear, knowing that cash flows are a nonlinear function of the exchange rates. Several authors investigate asymmetric response to appreciations and depreciations, as Koutmos and Martin (2003), Bartram (2004), Carter et al. (2005) and Tai (2005).

But most of the results are mitigated even though Rossi (2009) finds that 38% of his Brazilian samples display a non linear exposure. According several authors such as Koutmos and Martin (2003) or Muller and Verschoor (2006), various reasons can generate a nonlinear relationship between the value of the firm and the exchange rate movements, mainly asymmetric hedging, incorrect pricing of assets, hysteresis for firms involved in international trade, magnitude of exchange rate fluctuations, pricing policies and market structures, and government interference.

2.1 Asymmetric Hedging

One of the main factors to cause nonlinearity in the exchange rate exposure is the risk management chosen by the firm, through the use of hedging or financial derivatives. Firms always try to exploit opportunities and avoid adverse effects from macroeconomic changes, behavior which is reflected in their hedging strategies. It can generate nonlinear payoffs caused by the exchange rate movements leading to a nonlinear fluctuation of the cash flow and consequently the value of the firm. Options allow the company to make asymmetric gains (for example an importer will hedge against the depreciation of the domestic currency while making eventually a “profit” if the local currency appreciates) and the firm’s exposure will also be influenced by the magnitude of the currency fluctuation, see Miller and Reuer (1998), Allayannis and Ofek (2001) or Rossi (2008). The use of real or financial options means that market-value exposures is larger to beneficial macroeconomic changes than to adverse ones since this kind of hedging allows to protect the firm against adverse changes and exploit beneficial fluctuations, see Andren (2001) for more details.

2.2 Errors in Assets’ Pricing

Actors of the market may find uneasy to measure the consequences of an exchange rate movement on the firm’s value especially in case of shocks. Indeed, it is difficult to identify if a shock is permanent or just temporary hence the problem to measure the real impact on the firm. Moreover, the way firms disclose their financial information (hedging policies...) is not always totally transparent thus creating the risk to mislead investors in their valuation process. Muller and Verschoor (2006) argue that may push investors into a “safe behavior” by ignoring lower magnitude of exchange rate movements and reacting more strongly to greater magnitude especially in case of “bad news”, hence emphasizing the nonlinear component of the exposure.

2.3 Hysteretic and Magnitude of Exchange Rate Change Asymmetries

Another important source of asymmetry is the hysteretic behavior. If the depreciation of domestic currency persists, a number of new exporters may enter the market to benefit from the exchange rate movement. Therefore, the profits of the existing exporters may not increase as more firms are sharing the market. If the depreciation of the domestic currency is followed by a period of appreciation it is not sure that companies are in position to just quit the market, given the sunk costs the new comers had to pay. They are more likely to stay in the market with a lower profit or even losses in such a period. In these cases, the exchange rate fluctuations have a negative impact on the firm’s value. This creates an asymmetry in exchange rate exposure. The decrease in profits during appreciations is larger than the increase in profits during depreciations. The phenomenon of hysteresis is logically supposed to occur after greater magnitude exchange rate movement, since small fluctuations will not influence companies in their entry or exit decisions. Therefore, magnitude of exchange rate changes is also a source of asymmetry in the firms’ exposure. The magnitude leading to a response from the firm may depend on the company size, its industry, its past experience or macroeconomic factors. Thus the different responses of the firms to small and large exchange rate fluctuations give birth to the magnitude asymmetry of exchange rate exposure. The question remains in knowing for which threshold firms will start to respond and how long is supposed to be the period to attract new comers. See Baldwin (1988) and Dixit (1989) who describe hysteresis models.

2.4 Pricing-to-market

There are several studies describing pricing-to-market behavior of companies which is too, an important source of asymmetry of exchange rate exposure, see for example Froot and Klemperer (1989), Marston (1990) or Knetter (1994) who study this particular behavior which may take either two forms: pricing-to-market in view to maintain or improve the market share and pricing-to market under volume constraints. As Knetter (1994) states, the former form assumes that the firms’ goal is to maximize their market share. So if the local currency appreciates, the exporter will not pass on the impacts to buyers by increasing the foreign prices of their products, to avoid the risk of losing market share to competitors from other countries. They may even be prone to reduce their export prices. On the contrary, if the domestic currency depreciates, exporters will maintain their mark-up at the same level, letting the export prices unchanged. Thus, they will not pass the benefits of depreciation by reducing the foreign prices of their goods. Consequently, exporters’ profits may increase to a lesser degree during depreciation periods than decrease in appreciation periods. Pricing-to-market under volume constraints occurs because quota or wrong investment in marketing capacity (bottlenecks). On contrary to the previous behavior, the mechanism works in the other direction. In the case of a depreciation of the domestic currency exporters will not be able to increase their sales volume, because the volume constraints. Therefore, they may increase their foreign price to clear the market, being not interested in passing the benefit of depreciation to the

buyers. In the opposite situation, if the domestic currency appreciates, exporters may let the foreign prices reflect the fluctuations and may not use the pricing-to-market: they will not reduce the foreign prices.

2.5 Asymmetries due to Government Interference

Government interference in the foreign exchange market may also be a source of asymmetry by indirectly helping domestic firms. If the exchange rate exceeds a certain level, the government may intervene to reduce the currency volatility and hence the firms' exposure. By limiting the appreciation of the domestic currency, it may help exporters and by controlling the depreciations of the local currency, it will help companies holding debts in foreign currencies.

2.6 Asymmetry in Volatility of Stock Returns Underlying Exchange Rate Exposure

The main explanation of the asymmetry in volatility of stock returns is the leverage effect, common concept in finance, through the leverage ratio debt / equity. Resulting from bad news, the negative return shock increases the leverage ratio and the volatility while good news will generate a positive return shock and a lower leverage ratio and volatility. But if we analyze the volatility of stock returns underlying exchange rate exposure, the picture is not so clear. When a domestic currency appreciates or depreciates, we cannot state that we are facing good or bad news. It will depend on the situation of the market participants (exporter, importer etc...) as mentioned by Bodnar and Gentry (1993). But a firm can play more than one role like for instance exporter and internationally priced input user. As Maghrebi et al. (2006) state, "whether depreciation of domestic currency should be viewed as good news or bad news is an open question". Other authors cite evidence for the existence of volatility asymmetry in stock returns related to exchange rate fluctuations as for instance Kanas (2000) and Giurda and Tzavalis (2004) so it seems that this volatility asymmetry is one of the exposure components we need to take into account, even though its mechanism is unclear.

3. Methodology and Sample Description

3.1 Methodology

There is a drawback of the above mentioned augmented CAPM models (Eq. 1). We cannot estimate the total impact of the exchange rate changes on stock returns as a single coefficient with this specification. Since market returns and exchange rate fluctuations are correlated, the influence of the latter on the firm value can be divided into two components: the direct exposure effect contained in $\beta_{2,i}$ and the indirect effect included in $\beta_{1,i}$. Alone, $\beta_{2,i}$ may under/overestimate the firm's true exposure to currency fluctuations. Moreover, these two effects may reinforce or offset each other. Under (Eq. 1) if exposure is zero, it does not mean that the firm has no exposure but just that its exposure is the same as the market. To address this issue, various authors use an auxiliary regression between market returns and exchange rate changes. The auxiliary regression is described as:

$$R_{m,t} = \delta_0 + \delta_1 FX_t + \delta_{m,t} \quad (1-1)$$

with $\delta_{m,t}$, the orthogonalized market returns, representing the component of market returns that is uncorrelated with exchange rate changes. We replace $R_{m,t}$ in (Eq. 1) by $\delta_{m,t}$. Substituting (Eq. 1-1) into (Eq. 1) and rearranging, we obtain the orthogonalized model:

$$R_{i,t} = \beta_{0,i}^* + \beta_{1,i} \delta_{m,t} + \beta_{2,i}^* FX_t + \varepsilon_{i,t} \quad (1-2)$$

where:

$$\beta_{0,i}^* = \beta_{0,i} + \beta_{1,i} \delta_0 \quad (1-3)$$

$$\beta_{2,i}^* = \beta_{2,i} + \beta_{1,i} \delta_1 \quad (1-4)$$

$\beta_{0,i}$, $\beta_{1,i}$ and $\beta_{2,i}$ are from the unorthogonalized model $R_{i,t} = \beta_{0,i} + \beta_{1,i} R_{m,t} + \beta_{2,i} FX_t + \varepsilon_{i,t}$

The final purpose here is to capture both, sign asymmetry (responses from the firms after a depreciation or an appreciation of the domestic currency) and magnitude asymmetry (firms' reaction to small and large exchange rate fluctuations). We also use an orthogonalized version of the augmented CAPM specification but this time, by distinguishing asymmetric and exposure coefficients. In order to take into account specificities of financial time series as the time-varying volatility, we add a GARCH specification, more precisely a GJR GARCH (1,1) which is able to accommodate asymmetry in volatility of stock returns which is as mentioned above, a stylized facts related to the exposure mechanism. We use dummy variables to measure the effects of an appreciation of the

domestic currency (sign asymmetry) and a change in the exchange rate greater (magnitude asymmetry) than a specified filter (threshold), changing with the horizon.

The model is described as:

$$R_{i,t} = \beta_{0,i}^* + \beta_{1,i}\delta_{m,t} + (\beta_{2,i}^* + \beta_{3,i}D_{sign,t} + \beta_{4,i}D_{amp,t})FX_t + \varepsilon_{i,t} \quad (2)$$

where:

$R_{i,t}$ is the return of the firm i at time t

$\delta_{m,t}$ is the orthogonalized market return at time t

FX_t is the change in the USD/TWD exchange rate

$D_{sign,t} = 1$ if $FX_t < 0$ and 0 otherwise (dummy variable)

$D_{amp,t} = 1$ if $|FX_t| > x$ and 0 otherwise (dummy variable).

The filter $x = 0.5\%$ and 2% for respectively daily and monthly data.

The conditional variance equation $h_{i,t}$ is: $h_{i,t} = \omega_i + \alpha_i\varepsilon_{i,t-1}^2 + \gamma_i D_{t-1}\varepsilon_{i,t-1}^2 + \beta_i h_{i,t-1}$, where D_{t-1} is

equal to 1 if $\varepsilon_{i,t}$ is negative and 0 otherwise. The usual constraints related to GARCH models apply: $\omega_i > 0$, $\alpha_i > 0$, $\beta_i > 0$, $\alpha_i + \gamma_i > 0$ and $\frac{1}{2}(\alpha_i + \beta_i + \gamma_i) < 1$.

In this model, it is associated to good news when $\varepsilon_{i,t} > 0$ and bad news when $\varepsilon_{i,t} < 0$. Both outcomes have differential effects on the conditional variance: good news has an impact on α_i , while the bad news has an impact on $(\alpha_i + \gamma_i)$. If $\gamma_i > 0$, bad news increases volatility (we say there is a “leverage effect”). If γ_i is statistically significant, it implies the existence of an asymmetric volatility of stock returns underlying exchange rate exposure even though the mechanism through which it comes into being still remains unresolved. Depreciation or appreciation of the domestic currency is not automatically a good or bad news.

Table 1 summarizes the possible exposure coefficients according the various sign and magnitude changes in the exchange rate. $\beta_{2,i}^*$ and $\beta_{3,i}$ may be positive or negative according the position of the firm (exporter, importer, etc...) and we do not set constraints for the sign of $\beta_{4,i}$ which means that an exchange rate exposure associated with large fluctuations may be greater or lower than that of small changes. Indeed, Taiwanese firms may be more accustomed to relatively limited changes in the domestic currency (compared for instance to the JPY) given the Taiwan central bank policies. The various combination of the exposure and sign coefficients (respectively $\beta_{2,i}^*$ and $\beta_{3,i}$) mean different sources of asymmetry as mentioned in section 2. In view to address this issue, we adopt the classification of Koutmos and Martin (2003).

Table 1. Impacts of various sign and magnitude fluctuations

Changes in exchange rate	Exposure coefficients
Appreciation lower than the filter: $FX_t < 0$ and $ FX_t < x$	$\beta_{2,i}^* + \beta_{3,i}$
Appreciation greater than the filter: $FX_t < 0$ and $ FX_t > x$	$\beta_{2,i}^* + \beta_{3,i} + \beta_{4,i}$
Depreciation lower than the filter: $FX_t > 0$ and $ FX_t < x$	$\beta_{2,i}^*$
Depreciation greater than the filter: $FX_t > 0$ and $ FX_t > x$	$\beta_{2,i}^* + \beta_{4,i}$

$x = 0.5\%$ and 2% respectively for daily and monthly data

3.2 Sample Selection and Data Description

All data are obtained from Taiwan Economic Journal Data Bank (TEJ). We only focus on non-financial Taiwanese companies listed on the Taiwan Stock Exchange (TSE).

Financial institutions are not included due to their different asset characteristics and objectives with regard to financial risks. This restriction makes also the sample comparable to the ones used in most of the previous studies.

Our purpose here, is to investigate the exchange rate exposure on the longest possible period of time, starting from 1990 (financial liberalization began mid of 1987 so we disregard the last years of the 1980s to avoid a structural break).

At the time of sampling, 741 companies are listed on the TSE (199 firms in 1990) but after eliminating companies with unavailable information and financial firms, the final sample consists of 107 firms with data starting on June 6 1990 and finishing on July 14 2010. This period of time covers almost 22 years. Tables A1 and A2 describe the selected firms. The sample selection may introduce a survivorship bias in the results. Since all these firms have survived during the sample period, they are likely to be the ones that have effectively managed various risk exposure. It means that the bias is against finding significant exposure coefficient.

Table A1. Sample: industries represented

Industry Code	Sample	Percentage
1 Cement	5	4.67%
2 Foods	8	7.48%
3 Plastics	11	10.28%
4 Textile	17	15.89%
5 Elec. & Mach.	4	3.74%
6 Elec. Appliance & Cable	8	7.48%
7 Chemicals	11	10.28%
8 Glass & Ceramics	1	0.93%
9 Paper & Pulp	5	4.67%
10 Steel & Iron	6	5.61%
11 Rubber	4	3.74%
12 Automobile	1	0.93%
13 Electronics	5	4.67%
14 Construction	5	4.67%
15 Transportation	3	2.80%
16 Tourism	4	3.74%
17 Wholesale & Retail	7	6.54%
19 Others	2	1.87%
TOTAL	107	100.00%

Table A2. Sample list

Industry Code	Firm Code	Industry Code	Firm Code	Industry Code	Firm Code	Industry Code	Firm Code
1	1101	4	1418	7	1713	14	2540
1	1102	4	1419	7	1718	15	2601
1	1103	4	1423	8	1802	15	2603
1	1104	4	1434	9	1903	15	2605
1	1108	4	1435	9	1904	16	2701
2	1201	4	1441	9	1905	16	2702
2	1210	4	1436	9	1907	16	2704
2	1213	4	1437	9	1909	16	2705
2	1215	4	1439	10	2002	17	2915
2	1216	4	1440	10	2006	17	2913
2	1217	4	1443	10	2007	17	2901
2	1218	5	1503	10	2008	17	2903
2	1229	5	1504	10	2009	17	2904
3	1301	5	1506	10	2010	17	2905
3	1303	5	1507	11	2102	17	2906
3	1304	6	1605	11	2103	19	9904
3	1305	6	1608	11	2104	19	9902
3	1307	6	1609	11	2105		
3	1308	6	1611	12	2201		
3	1309	6	1603	13	2303		
3	1310	6	1604	13	2371		
3	1312	7	1701	13	2302		
3	1313	7	1702	13	2305		
3	1326	7	1704	13	2308		
4	1402	7	1707	13	2311		
4	1409	7	1708	13	2312		
4	1410	7	1709	14	2501		
4	1413	7	1710	14	2504		
4	1416	7	1711	14	2509		
4	1417	7	1712	14	2506		

We decide to select the firm as the unit of analysis for several reasons.

Firstly, firms within the same industry are not homogenous and hence may display different exposure coefficients. Thus, individual exposure effects may be averaged out at the industry level.

Secondly, industry return indices are often value-weighted, advantaging large firms. As Dominguez and Tesar (2001) say, if small firms are more exposed to exchange rate fluctuations, analysis at the industry level will misjudge the true level of exposure.

Thirdly, asymmetry effects can best be captured at the firm level since an industry can include both exporters and importers.

Finally, if this study provides interesting conclusions, they may have a more practical impact and be more useful in exchange rate and assets management at the firm level.

As a proxy for the returns on the market portfolio, we use the TAIEX which is the main index in the Taiwan stock exchange.

We choose to employ a bilateral exchange rate instead of an exchange rate index to avoid its aggregated effects issues. Moreover, an exchange rate index is not always relevant for a firm. Currency changes may be measured in nominal and real terms.

We choose to use the nominal exchange rate firstly because it avoids the trouble to adjust the other variables of our regressions for consistency purposes (Khoo (1994)) and secondly, Mark (1990) finds that nominal and real

changes are almost perfectly correlated for the seven countries used in his study. His conclusion is also shared by Atindehou and Gueyie (2001).

The American dollar is the currency mostly used by Taiwanese firms so as the nominal bilateral exchange rate we employ the USD / TWD (amount of Taiwanese dollar for one unit of American dollar). If the exchange rate change is negative (positive), the domestic currency (TWD) is appreciating (depreciating). If the firm displays a negative exposure coefficient, it will benefit from an appreciation of the TWD and if the exposure coefficient is positive, the firm will benefit from a depreciation of the domestic currency. We have respectively for daily and monthly data, 5245 and 240 individual observations representing 571,705 daily observations and 26,160 monthly observations over the sample period.

4. Empirical Results and Major Findings

4.1 Multiple Asymmetries and Exchange Rate Exposure

Table 2 provides the main results. The model measures individually each asymmetry and the exposure to see how the latter may be influenced by the former.

Table 2. Horizon Comparison: Model GJR GARCH multiple asymmetries

$$R_{i,t} = \beta_{0,i}^* + \beta_{1,i}\delta_{m,t} + (\beta_{2,i}^* + \beta_{3,i}D_{sign,t} + \beta_{4,i}D_{amp,t})FX_t + \varepsilon_{i,t}$$

With: $R_{m,t} = \delta_0 + \delta_1FX_t + \delta_{m,t}$, $D_{sign,t} = 1$ if $FX_t < 0$ and 0 otherwise and $D_{amp,t} = 1$ if $|FX_t| > x$ and 0 otherwise. $x = 0.5\%$ and 2% for respectively daily and monthly data. The conditional variance equation $h_{i,t}$

is: $h_{i,t} = \omega_i + \alpha_i\varepsilon_{t-1}^2 + \gamma_iD_{t-1}\varepsilon_{t-1}^2 + \beta_i h_{i,t-1}$, where D_{t-1} is equal to 1 if $\varepsilon_{i,t}$ is negative and 0 otherwise.

The usual constraints related to GARCH models apply: $\omega_i > 0$, $\alpha_i > 0$, $\beta_i > 0$, $\alpha_i + \gamma_i > 0$ and $\frac{1}{2}(\alpha_i + \beta_i + \gamma_i) < 1$

Daily Model				Sample Size		105			
				Average Adj R ²		34.78%			
Firms Exposed at		β_2		β_3		β_4		γ	
10%	93	88.57%		15	14.29%	13	12.38%	40	38.10%
5%	90	85.71%		11	10.48%	11	10.48%	35	33.33%
1%	77	73.33%		3	2.86%	5	4.76%	19	18.10%
		β_2		β_3		β_4		γ	
		>0	<0	>0	<0	>0	<0	>0	<0
% of Exposed		0.00%	100.00%	6.67%	93.33%	69.23%	30.77%	37.50%	62.50%
Mean			-0.649	0.380	-0.347	0.426	-0.500	0.026	-0.029
Median			-0.617		-0.324	0.435	-0.504	0.026	-0.028
Standard Deviation			0.202		0.059	0.100	0.089	0.007	0.012
Maximum			-0.299		-0.284	0.584	-0.407	0.043	-0.015
Minimum			-60.373		-0.511	0.275	-0.584	0.017	-0.059
Monthly Model				Sample Size		102			
				Average Adj R ²		37.84%			
Firms Exposed at		β_2		β_3		β_4		γ	
10%	65	63.73%		11	10.78%	6	5.88%	58	56.86%
5%	55	53.92%		7	6.86%	3	2.94%	51	50.00%
1%	27	26.47%		4	3.92%	1	0.98%	33	32.35%
		β_2		β_3		β_4		γ	
		>0	<0	>0	<0	>0	<0	>0	<0
% of Exposed		0.00%	100.00%	27.27%	72.73%	50.00%	50.00%	60.34%	39.66%
Mean			-2.581	2.195	-2.978	2.191	-1.912	0.238	-0.417
Median			-2.580	2.204	-2.315	1.875	-1.815	0.191	-0.279
Standard Deviation			0.653	0.572	2.088	1.006	0.549	0.170	0.318
Maximum			-1.303	2.762	-1.606	3.316	-1.418	0.791	-0.054
Minimum			-4.242	1.618	-8.055	1.381	-2.503	0.033	-1.237

We find strong evidence of the presence of exchange rate exposure. At the 10% level of significance, 88.57% of the sample is exposed to daily foreign exchange changes; 14.29% exhibit a daily sign asymmetry and 12.38% a daily magnitude asymmetry. Monthly percentages are respectively 63.73%, 10.78% and 5.88%.

The percentage of exposed firms to foreign exchange risk decreases sharply when the horizon increases. The same comment can be made as well for the firms displaying sign and magnitude asymmetries.

All exposure coefficients are negative, with an average level of -0.649 and -2.581 for daily and monthly respectively. Table 3 exhibits the different forms of exposure and asymmetries obtained from the model.

Table 3. Forms of Exposure and Asymmetries (Level of significance used: 10%)

Firms Displaying:	Coefficients	Daily Data		Monthly Data	
Exchange Rate Exposure	β_2	93	88.57%	65	63.73%
Sign Asymmetry	β_3	15	14.29%	11	10.78%
Magnitude Asymmetry	β_4	13	12.38%	6	5.88%
Asymmetric Volatility	γ	40	38.10%	58	56.86%
Exposure and Sign Asymmetry	β_2 and β_3	14	13.33%	5	4.90%
Exposure and Magnitude Asymmetry	β_2 and β_4	10	9.52%	3	2.94%
Exposure and Asymmetric Volatility	β_2 and γ	37	35.24%	38	37.25%
Sign and Magnitude Asymmetries	β_3 and β_4	3	2.86%	3	2.94%
Sign and Volatility Asymmetries	β_3 and γ	5	4.76%	5	4.90%
Magnitude and Volatility Asymmetries	β_4 and γ	5	4.76%	4	3.92%
All Three Asymmetries	β_3 and β_4 and γ	3	2.86%	1	0.98%
Only Asymmetric Volatility	Only γ	30	28.57%	16	15.69%
No Asymmetry at All	No β_3 and β_4 and γ	42	40.00%	24	23.53%
At Least One Form of Asymmetry	β_3 or β_4 or γ	63	60.00%	78	76.47%

Sign and magnitude asymmetries are more present when using daily data. 13.33% of the sample display simultaneous exposure and sign asymmetry and 9.52% an exposure and magnitude asymmetry; 2.86% of the firms display both asymmetries.

The percentage of firms displaying sign and magnitude asymmetries decreases with the horizon, but the situation is reversed for the volatility asymmetry: it increases from 38.10% to 56.86 % (respectively for daily and monthly data at the 10% significance level).

The percentage of exposed firms displaying a volatility asymmetry is respectively 35.24% and 37.25% for daily and monthly data, which also shows an increase with the horizon.

We checked if the fact to belong to a particular industry may explain the value of the Betas (exposure, sign and magnitude). For both, daily and monthly data, no specific pattern emerged.

So the industry is not an explanatory variable, at least for Taiwan. This fact is already a significant result.

4.1.1 Sign Asymmetry in Exchange Rate Exposure

In order to describe the sources of sign asymmetry, we use the classification in Koutmos and Martin (2003), with daily and monthly data. The results are summarized in Tables 4 and 5.

Table 4. Possible Sources of Sign Asymmetry of Exchange Rate Exposure: Daily Data

	$\beta_2 > 0$	$\beta_2 = 0$	$\beta_2 < 0$
$\beta_3 > 0$	#Net Exporters	#Net Exporters	#Net Importers
	#Pricing-to-Market With Market Share Objective	#Pricing-to-Market With Market Share Objective	#Pricing-to-Market With Market Share Objective
	#Hysteresis	#Hysteresis	
	0 firm (0.00%)	0 firm (0.00%)	1 firm (0.95%)
$\beta_3 = 0$	#Net Exporters	#Net Exporters or Importers	#Net Importers
	#Symmetric Exposure	#No Exposure	#Symmetric Exposure
	0 firm (0.00%)	11 firms (10.48%)	79 firms (75.24%)
$\beta_3 < 0$	#Net Exporters	#Net Importers	#Net Importers
	#Pricing-to-Market Under Volume Constraints	#Pricing-to-Market Under Volume Constraints	#Asymmetric Hedging
	#Asymmetric Hedging	#Asymmetric Hedging	
	0 firm (0.00%)	1 firm (0.95%)	13 firms (12.38%)

Adopted from Koutmos and Martin (2003) at the 10% level of acceptance

Table 5. Possible Sources of Sign Asymmetry of Exchange Rate Exposure: Monthly Data

	$\beta_2 > 0$	$\beta_2 = 0$	$\beta_2 < 0$
$\beta_3 > 0$	#Net Exporters	#Net Exporters	#Net Importers
	#Pricing-to-Market With Market Share Objective	#Pricing-to-Market With Market Share Objective	#Pricing-to-Market With Market Share Objective
	#Hysteresis	#Hysteresis	
	0 firm (0.00%)	1 firm (0.98%)	2 firms (1.96%)
$\beta_3 = 0$	#Net Exporters	#Net Exporters or Importers	#Net Importers
	#Symmetric Exposure	#No Exposure	#Symmetric Exposure
	0 firm (0.00%)	31 firms (30.39%)	60 firms (58.22%)
$\beta_3 < 0$	#Net Exporters	#Net Importers	#Net Importers
	#Pricing-to-Market Under Volume Constraints	#Pricing-to-Market Under Volume Constraints	#Asymmetric Hedging
	#Asymmetric Hedging	#Asymmetric Hedging	
	0 firm (0.00%)	5 firms (4.90%)	3 firms (2.94%)

Adopted from Koutmos and Martin (2003) at the 10% level of acceptance

Results here are not comparable with Koutmos and Martin (2003); their unit being the country-sector, but they reported that 63% of non-US cases were not exposed to exchange rate changes, while only 10.48% and 30.39% (respectively for daily and monthly data) of our Taiwanese sample were not exposed.

Their sample showed a higher percentage of firms displaying a sign asymmetry: 16%, compared to 14.29% and 10.78% for our daily and monthly data. Additionally, 22% of their non-US sample was symmetrically exposed while we found a higher percentage for our sample: 75.24% and 58.22%.

Our findings reveal that more Taiwanese firms are exposed to exchange rate changes but less are displaying a sign asymmetry.

Interestingly, the sign asymmetry is much more frequent in our daily data therefore the figures are too large to be ignored. We notice here a dichotomy: if all the sign asymmetry coefficients (but one) are negative for the daily data, about 27% (of the concerned firms) are positive and 73% negative for the monthly data.

On average, the sign asymmetry coefficient has a higher impact when the coefficient is negative (-2.978) than when it is positive (2.195). It means that not only do more firms display a benefit from a daily or monthly appreciation of the domestic currency but the impact of an appreciation is also greater than from a depreciation of the currency.

4.1.2 Magnitude Asymmetry in Exchange Rate Exposure

We also noticed a dichotomy for the firms displaying a magnitude asymmetry but the horizon here has an opposite effect. In our study 69% of the concerned firms display a positive daily magnitude asymmetry coefficient, but only 50% in the monthly case.

On average, when the daily coefficient is negative, the impact is larger than for positive coefficients: -0.500 compared to 0.426, but the situation is reversed when we consider the monthly data: 2.191 compared to -1.912.

More tests should be conducted on the threshold level for which the reaction from the firms is stronger. Our results show that almost 88% of the Taiwanese firms are exposed to a small exchange rate change at the daily horizon and 94% at the monthly horizon. For firms displaying a magnitude asymmetry, the impact on their returns depends on the sign of the exchange rate variation.

At the daily horizon, 69.23% of the concerned firms suffered from a large appreciation of the domestic currency while 30.77% benefited from it. The percentage of firms suffering from a large appreciation of the TWD decreases to 50% at the monthly horizon. It is difficult to explain precisely the role of the horizon here, but the consequence for a firm displaying a magnitude asymmetry is to reduce the level of foreign exchange exposure (all having a negative sign) and thus the benefit from an appreciation of the domestic currency.

4.1.3 Asymmetric Volatility Underlying Exchange Rate Exposure

As mentioned before, if the percentage of firms displaying sign and magnitude asymmetries decreases with the horizon, the situation is reversed for the volatility asymmetry: it increases from 38.10% to 56.86% (respectively for daily and monthly data at the 10% level of significance).

From table 3, we see that the percentage of firms exposed to the exchange rate risk displaying a volatility asymmetry is respectively 35.24% and 37.25% for daily and monthly data, showing an increase also with the horizon.

But the percentage of the firms displaying simultaneously sign and volatility asymmetries is much lower: 4.76% and 4.90% respectively for daily and monthly data as well as for the firms displaying simultaneously magnitude and volatility asymmetries 4.76% and 3.92% respectively for daily and monthly data.

Only 2.86% of the exposed firms display simultaneously at the daily horizon, the three forms of asymmetry (0.98% at the monthly horizon) but 60% of the exposed firms display at least one form of asymmetry at the daily horizon and 76.47% at the monthly horizon.

Not indicated on the above tables, we found that even though they do not show a statistically significant exchange rate exposure, three firms (2.86% of our sample) display a volatility asymmetry at the daily horizon (two positive and one negative) and 20 (19.61%) at the monthly horizon (eight positive and 12 negative). So, although the mechanism of the volatility asymmetry is not very clear at the firm level, it is too remarkable to be ignored especially at the monthly horizon.

A positive volatility asymmetry coefficient is associated to bad news, thus increasing the volatility of the asset's return but considering exchange rates, a change does not necessarily mean bad or good news. It will of course depend on the situation of the firm.

Following our tables 4 and 5, both net exporters and importers are included in our sample so it seems logical to observe a dichotomy in the sign of the volatility asymmetry coefficient. But when we compare both horizons, the majority of the signs are negative at the daily horizon (62.50%) but positive at the monthly horizon (60.34%). This implies that explaining the mechanism underlying volatility asymmetry is somehow difficult.

5. Concluding Remarks

Understanding the impact of foreign exchange risk is critical for purposes of firm valuation and risk management. In other words, it is important to understand if (and how) stock returns are linked to exchange rate fluctuations.

But it is surprising that most of the previous studies having investigated this issue obtain mixed results hence the term “exchange rate exposure puzzle”. Bartram and Bodnar (2007) consider that financial and operational hedging are the main explanation, and not the sampling or the models used.

However, encouraging results (still not as good as one may expect in regard of the financial theory) are obtained when authors focus on small and open economies, see for example Moran (2005) with his Chilean sample, or Chen et al. (2004) who find that exchange rate changes affect the value of New Zealand firms.

That is the reason why we investigate the case of Taiwan, which is one of the most open economies in the world. Using a sample of 107 publicly traded Taiwanese firms, from 6th June 1990 to 14th July 2010, we test our hypothesis according to which open economy is a good laboratory for investigating the exchange rate exposure puzzle.

Our contributions to the exposure literature may be summarized as followed:

1. The hypothesis, according to which a small open economy is better to study exposure, is largely confirmed.
2. As far as we know, we obtain (among the previous publications) the highest level of exposure: almost 90% and 64% for respectively daily and monthly data. Even the results from Chen et al. (2004) and Moran (2005) who also studied small open economies, exhibit that only about 25% of their sample are exposed.
3. Taiwanese firms exhibit mostly a symmetric profile, even though the percentage of the company with an asymmetric behavior is too high to be ignored.
4. 100% of the exposed firms are negatively exposed: Taiwanese firms benefit from an appreciation of the domestic currency (TWD).
5. Our results may lead to the fact that the exposure puzzle we mentioned in our introduction may be a consequence of sample selection and methodological limitations of earlier studies.
6. Industry is not an explanatory variable, at least for Taiwanese firms.

We find that Taiwanese firms are statistically and economically strongly exposed to exchange rate changes and display an exposure coefficient which increases sharply with the time horizon.

When we take into account simultaneously all forms of asymmetry: sign, magnitude and volatility, 88.57% and 63.73% (respectively for daily and monthly data) are exposed to exchange rate fluctuations. It seems that the percentage decreases with the time horizon. It might be explained by the fact that GARCH specifications are more efficient with high frequency data.

To our knowledge, this high percentage is not found in previous studies. Moreover, 100% of the concerned firms are negatively exposed, which means that all benefit from an appreciation of the domestic currency.

Obviously this result is not conformed to the conventional wisdom but it is similar to the findings of Muller and Verschoor (2007), Chen et al. (2004) and Moran (2005) who use respectively an Asian, a New Zealand and a Chilean sample. But Chen et al. (2004) found opposite results when using AUD and Moran (2005) obtained a negative exposure but only on average. Moreover when we compare our results with the ones obtained when studying small economies, Chen et al. (2004) did not analyze asymmetric exposure and Moran (2005) did not find any evidence of asymmetry.

Using the classification in Koutmos and Martin (2003) we see that only 10.48% and 30.39% (respectively for daily and monthly data) of our sample are not exposed. If for our daily and monthly data, 75.24% and 58.22% of Taiwanese firms are symmetrically exposed, respectively 14.29% and 10.78% display a sign asymmetry. Almost 88% of the Taiwanese firms are exposed to a small exchange rate change at the daily horizon and 94% at the monthly horizon, which is coherent with a concave behavior.

The majority of firms displaying a sign asymmetry benefit from an appreciation of the domestic currency (increasing their exposure) while companies having a magnitude asymmetry profile tend to benefit from a depreciation of the currency (reducing their exposure).

The percentage of exposed firms displaying a volatility asymmetry is respectively 35.24% and 37.25% for daily and monthly data, which shows an increase with the horizon.

Not indicated in our tables, we find that even though they do not show a statistically significant exchange rate exposure, three firms (2.86% of our sample) display a volatility asymmetry at the daily horizon (two positive and one negative) and 20 (19.61%) at the monthly horizon (eight positive and 12 negative). So, although the mechanism of the volatility asymmetry is not very clear at the firm level, it is too remarkable to be ignored especially at the monthly horizon.

Both net exporters and importers are included in our sample so it seems logical to observe a dichotomy in the sign of the volatility asymmetry coefficient. But when we compare both horizons, the majority of the signs are negative at the daily horizon (62.50%) but positive at the monthly horizon (60.34%). This implies that explaining the mechanism underlying volatility asymmetry is somehow difficult.

This study confirms that an open economy allows a better investigation of the exchange rate exposure puzzle, and the entire currency risk actually faced by firms is not fully captured by the traditional exposure coefficient alone. It seems also that the negligence of multiple asymmetries may overestimate exchange rate exposure.

Knowing their asymmetric profile, firms can appropriately choose their hedging instruments. A non negligible part of our sample displays an asymmetric exposure, but the majority is symmetrically exposed.

Thus, Forwards and Futures may be more appropriate for them. The government should then put more effort into upgrading these financial markets. Investors may also benefit from knowing the exposure profile of their targets.

If for example they decide to invest in the stocks of a Taiwanese exporter with market share objective, they will have to know that the stock returns will positively respond to an appreciation of the domestic currency.

The data we collected (about the firms) are mostly the stock prices, so our results can be compared to the ones described in the earlier literature. If we still could make significant conclusions, our set of data and models can not answer to questions related to the level and sign of exposure.

As mentioned before, industry is not an explanatory variable, at least for Taiwan. But other factors may provide explanations this research could not. So we should from now, focus on a better understanding of the Taiwanese exposure, by using a different set of data and models.

Firstly, did the two financial crises have an impact on the level of Taiwanese exposure?

Secondly, the largest part of the transactions in the Taiwan Stock Exchange is made by the Electronic sector. We should verify if the exposure behavior of these firms is similar to the ones we obtained with this research, which did not focus on any industry in particular.

Thirdly, we should use the available financial data (balance sheet, income statement...) to investigate in details the determinants of the Taiwanese exposure, in view to answer some questions as: why a so high percentage of companies are exposed and why they only benefit from an appreciation of the domestic currency.

References

- Adler M., & Dumas B. (1984). Exposure to Currency risk: Definition and Measurement. *Financial Management*, 13, 41-50. <http://dx.doi.org/10.2307/3665446>
- Allayannis G., & Ofek E., (2001). Exchange Rate Exposure, Hedging and the Use of Foreign Currency Derivatives. *Journal of International Money and Finance*, 20, 273-296. [http://dx.doi.org/10.1016/S0261-5606\(00\)00050-4](http://dx.doi.org/10.1016/S0261-5606(00)00050-4)
- Amihud, Y. (1994). Evidence on Exchange Rates and Valuation of Equity Shares, in Y. Amihud and R.M. Levich, Eds. *Exchange Rates and Corporate Performance*. Irwin Professional Publishing, New York, 49-59
- Andren, N. (2001). Is macroeconomic exposure asymmetric? Department of Business Administration, Lund University, Working Paper
- Atindehou, R. B., & Gueyie, J. P. (2001). Canadian chartered banks' stock returns and exchange rate risk. *Management Decision*, 39, 285-295. <http://dx.doi.org/10.1108/EUM0000000005463>
- Baldwin, R. (1988). Hysteresis in import prices: the Beachheld effect. *American Economic Review*, 78, 773-785.
- Bartram S. M. (2004). Linear and Nonlinear foreign Exchange Rate exposure of German Non Financial Corporation. *Journal of International Money and Finance*, 23, 673-699.
- Bartram, S. M., & Bodnar, G.M. (2007). The exchange rate exposure puzzle. *Managerial Finance*, 33(9), 642-666.
- Bartram, S. M., Brown, G. W., & Minton B. A. (2010). Resolving the exposure puzzle: The many facets of exchange rate exposure. *Journal of Financial Economics*, 95, 148-173.
- Bodnar G. M., Dumas B., & Marston R. C. (2002). Pass-Trough and Exposure. *Journal of Finance*, 57(1), 199-231. <http://dx.doi.org/10.1111/1540-6261.00420>

- Bodnar G. M., & Gentry W. M. (1993). Exchange Rate Exposure and Industry Characteristics: Evidence from Canada, Japan and the USA. *Journal of International Money and Finance*, 12, 29-45. [http://dx.doi.org/10.1016/0261-5606\(93\)90008-Y](http://dx.doi.org/10.1016/0261-5606(93)90008-Y)
- Bodnar G. M., & Wong M. H. F. (2000). Estimating Exchange Rate Exposures: Some “Weighty” Issues. *NBER Working Paper Series*. Working Paper No. 7497
- Carter D. A., Pantzalis C., & Simkins B. J. (2005). Asymmetric exposure to foreign-exchange risk: financial and real option hedges implemented by U.S. multinational corporations. Oklahoma State University, Stillwater, Working Paper
- Chen J., Naylor M., & Lu, X. (2004). Some Insights into the Foreign Exchange Pricing Puzzle: Evidence from a Small Open Economy. *Pacific-Basin Finance Journal*, 12, 41-64. [http://dx.doi.org/10.1016/S0927-538X\(03\)00020-9](http://dx.doi.org/10.1016/S0927-538X(03)00020-9)
- Dixit, A. (1989). Entry and exit decisions under uncertainty. *Journal of Political Economy*, 97, 620-638.
- Dominguez K. M. E., & Tesar L. L. (2001). A Re-Examination of Exchange Rate Exposure. *NBER Working Paper Series*. Working Paper No. 8128.
- Dominguez, K., & Tesar, L. (2006). Exchange rate exposure. *Journal of International Economics*, 68, 188-218. <http://dx.doi.org/10.1016/j.jinteco.2005.01.002>
- Friberg R., & Nydahl S. (1999). Openness and the Exchange Rate Exposure of National Stock Markets. *International Journal of Finance and Economics*, 4(1), 55-62. [http://dx.doi.org/10.1002/\(SICI\)1099-1158\(199901\)4:1<55::AID-IJFE90>3.0.CO;2-1](http://dx.doi.org/10.1002/(SICI)1099-1158(199901)4:1<55::AID-IJFE90>3.0.CO;2-1)
- Froot, K. A., & Klemperer P. D. (1989). Exchange rate pass-through when market share matters. *Economic Review*, 79, 637-654.
- Giurda, F., & Tzavalia, E. (2004). Is the currency risk priced in equity markets? *Department of Economics, Queen Mary University of London*. Working Paper 511
- Griffin J., & Stulz R. (2001). International Competition and Exchange Rate Shocks: A Cross-Country Industry Analysis of Stock Returns. *Review of Financial Studies*, spring, 14(1), 215-241. <http://dx.doi.org/10.1093/rfs/14.1.215>
- Heckman, C. (1985). A Financial model of foreign exchange exposure. *Journal of International Business Studies*, Summer, 83-99. <http://dx.doi.org/10.1057/palgrave.jibs.8490452>
- Hung, J. (1992). Assessing the Exchange Rate’s Impact on U.S. Manufacturing Profits. *Quarterly Review*, Federal Reserve Bank of New York, Quarterly 4, 44-63
- Jorion P. (1990). The Exchange-Rate Exposure of U.S. Multinationals. *Journal of Business*, 63(3), 331-345. <http://dx.doi.org/10.1086/296510>
- Jorion P. (1991). The Pricing of Exchange Rate Risk in the Stock Market. *Journal of Financial and Quantitative Analysis*, 26(3), 363-376. <http://dx.doi.org/10.2307/2331212>
- Kanas, A. (2000). Volatility spillovers between stock returns and exchange rate changes. *Journal of Business and Finance and Accounting*, 27(3-4), 447-467. <http://dx.doi.org/10.1111/1468-5957.00320>
- Khoo, A. (1994). Estimation of Foreign Exchange Exposure: an Application to Mining Companies in Australia. *Journal of International Money and Finance*, 13, 342-363. [http://dx.doi.org/10.1016/0261-5606\(94\)90032-9](http://dx.doi.org/10.1016/0261-5606(94)90032-9)
- Knetter, M. M. (1994). Is export price adjustment asymmetric: evaluating market share and marketing bottlenecks hypotheses. *Journal of International Money and Finance*, 13, 55-70. [http://dx.doi.org/10.1016/0261-5606\(94\)90024-8](http://dx.doi.org/10.1016/0261-5606(94)90024-8)
- Koutmos G., & Martin A. D. (2003). Asymmetric Exchange Rate Exposure: Theory and Evidence. *Journal of International Money and Finance*, 22, 365-383. [http://dx.doi.org/10.1016/S0261-5606\(03\)00012-3](http://dx.doi.org/10.1016/S0261-5606(03)00012-3)
- Maghrebi, N., Holms, M. J., & Pentecost, E. J. (2006). Are there asymmetries in the relationship between exchange rate fluctuations and stock market volatility in Pacific Basin Countries? *Review of Pacific Basin Financial Markets and Policies*, 9(2), 229-256. <http://dx.doi.org/10.1142/S0219091506000719>
- Mark, N.C. (1990). Real and nominal exchange rates in the long run: an empirical investigation. *Journal of International Economics*, 28, 115-136. [http://dx.doi.org/10.1016/0022-1996\(90\)90052-N](http://dx.doi.org/10.1016/0022-1996(90)90052-N)

- Marston, R. (1990). Pricing to market in Japanese manufacturing. *Journal of International Economics*, 29, 217-236. [http://dx.doi.org/10.1016/0022-1996\(90\)90031-G](http://dx.doi.org/10.1016/0022-1996(90)90031-G)
- Miller K. D., & Reuer J. J. (1998). Asymmetric Corporate Exposures to Foreign Exchange Rate Changes. *Strategic Management Journal*, 19(12), 1183-1191. [http://dx.doi.org/10.1002/\(SICI\)1097-0266\(1998120\)19:12<1183::AID-SMJ1>3.3.CO;2-J](http://dx.doi.org/10.1002/(SICI)1097-0266(1998120)19:12<1183::AID-SMJ1>3.3.CO;2-J)
- Moran, P. (2005). Foreign Exchange Exposure of Chilean Firms, Facultad de Ciencias Empresariales, Universidad de Talca, Chile, Working Paper.
- Muller, A., & Verschoor W. F. C. (2006). Asymmetric foreign exchange risk exposure: evidence from U.S. multinational firms. *Journal of Empirical Finance*, 13, 495-518. <http://dx.doi.org/10.1016/j.jempfin.2006.01.003>
- Muller, A., & Verschoor W. F. C. (2007). Asian foreign exchange risk exposure. *Journal of the Japanese and International Economies*, 21, 16-37.
- Rosenberg, M. (2003). *Exchange Rate Determination*. McGraw Hill.
- Rossi Jr., J. L. (2008). Corporate foreign vulnerability, financial policies and the exchange rate regime: evidence from Brazil, Insper, IBMEC Sao Paulo, Working Paper.
- Rossi Jr., J.L. (2009). Nonlinear foreign exchange exposure: evidence from Brazilian companies, Insper, IBMEC Sao Paulo, Working Paper 189/2009
- Tai, C. (2005). Asymmetric currency exposure of U.S. bank stock returns. *Journal of Multinational Financial Management*, 15, 455-472.
- Williamson R. (2001). Exchange Rate Exposure and Competition: Evidence from the Automotive Industry. *Journal of financial Economics*, 59, 441-475.

An Assessment of the Trade Effects of the East African Community Customs Union on Member Countries

Steven Buigut

Correspondence: Steven Buigut, School of Business Administration, American University in Dubai, P.O. Box 28282, Dubai, UAE. Tel: 971-4-318-3117. E-mail: sbuigut@aud.edu

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Abstract

This study uses a modified gravity model to estimate the trade effects of the recently implemented East African Community (EAC) customs union on individual member countries. The analysis is based on bilateral import data for seventy potential trading partners for the EAC bloc. It covers the period 1996 to 2009. The results suggest the customs union has generated disproportionate impacts on intra bloc exports and imports for individual member countries. Kenya, Uganda and Rwanda have seen a significant increase in their intra EAC exports, while Kenya and Tanzania have seen a significant increase in their intra EAC imports. Significant changes are seen in Kenyan exports and Tanzanian imports up to three years prior to the actual implementation.

Keywords: trade effect, customs union, gravity model, East African Community

JEL Classification Code: F13, F15

1. Introduction

The EAC integration effort started with the signing of the “Agreement for the Establishment of the Permanent Tripartite Commission for East African Co-operation” in 1993 by Kenya, Uganda and Tanzania. This effort by the three East African countries revived a regional bloc that had failed earlier in 1977. The East African Community (EAC) has since then advanced its integration agenda rapidly. The three members (Kenya, Uganda, and Tanzania) signed a customs union treaty in 2004. This was implemented over a transitional period of five years. The asymmetric internal tariff elimination structure agreed upon granted Ugandan and Tanzanian goods into Kenya immediate duty free status. Goods flowing between Uganda and Tanzania and some Kenyan goods (category A) into Uganda and Tanzania also achieved duty free status immediately. However the internal tariff on some Kenyan goods (category B) to Uganda and Tanzania was reduced gradually from 10% to 0% over the five year period. Rwanda and Burundi joined the EAC in 2007 bringing the EAC membership to five. The EAC members have signed a common market protocol in 2009. The operationalization of the common market started in 2010. The EAC started negotiating a protocol to establish the East African Monetary Union (EAMU) in January 2011.

As the EAC integration deepens, it is a pertinent question for policy makers to ask what effect, if any, this has had on the region’s trade flows. To show such effects one needs to establish a counterfactual of trade that would have occurred in the absence of the agreement (Clausing, 2001). The gravity model has been used frequently to predict the bilateral trade in the absence of any agreement with the effects of the trade agreements measured by a regional free trade agreement (FTA) dummy (Magee, 2008). A similar approach is frequently used to assess the effect of currency unions on trade (see for example Glick and Rose 2002; Rose and Van Wincoop, 2001). Care must be exercised in the use of the gravity model with dummies capturing the treatment effect. It has been established that countries select endogenously into Free Trade Agreements (FTAs) for a host of reasons that may include historical, cultural, and other unobservable reasons that are likely correlated to level of trade. For example, Magee (2003) shows empirically that higher bilateral trade flows increase the likelihood that countries will form FTAs.

Bair and Bergstrand (2007) also provide empirical support for the claim that the typically used cross section FTA coefficients are biased. The source of potential bias is omitted variables. In their study of the determinants of FTAs, they find strong evidence that countries that have FTAs tend to share economic characteristics that should enhance net economic welfare gains from an FTA, such as the size and similarity of their GDPs, closeness to each other, and the remoteness from the rest of the world. These variables also tend to explain a large amount of trade flows between countries. Hence FTA dummies are not exogenous random variables. To overcome these problems, a

number of studies (e.g. Magee, 2008; Carrere, 2006; Egger and Pfaffermayr, 2003) suggest including country pair fixed effects to control for historical and time-constant factors that affect the level of trade between partner countries. Several studies suggest preference of fixed effects model over random effects model (e.g. Egger, 2000).

The majority of existing ex post studies estimate average treatment effect of an FTA for all its members. This presumes the effect of the FTA is similar for all the members. However it is not always true that membership in an FTA would necessarily produce the same effect on trade flows for all the member countries. It is reasonable to expect that in cases where countries have some structural differences, a larger than proportionate effect may accrue to more competitive members. Such differences may be large enough to warrant specific country analysis. This is a very relevant issue for the EAC given one of the main concerns that led to the demise of the original EAC in 1977, in addition to ideological and political differences at the time, was the concern that some members were benefiting more than others (Goldstein and Ndungu, 2001). Some of these problems still exist today and regional integration should be pursued without losing sight of the problems that led to the collapse of the earlier EAC (ibid). However after the revival of the EAC there have been no corresponding empirical studies to assess the specific effects on trade among the member states arising from the EAC integration process. This study attempts to fill this gap. The main objective of this study therefore is to estimate the effects of the customs union agreement on each of the EAC members' trade flows. Some researchers (e.g. Frankel, 1997) argue there is a tendency for trade flows to be affected in advance of implementation in anticipation of the actual implementation. Another objective of the present study is to investigate the time frame of such effects, if this happened on implementation or before. The customs union was signed in 2004, and gradually implemented since 2005. The empirical estimation is carried out using a gravity model that controls for country and time effects.

There are currently very few studies that focus on the EAC integration process. One study that attempts to capture the effect of the EAC integration effort on specific countries is Darku (2009), who studies the effect of EU and EAC on Tanzania for the period 1980 – 2004. He finds moderate trade creation effects on Tanzania's bilateral trade. Thus this study does not capture the EAC's customs union implementation period which happened from 2005, but considers only the earlier integration effort preceding the customs union. It also analyzes one EAC member. The present study estimates the effect on each of the five members of the EAC. Musila (2005) also uses a gravity model to study the Common Market for Eastern and Southern Africa (COMESA), Economic Community of Central African States (ECCAS) and Economic Community of West African States (ECOWAS) for the period 1991-98. His findings indicate some trade creation effects from COMESA and ECOWAS but not ECCAS. Aside from the difference in the period of analysis, this study does not specifically analyze the EAC. Likewise Sawkut (2006) uses a standard gravity model augmented with three dummy variables to capture the effects of COMESA. The time period of the analysis is from 1980-2001. So it mostly captures the preferential trade area (PTA) for Eastern and Southern Africa, the forerunner of COMESA and COMESA before FTA.

There are currently no empirical studies that have focused on estimating specific trade effects of the custom union on each of the five EAC members. This study is the first comprehensive analysis of the effects of the EAC customs union on the trade flows for each individual member country. The rest of the paper is organized as follows. Section 2 presents the data used, while Section 3 describes the empirical models. In Section 4 the results are discussed and concluding remarks provided in Section 5.

2. Data Sources

Bilateral import data was obtained from the International Monetary Fund's (IMF's) Direction of Trade Statistics (DOTs) CD in US dollars (January 2011). This is converted to real imports using US consumer price index. The period considered is for the years 1996 -2009 for a total of seventy potential trading partners for the EAC countries. The EAC partner countries included cover Africa, Western Europe, Eastern Europe, North and South America (see Appendix I for the list of the countries). With 70 trading partners and 14 years there are 980 bilateral data points for each EAC country analyzed.

The key control variables are the Real GDP sourced from the World Bank's World Development Indicators CD (2011). The population figures are obtained from the IMF's International Financial Statistics (IFS) CD (August 2011). The real exchange rates are computed from nominal exchange rate and consumer price index sourced from the IFS CD. These are given as country *i*'s currency (importer country) per country *j*'s (exporter country) currency, that is importer country currency per unit of exporter country currency. Other variables that may influence trade flows such as the distances between the trade partners, and similarity in languages, are sourced from the Institute for Research on the International Economy (CEPII) data base (dist_cepil.xls file).

3. Empirical Model

The gravity model has become the favored tool to assess ex-post trade creation and trade diversion effects of

regional trade agreements. A typical gravity model often used is of the form:

$$\ln[M_{ijt}] = \alpha_0 + \beta_1 \ln[D_{ij}] + \beta_2 \ln[Y_{it}] + \beta_3 \ln[Y_{jt}] + \beta_4 \ln[RER_{ijt}] + \beta_5 RTA_int ra_{ijt} + \beta_6 RTA_imports_{ijt} + \alpha X_{ijt} + \varepsilon_{ijt} \quad (1)$$

where M_{ij} is the imports of country i from country j . D_{ij} is the distance between the two countries, Y_{it} and Y_{jt} , the real GDPs of countries i and j , RER is the real exchange. $RTA_int ra_{ijt}$ is a dummy variable which is = 1 if both partners i and j belong to the FTA, zero otherwise. This captures intra-bloc trade. $RTA_imports_{ijt}$ is = 1 if importing country i belongs to the customs union and exporting country j to rest of world, zero otherwise. This captures the effect on bloc imports from the rest of world. X_{ijt} is a vector of other characteristics, e.g. use of common language, colonial ties, contiguity etc., that may have an effect on bilateral trade.

However, a long list of studies (Carrère, 2006; Bair and Bergstrand, 2007; Egger and Pfaffermayr, 2003; Magee, 2008) have suggest estimates from this formulation may be biased. There is strong evidence that countries that have FTAs tend to share economic characteristics that should enhance net economic welfare gains from an FTA. Hence trade dummies are not exogenous. To deal with this problem, models that include country pair fixed effects have been suggested (see Magee 2008; Carrere, 2008).

$$\ln[M_{ijt}] = \alpha_{ij} + \alpha_t + \beta_1 \ln[D_{ij}] + \beta_2 \ln[Y_{it}] + \beta_3 \ln[Y_{jt}] + \beta_4 \ln[RER_{ijt}] + \beta_5 RTA_int ra_{ijt} + \beta_6 RTA_imports_{ijt} + \alpha X_{ijt} + \varepsilon_{ijt} \quad (2)$$

where α_{ij} are the specific effects associated with each bilateral trade flow such that $\alpha_{ij} \neq \alpha_{ji}$, α_t are the specific effects associated with time effects. The rest of the variables are as discussed earlier under Equation 1. The bilateral effects account for any time invariant geographical, historical, political and other bilateral influences which lead to deviations from a country pair's normal propensity to trade (Egger and Pfaffermayr, 2003; Magee, 2008).

The aim of the present study is to identify the effects of a regional trade agreement, the EAC customs union, on trade flows for individual member countries. To achieve this objective, the study uses a modified version of the gravity model in Equation 2. The first approach analyzes the effect of the EAC customs union on exports for each of EAC member countries. In Equation 3 only importer country fixed effects is included while in Equation 4 importer country and time fixed effects are included.

$$\ln[M_{ijt}] = \alpha_0 + \alpha_i + \beta_1 \ln[D_{ij}] + \beta_2 \ln[Y_{it}] + \beta_3 \ln[Y_{jt}] + \beta_4 RER_{ijt} + \beta_5 CUA_int ra_{ijt} + \alpha X_{ijt} + \varepsilon_{ijt} \quad (3)$$

where M_{ij} are the imports of country i from country j . α_0 is a constant, α_i are the importer country effects. Note that since the exporter, j , is restricted to one EAC member at a time, country pair fixed effects, α_{ij} , basically reduces to α_i . The ex-post assessment of the trade agreement, the customs union agreement (CUA) in this case, on the volume of trade will include a dummy variable, CUA_intra which is = 1 if both partners i and exporter country j belong to the EAC customs union, zero otherwise. This captures how exports to EAC members have changed for the specific EAC member country, j , in question. The dummy variable, CUA_intra , used to capture the customs union is constructed based on the date of implementation (the year 2005) for Kenya, Uganda and Tanzania and the date of entry (the year 2007) for Burundi and Rwanda. A positive and significant coefficient means intra-bloc exports for the member country have increased.

In Equation 4 the time fixed effects are included.

$$\ln[M_{ijt}] = \alpha_0 + \alpha_i + \alpha_t + \beta_1 \ln[D_{ij}] + \beta_2 \ln[Y_{it}] + \beta_3 \ln[Y_{jt}] + \beta_4 RER_{ijt} + \beta_5 CUA_int ra_{ijt} + \alpha X_{ijt} + \varepsilon_{ijt} \quad (4)$$

where α_t is the time fixed effects, everything else same as in Equation 3. $\alpha_i + \alpha_t$ in Equation 4 can actually be considered as similar to $\alpha_{ij} + \alpha_t$ in (2) with j restricted to one country at a time. Note that since the analysis uses only exports by one country to 70 trading partners it is only possible to capture exports within the block or outside the bloc, not both. The total change in exports for a given country for time t can be split into two parts; change in intra EAC exports and change in exports outside the EAC. Thus both cannot be captured at the same time. Thus CUA_intra captures intra EAC exports in this specification.

In the second approach the effects of the customs union on the imports of the EAC member countries are analyzed. In Equation 5 exporter country fixed effects is included while in (6) both exporter country and time fixed effects are included.

$$\ln[M_{ijt}] = \alpha_0 + \alpha_j + \beta_1 \ln[D_{ij}] + \beta_2 \ln[Y_{it}] + \beta_3 \ln[Y_{jt}] + \beta_4 RER_{ijt} + \beta_5 CUA_intra_{ijt} + \alpha X_{ijt} + \varepsilon_{ijt} \quad (5)$$

α_j are the exporter country effects. Note that since the importer country, i , is constrained to one EAC member at a time, importer country effect, α_i , is constant. Thus the country pair fixed effect α_{ij} actually reduces to exporter country effects, α_j , since i is one country.

The ex-post assessment of the customs union agreement (CUA), on the volume of trade uses a dummy variable, CUA_intra which is = 1 if both importer country i and partners j belong to the EAC customs union, zero otherwise. This captures intra-bloc trade, how imports from EAC members have changed for the specific EAC member country, i , in question. A positive and significant coefficient means intra-bloc imports for the member country have increased.

In Equation 6 time fixed effects are included.

$$\ln[M_{ijt}] = \alpha_0 + \alpha_j + \alpha_t + \beta_1 \ln[D_{ij}] + \beta_2 \ln[Y_{it}] + \beta_3 \ln[Y_{jt}] + \beta_4 RER_{ijt} + \beta_5 CUA_intra_{ijt} + \alpha X_{ijt} + \varepsilon_{ijt} \quad (6)$$

$\alpha_j + \alpha_t$ is actually similar to using $\alpha_{ij} + \alpha_t$ with i constrained to one member country at a time. In that case α_{ij} , reduces to α_j . Note that since the analysis uses only imports by one country from 70 trading partners it is only possible to capture imports from within the block or from outside the bloc, not both. The total change in imports for a given country for time t can be split into two parts; change in intra EAC imports and change in imports from outside the EAC. Thus both cannot be captured at the same time. Thus CUA_intra captures intra EAC imports in this specification.

4. Results

This section discusses the estimation results. Figure 1 shows the real total value (in US \$) of intra-EAC imports over time for each of the five EAC member countries (Kenya, Tanzania, Uganda, Burundi and Rwanda). The intra-bloc imports have largely been increasing from 2000/2001. Uganda has generally imported more from the EAC than the other countries, though Tanzania's imports from the regional bloc have caught up over the last few years. However the growth of Uganda's imports has been low and erratic. Tanzania's imports have increased substantially from around \$100 million in 2002 to over \$400 million in 2007. This sharp growth predates the actual customs union implementation by a few years. The same case applies to Rwanda, whose imports have increased from around \$60 million to over \$300 million. This growth also predates the customs union implementation. Note that Rwanda officially joined the union in 2007. Kenya has traditionally imported little from the EAC members. However her imports have increased sharply from around \$55 million in 2004 to \$300 million by 2009. Unlike Tanzania and Rwanda this increase seems to come immediately with the implementation of the customs union. Burundi's imports have increased but only marginally from 2001. It does not show any changes upon entry in 2007, but rather seems to be leveling off.

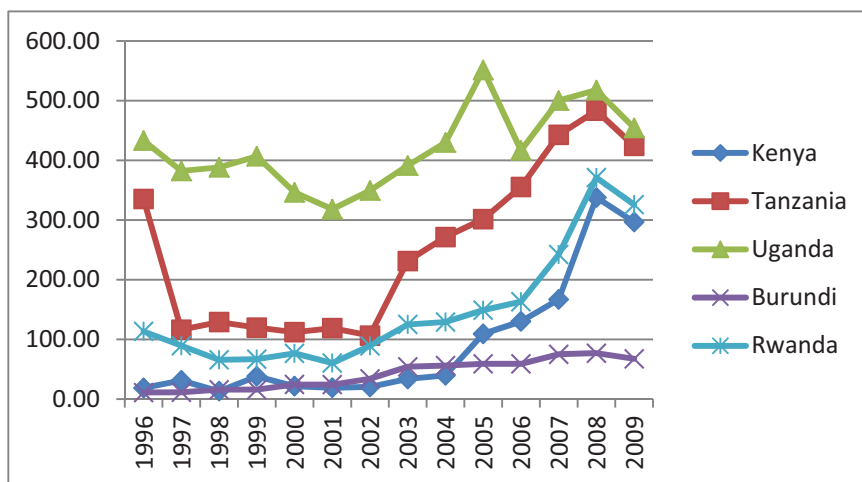


Figure 1. Volume of Intra EAC Imports by Member Countries (Millions US \$), 1996-2009

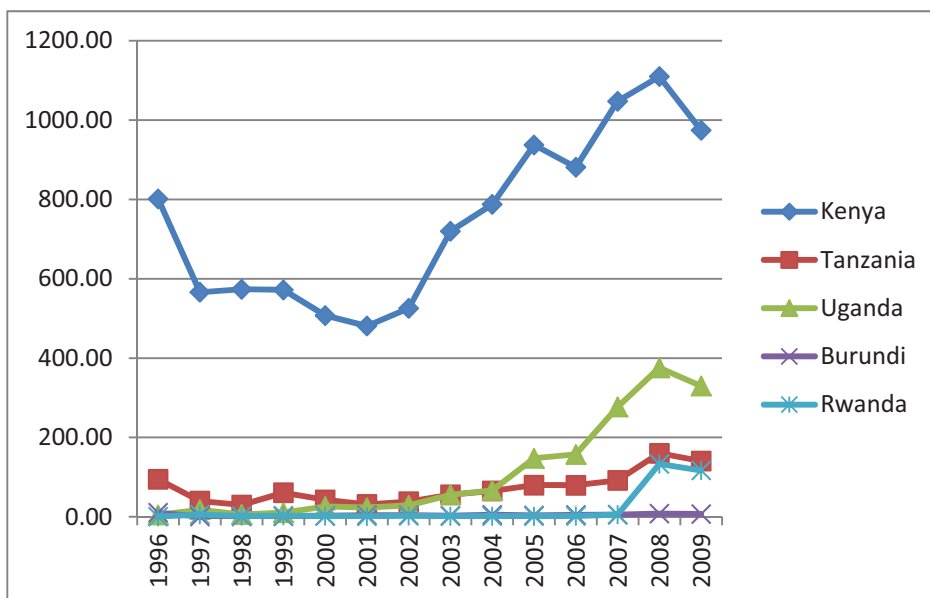


Figure 2. Volume of Intra EAC Exports by Member Countries (Millions US \$), 1996-2009

Figure 2 shows the intra-EAC exports over time for each of the EAC member countries. The figure suggests there has been a sharp growth of Ugandan exports to other EAC member countries, from a low of around \$65 million in 2004 to around \$330 million by 2009. Kenya’s exports have increased but the increase predates the implementation of the customs union. Thus Kenya’s export trends seem to suggest some anticipation effect. Tanzania’s exports show only a marginal increase. There is a slight pump in exports from Rwanda to the EAC bloc upon entry in 2007. Burundi’s exports show no sign of increasing over the period of analysis.

Regression results are discussed next. The first EAC member country considered is Kenya in Table 1. Table 1 shows the estimation results of customs union effect on Kenya’s intra-EAC trade flow. In model 1, the dependent variable is the natural log of real imports (ln real imports) from Kenya (i.e. exports by Kenya), while it is the exports from Kenya in model 2.

Table 1. Effect of the EAC Customs Union on Kenya's Intra EAC Trade

	Model 1 ^A (Equation 3)	Model 1 ^B (Equation 4)	Model 2 ^A (Equation 5)	Model 2 ^B (Equation 6)
Dependent variable:	ln(imports)	ln(imports)	ln(exports)	ln(exports)
Explanatory variables	Coefficient	Coefficient	Coefficient	Coefficient
Contiguity	1.509 (0.64)	1.507 (0.64)	5.407 (*1.87)	5.353 (*1.85)
Common language – ethnology	1.561 (0.46)	1.481 (0.64)	2.367 (**2.22)	2.385 (**2.22)
Distance	1.092 (**2.35)	-0.990 (**2.12)	0.214 (0.42)	0.196 (0.38)
Population – importer	0.471 (0.76)	0.477 (0.77)	-2.024 (-1.25)	--
Population – exporter	-1.050 (-0.89)	--	-0.932 (-1.14)	-0.924 (-1.13)
Real GDP – importer	-0.084 (-0.26)	-0.159 (-0.49)	0.817 (0.70)	--
Real GDP – exporter	0.207 (0.25)	--	0.648 (1.39)	0.641 (1.37)
Real exchange rate	0.020 (0.50)	0.028 (0.69)	0.074 (1.33)	0.080 (1.42)
CUA_intra	-0.077 (-0.30)	-0.085 (-0.34)	0.712 (*1.95)	0.738 (**2.01)
Constant	5.130 (0.31)	7.347 (1.20)	-35.077 (-1.61)	-22.670 (***2.99)

Notes: Model 1 estimates effect on Kenya's exports to the EAC countries (i.e. imports from Kenya); Model 2 estimates effect on Kenya's imports from EAC countries (i.e. exports to Kenya). ^{A)} Includes country fixed effects only; ^{B)} includes both country and time fixed effects. The t-statistics are provided in brackets; (***), (**), (*) indicates the coefficients are statistically significant at the 1%, 5%, or 10% level. (--) indicates variable gets dropped. The analysis uses only exports (imports) by one country to (from) 70 trading partners with time fixed effects controlling for change in this variable in time t which means this variable cannot be estimated.

Column one shows the results from estimating Equation 3 in the text. This captures Kenya's exports to EAC member countries when only country fixed effects are included. Column two shows estimation results from Equation 4. This captures Kenya's exports to EAC countries when both country and time fixed effects are included. The key variable of interest is CUA-intra, which is a dummy variable to capture the effect of the customs union as explained in section 3. Both results (columns one and two) suggest the customs union implementation has not had a significant contemporaneous effect on Kenya's intra-EAC exports. This could be mainly due to the higher share of Kenyan exports in the EAC. However, note that a large share of the increase occurs prior to the customs union implementation in 2005 – probably in anticipation of the event. This anticipatory effect is not captured in the regression estimation. This effect is shown in results given in Table 6. Column three shows the results from estimating Equation 5 in the text. This captures Kenya's imports from the EAC member countries when only country fixed effects are included. Column four shows estimation results from Equation 6 which captures Kenya's imports from the EAC countries when both country and time fixed effects are included. Again looking at the key variable of interest, CUA-intra, both results (columns three and four) suggest the customs union has had a significant positive effect on Kenya's intra-bloc imports.

Both coefficients are positive (0.712, and 0.738) and significant at 10% and 5% level respectively. Hence the customs union effect is given by $[100*(e^{0.712}-1) = 103.8\%]$. This suggests the customs raised intra-bloc trade level by 104 percent (roughly double). Figure 1 suggests a five-fold increase from \$60 million to over \$300 million, which lends support to the results shown in Table 1. For all the results that follow this specification distinction used in Table 1 is maintained: Model 1A (column 1) and 1B (column 2) analyze exports. Model 2A (column 3) and 2B (column 4) analyze imports. Specification A includes country fixed effects, while B includes both country and time fixed effects.

Table 2 shows the estimation results of the customs union effect on Tanzania's intra-EAC trade. The dependent variable is the natural log of real imports (ln real imports), and column one through four indicate the specifications as discussed for Table 1. Columns one and two estimation results suggest the customs union has not had a significant effect on Tanzania's exports to the EAC. Columns three and four results also suggest the customs union has not had any significant effect on Tanzania's imports from the EAC countries. This is contrary to what is suggested by Figure 1 that indicates a sharp increase of nearly four-fold in Tanzania's imports from 2002 to 2009. However, note that a large share of the increase occurs prior to the customs union implementation in 2005 – probably in anticipation of the event. This anticipatory effect is not captured in the regression estimation. This effect is shown in results provided in Table 6.

Table 3 shows the effect of the customs union on Uganda's intra-EAC trade flows. Again looking at the key variable of interest, CUA-intra, both results from column one and two suggest the customs union has had a significant positive effect on Uganda's exports to the EAC. The coefficients are large, positive (0.964, and 0.953) and significant at 5% level. Hence the intra-bloc effect is given by $[100*(e^{0.953}-1) = 159\%]$. This suggests an intra-bloc trade level of 159% above predicted. Figure 2 shows a six-fold increase from \$65 million to over \$330 million, which supports the findings in Table 3. Column three and four estimation results suggest the customs union has not had a significant effect on Uganda's the intra-bloc imports.

Table 2. Effect of the EAC Customs Union on Tanzania's Intra EAC Trade

	Model 1 ^A (Equation 3)	Model 1 ^B (Equation 4)	Model 2 ^A (Equation 5)	Model 2 ^B (Equation 6)
Dependent variable:	ln(imports)	ln(imports)	ln(exports)	ln(exports)
Explanatory variables	Coefficient	Coefficient	Coefficient	Coefficient
Contiguity	-4.720 (***-6.52)	-4.701 (***-6.47)	-1.935 (-1.04)	-2.049 (-1.09)
Common language – ethnology	0.168 (0.08)	--	4.795 (***3.05)	4.845 (***3.07)
Distance	0.170 (0.34)	0.185 (0.37)	0.960 (1.06)	0.998 (1.10)
Population – importer	-0.287 (-0.36)	-0.288 (-0.36)	-4.337 (-0.93)	--
Population – exporter	0.404 (0.09)	--	0.631 (0.79)	0.498 (0.62)
Real GDP – importer	-0.209 (-0.48)	-0.202 (-0.46)	1.727 (0.86)	--
Real GDP – exporter	0.038 (0.02)	--	-0.793 (*-1.79)	-0.655 (-1.46)
Real exchange rate	0.090 (*1.74)	0.082 (1.56)	-0.006 (-0.11)	-0.011 (-0.20)
CUA_intra	-0.246 (-0.75)	-0.216 (-0.66)	0.221 (0.64)	0.281 (0.81)
Constant	0.918 (0.03)	2.715 (0.20)	-16.651 (-0.56)	5.077 (0.54)

Notes: Model 1 estimates effect on Tanzania's exports to the EAC countries (i.e. imports from Tanzania); Model 2 estimates effect on Tanzania's imports from EAC countries (i.e. exports to Tanzania). ^A Includes country fixed effects only; ^B includes both country and time fixed effects. The t-statistics are provided in brackets; (***), (**), (*) indicates the coefficients are statistically significant at the 1%, 5%, or 10% level. (--) indicates variable dropped. The analysis uses only exports (imports) by one country to (from) 70 trading partners with time fixed effects controlling for change in this variable in time t which means this variable cannot be estimated.

Table 3. Effect of the EAC Customs Union on Uganda's Intra EAC Trade

	Model 1 ^A (Equation 3)	Model 1 ^B (Equation 4)	Model 2 ^A (Equation 5)	Model 2 ^B (Equation 6)
Dependent variable:	ln(imports)	ln(imports)	ln(exports)	ln(exports)
Explanatory variables	Coefficient	Coefficient	Coefficient	Coefficient
Contiguity	-6.930 (***-3.02)	-6.838 (***-2.96)	11.838 (***9.36)	11.784 (***9.29)
Common language – ethnology	6.267 (***3.75)	6.028 (***3.69)	-11.182 (***-4.98)	-11.067 (***-4.91)
Distance	1.411 (1.24)	1.379 (1.20)	2.922 (***4.13)	2.914 (***4.11)
Population – importer	-1.843 (* -1.78)	-1.826 (* -1.75)	0.323 (0.09)	--
Population – exporter	-0.904 (-0.22)	--	-2.531 (***-2.81)	-2.519 (***-2.78)
Real GDP – importer	0.500 (0.94)	0.524 (0.97)	-0.118 (-0.07)	--
Real GDP – exporter	-0.005 (-0.00)	--	-0.200 (-0.40)	-0.187 (-0.37)
Real exchange rate	-0.002 (-0.04)	0.003 (0.05)	-0.022 (-0.36)	-0.021 (-0.35)
CUA_intra	0.964 (**2.34)	0.953 (**2.30)	0.053 (0.14)	0.052 (0.14)
Constant	-12.948 (-0.42)	-16.063 (-1.44)	-2.229 (-0.08)	-4.132 (-0.36)

Notes: Model 1 estimates effect on Uganda's exports to the EAC countries (i.e. Imports from Uganda); Model 2 estimates effect on Uganda's imports from EAC countries (i.e. exports to Uganda). ^{A)} Includes country fixed effects only; ^{B)} includes both country and time fixed effects. The t-statistics are provided in brackets; (***), (**), (*) indicates the coefficients are statistically significant at the 1%, 5%, or 10% level. (--) indicates variable dropped. The analysis uses only exports (imports) by one country to (from) 70 trading partners with time fixed effects controlling for change in this variable in time t which means this variable cannot be estimated.

Table 4 shows the effect of the customs union on Burundi's intra-EAC trade flows. Columns one and two estimation results suggest the customs union has not had a significant effect on this country's intra EAC exports. Columns three and four results also show there is no significant effect from the customs union on Burundi's intra EAC imports. Similarly, no effect is detected for Rwanda from Table 5 results. But note that these countries officially joined EAC only in 2007.

Table 4. Effect of the EAC Customs Union on Burundi's Intra EAC Trade

	Model 1 ^A (Equation 3)	Model 1 ^B (Equation 4)	Model 2 ^A (Equation 5)	Model 2 ^B (Equation 6)
Dependent variable:	ln(imports)	ln(imports)	ln(exports)	ln(exports)
Explanatory variables	Coefficient	Coefficient	Coefficient	Coefficient
Contiguity	3.195 (1.03)	1.622 (0.29)	-9.951 (***-4.22)	-9.793 (***-4.05)
Common language –	0.486 (0.18)	0.752 (0.17)	4.894 (***2.74)	4.629 (**2.56)
Ethnology				
Distance	0.095 (0.05)	-0.610 (-0.31)	-2.125 (***-3.54)	-1.984 (***3.10)
Population – importer	0.889 (0.65)	0.944 (0.67)	-0.854 (-0.29)	--
Population – exporter	-1.053 (-0.29)	--	1.129 (0.93)	0.847 (0.67)
Real GDP – importer	-0.029 (-0.04)	-0.167 (-0.22)	-0.400 (-0.14)	--
Real GDP – exporter	0.442 (0.13)	--	-0.300 (-0.60)	-0.256 (-0.51)
Real exchange rate	0.133 (**1.98)	0.141 (*1.90)	-0.035 (-0.71)	-0.044 (-0.81)
CUA_intra	-0.096 (-0.21)	-0.084 (-0.17)	-0.077 (-0.20)	0.005 (0.01)
Constant	-16.023 (-0.25)	-0.987 (-0.05)	25.530 (0.49)	14.644 (1.60)

Notes: Model 1 estimates effect on Burundi's exports to the EAC countries (i.e. imports from Burundi); Model 2 estimates effect on Burundi's imports from EAC countries (i.e. exports to Burundi). ^{A)} Includes country fixed effects only; ^{B)} Includes both country and time fixed effects. The t-statistics are provided in brackets; (***), (**), (*) indicates the coefficients are statistically significant at the 1%, 5%, or 10% level. (--) indicates variable dropped. The analysis uses only exports (imports) by one country to (from) 70 trading partners with time fixed effects controlling for change in this variable in time t which means this variable cannot be estimated.

Table 5. Effect of the EAC Customs Union on Rwanda's Intra EAC Trade

	Model 1 ^A (Equation 3)	Model 1 ^B (Equation 4)	Model 2 ^A (Equation 5)	Model 2 ^B (Equation 6)
Dependent variable:	ln(imports)	ln(imports)	ln(exports)	ln(exports)
Explanatory variables	Coefficient	Coefficient	Coefficient	Coefficient
Contiguity	1.308 (0.54)	3.165 (1.27)	0.501 (0.17)	0.523 (0.17)
Common language – ethnology	4.419 (1.24)	-0.606 (-0.16)	1.811 (0.63)	1.630 (0.57)
Distance	1.041 (0.49)	-1.366 (-0.94)	-0.991 (-0.77)	-1.098 (-0.85)
Population – importer	-0.413 (-0.24)	-0.336 (-0.19)	-0.300 (-0.32)	--
Population – exporter	0.644 (0.49)	--	0.151 (0.13)	0.164 (0.14)
Real GDP – importer	0.124 (0.15)	0.127 (0.15)	-0.292 (-0.50)	--
Real GDP – exporter	-0.210 (-0.25)	--	-0.268 (-0.51)	-0.125 (-0.23)
Real exchange rate	-0.007 (-0.08)	-0.007 (-0.09)	0.022 (0.37)	0.041 (0.66)
CUA_intra	-0.047 (-0.09)	-0.105 (-0.20)	0.286 (0.70)	0.312 (0.75)
Constant	-15.050 (-0.92)	2.179 (0.10)	17.109 (*1.65)	7.928 (0.73)

Notes: Model 1 estimates effect on Rwanda's exports to the EAC countries (i.e. imports from Rwanda); Model 2 estimates effect on Rwanda's imports from EAC countries (i.e. exports to Rwanda). ^{A)} Includes country fixed effects only; ^{B)} Includes both country and time fixed effects. The t-statistics are provided in brackets; (***), (**), (*) indicates the coefficients are statistically significant at the 1%, 5%, or 10% level. (--) indicates variable dropped. The analysis uses only exports (imports) by one country to (from) 70 trading partners with time fixed effects controlling for change in this variable in time t which means this variable cannot be estimated.

The preceding analyses has attempted to capture the customs union effects using dummy variables constructed based on the date of implementation (the year 2005) for Kenya, Uganda and Tanzania and date of entry (year 2007) for Burundi and Rwanda. However, the customs union protocol was negotiated over a period of time before it was finally agreed upon. Therefore the agents in the market were aware of it and it would be reasonable to expect anticipatory market reaction in advance of the actual date of implementation.

To test for anticipation effects a dummy variable, *L3-CUA-intra*, is included in the analysis. This is similar to CUA-intra but lagged three years. This is used to capture the effect, if any, of the customs union from three years before implementation. The estimation results are shown in Table 6.

Table 6. Anticipatory Effects of the Customs union on Intra EAC Trade

Country	Exp. variable	(Imports from) Model 1 ^B	(Exports to) Model 2 ^B
Kenya	L ₃ -CUA-intra	0.618 (**2.19)	-0.395 (-0.98)
	CUA-intra	-0.481 (-1.55)	0.992 (**2.21)
Tanzania	L ₃ -CUA-intra	-0.198 (-0.53)	0.961 (**2.45)
	CUA-intra	-0.089 (-0.22)	-0.340 (-0.79)
Uganda	L ₃ -CUA-intra	-0.155 (-0.35)	0.309 (0.66)
	CUA-intra	1.049 (**2.11)	-0.153 (-0.31)
Burundi	L ₃ -CUA-intra	-0.188 (-0.39)	0.491 (1.28)
	CUA-intra	0.023 (0.24)	-0.259 (-0.57)
Rwanda	L ₃ -CUA-intra	1.171 (**2.16)	0.410 (0.97)
	CUA-intra	-0.827 (-1.32)	0.044 (0.09)

Note: Model 1^B estimates the effect of customs union on imports from stated country (i.e. country exports) with both country and time fixed effects included. Model 2^B estimates the effect on exports to the stated country (i.e. country imports) with both country and time fixed effects included. The t-statistics are provided in brackets. (***), (**), (*) indicates the coefficients are statistically significant at the 1%, 5%, or 10% level. *CUA-intra* is constructed using date of implementation (2005), while *L₃-CUA-intra* is *CUA-intra* lagged three years.

Only the coefficients and t-values on the lagged *L₃-CUA-intra* and contemporaneous *CUA-intra* customs union dummies for the estimation specification that includes both country and time fixed effects (1B and 2B) are provided. The results indicate a positive customs union effect on Kenya's exports before the actual implementation date and no significant impact on implementation. The coefficient on *L₃-CUA-intra* is 0.618 (85.5% increase) and significant but the coefficient on *CUA-intra* is not significant. This suggests there was some significant anticipation reaction by Kenyan exporters. But because the Kenyan exports to EAC countries did not all achieve duty free status immediately on implementation of the customs union, this may explain why the actual implementation had no further significant impact. These results tie better with Figure 2 which shows a sharp increase in Kenyan exports around 2002. Regarding imports, there is no anticipatory effect but the actual implementation had significant effect on Kenyan imports from the EAC. These results are similar to that obtained earlier in Table 1. Thus combining these results with that of Table 1, it seems to suggest that Kenyan exporters were able to and reacted earlier to the expected customs union, while the other EAC countries exporters were only able to tap the Kenya market after the actual removal of the tariffs upon implementation.

Turning to Tanzania, the results suggest there was no anticipatory effect on Tanzanian exports. The results are therefore similar to that already discussed in Table 2. However the results on imports differ from that in Table 2. The coefficient on *L₃-CUA-intra* is (0.961) positive and significant, suggesting an effect of about 161% increase predating the actual implementation date. These results are more consistent with Figure 1 which shows a sharp increase in Tanzania's imports from 2002. Uganda and Burundi's results are similar to earlier results in Table 3 and 4. Uganda's exports have only increased after the actual removal of internal tariffs on her goods. Rwanda's exports to the EAC also show some significant anticipatory increase of about 223%. However for both Rwanda and Burundi it is worth noting we have very few post entry data. Overall the results suggest some anticipatory effects on exports from Kenya and Rwanda, and imports into Tanzania. The full effect of the customs union is unlikely to have been captured by the anticipatory effects and the contemporaneous effects during the implementation period because some internal tariffs were only eliminated gradually over the transition period. Due to limited post transition period (2009) data we are not able to capture the evolution of these effects after complete implementation of tariff elimination in this analysis.

5. Conclusion

The study uses a variety of specifications to estimate the effects of the EAC custom union agreement on intra EAC trade. The time frame covers the years 1996 -2009 for seventy potential trading partners for the EAC countries from Africa, Western Europe, Eastern Europe, North and South America. The paper assesses how the implementation of the customs union over the transition period has affected the intra EAC trade levels for each of the five member countries. The majority of the existing studies estimate an average treatment effect across an FTA membership. However it is not necessarily true that membership in an FTA produces the same effect on each member country. Some countries may be better placed to achieve a higher than average increase from free trade. Such differences may be large enough to warrant specific country analysis. This is relevant to the EAC given that one of the main concerns that led to the demise of the original EAC in 1977, in addition to ideological differences at the time, was the concern that some members were benefiting disproportionately.

In this study the effects of the customs union agreement on the intra EAC trade flows for member country is estimated. This is done in a framework that controls for country and time fixed effects. The customs union was signed in 2004, and gradually implemented from 2005 to 2009. However its trade effects on individual member countries have not been empirically estimated. The results, as expected, suggest that the EAC customs union has had different effects on its members' exports and imports. The customs union has increased Kenya's intra EAC imports by about 104 percent to 170 percent. This implies the EAC member countries have taken advantage of the immediate duty free status of goods entering Kenya. However the custom union has not had a significant impact on imports by other EAC countries, except for Tanzania. The results indicate an anticipatory increase predating the implementation of the customs union of about 161 percent.

In terms of exports, Uganda's exports to the EAC bloc have increased by about 159 percent to 185 percent. The implementation of the custom union has not had a significant contemporaneous effect on Kenya's exports. However there is an anticipatory increase in Kenyan exports to EAC of about 86%. The reason may be due to the fact that some of Kenya's exports to the EAC bloc were not granted immediate duty free status. Rather the tariff rate was reduced gradually to zero over a 5 year period starting 2005. Due to data availability, the analysis has been limited to 2009 and earlier. This captures only the five year transition period. Noting that internal tariffs were not completely removed till the end of the analysis period, the results provided here possibly do not capture the full effects of the customs union, but most likely understates it. In summary Kenya, Uganda and Rwanda have seen a significant increase in intra EAC exports. But only Kenya and Tanzania have seen a significant increase in their intra EAC imports.

References

- Bair, S. L., & Bergstrand, J. H. (2007). Do free trade agreements actually increase member's international trade? *Journal of International Economics*, 71, 72-95.
- Carrère, C. (2006). Revisiting the effects of regional trade agreements on trade flows with proper specification of the gravity model. *European Economic Review*, 50, 223-247. <http://dx.doi.org/10.1016/j.euroecorev.2004.06.001>
- Clausing, K. (2001). The trade creation and trade diversion in the Canada-United States free trade agreement. *Canadian Journal of Economics*, 34, 677-696. <http://dx.doi.org/10.1111/0008-4085.00094>
- Darku, A. B. (2009). The gravity model and the test for the regional integration effect: the case of Tanzania. *Journal of Developing Areas*, 43(1), 25-44. <http://dx.doi.org/10.1353/jda.0.0040>
- Egger, P. (2000). A note on the proper econometric specification of the gravity equation. *Economics Letters*, 66, 25-31. [http://dx.doi.org/10.1016/S0165-1765\(99\)00183-4](http://dx.doi.org/10.1016/S0165-1765(99)00183-4)
- Egger, P., & Pfaffermayr, M. (2003). The proper panel econometric specification of the gravity equation: a three-way model with bilateral interaction effects. *Empirical Economics*, 28, 571-580. <http://dx.doi.org/10.1007/s001810200146>
- Frankel, J. (1997). *Regional Trade Blocs in the World Economic System*. Washington D. C., Institute for International Economics.
- Glick R., & Rose A. K. (2002). Does a currency union affect trade? the time series evidence. *European Economic Review*, 46(6), 1125-1151. [http://dx.doi.org/10.1016/S0014-2921\(01\)00202-1](http://dx.doi.org/10.1016/S0014-2921(01)00202-1)
- Goldstein A., & Ndungu, S. N. (2001). Regional integration experience in the Eastern African Region. OECD Development Centre, Working Paper No. 171.
- Magee, C. (2003). Endogenous preferential trade agreements: an empirical analysis. *Contributions to Economic Analysis & Policy*, 2(1), Article 15.
- Magee, C. S. P. (2008). New measures of trade creation and trade diversion. *Journal of International Economics*, 75, 49-362. <http://dx.doi.org/10.1016/j.jinteco.2008.03.006>
- Musila, W. J. (2005). The intensity of trade creation and trade diversion in COMESA, ECCAS and ECOWAS: a comparative analysis. *Journal of African Economies*, 14(1), 117-141. <http://dx.doi.org/10.1093/jae/ejh039>
- Rose, J., & Van Wincoop, E. (2001). National money as a barrier to international trade: the real case for currency union. *American Economic Review: Papers and Proceedings*, 91(2), 386-390. <http://dx.doi.org/10.1257/aer.91.2.386>
- Sawkut, R. (2006). COMESA trade potential: a gravity approach. *Applied Economics Letters*, 13(14), 947-951. <http://dx.doi.org/10.1080/13504850500426061>

Appendix I: List of Countries Included in the Analysis.

	Country		Country		Country		Country
1	Austria	19	Norway	37	South Africa	55	Hungary
2	Finland	20	Singapore	38	Sudan	56	Poland
3	France	21	Sweden	39	Swaziland	57	Romania
4	Germany	22	Switzerland	40	*Tanzania	58	Turkey
5	Greece	23	United Kingdom	41	*Uganda	59	Russia
6	Ireland	24	United States	42	Zambia	60	Ukraine
7	Italy	25	*Burundi	43	Zimbabwe	61	Bahrain
8	Netherlands	26	Congo, D. R.	44	Bangladesh	62	Egypt
9	Portugal	27	Congo, Rep. of	45	China P. R.: Mainland	63	Iran
10	Spain	28	Côte d'Ivoire	46	India	64	Jordan
11	Australia	29	Djibouti	47	Indonesia	65	Kuwait
12	Canada	30	Ethiopia	48	Malaysia	66	Oman
13	China,P.R.: Hong Kong	31	*Kenya	49	Pakistan	67	Qatar
14	Denmark	32	Malawi	50	Philippines	68	Saudi Arabia
15	Israel	33	Mauritius	51	Sri Lanka	69	UAE
16	Japan	34	Mozambique	52	Thailand	70	Argentina
17	Korea	35	Nigeria	53	Bulgaria	71	Brazil
18	New Zealand	36	*Rwanda	54	Czech Republic		

Note: * Indicates EAC member Country.

Sources of Economic Growth in 31 Sub-Sahara African Countries for the Period 1975–2008: A Growth Accounting Approach

Girma Zelleke¹ & Abdulwahab Sraiheen¹

¹ College of Business, Kutztown University of Pennsylvania, Kutztown, USA

Correspondence: Girma Zelleke, College of Business, Kutztown University of Pennsylvania, Kutztown, PA 19530, USA. Tel: 1-610-944-0845. E-mail: Zelleke@kutztown.edu

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Abstract

This paper examines the empirical validity of the Cobb- Douglas (CD) Model of Economic Growth for 31 Sub-Sahara African (SSA) countries. We made use of labor and capital shares of income coefficients estimated from aggregate production functions for both Kenya and South Africa. Using the estimated coefficients of factors share of income, we decomposed the sources of economic growth in the 31 SSAs as a group and, in each of the countries within the group for the periods 1975–2008 and, 1995–2008. Our findings indicate that from 1975–2008, about 68 percent of SSA's growth is accounted for by accumulation of physical capital, 28 percent by labor and, 3 percent by growth of total factor productivity. Among SSAs, the highest growth rate of GDP and, capital accumulation occurred during the period 1995–2008.

Keywords: measurement of economic growth, aggregate productivity, cross-country output convergence, Africa, comparative studies of countries

1. Introduction

The use of Growth Accounting approach to identify the sources of economic growth and, trends in labor productivity and, total factor productivity, came to prominence following the popular empirical studies by Edward Denison (1962). In one of his papers titled, "*The Sources of Economic Growth in the United States and the Alternatives Before Us*," (1962) and, in a series of other articles (1985) and five books that he authored while at the Brookings Institution, he decomposed the sources of economic growth for the United States economy from 1929–1982. Our objective in this paper is to use Denison's conceptual framework to gain some insight into the sources and determinants of economic growth and, labor productivity in a sample of 31 sub-Saharan African countries. The countries in our sample are heterogeneous in terms of their endowment of resources, ethnic composition, geographic size, political and, democratic institutions. The only common denominator among the group is similarity of standard of living as measured by per capita income. Our study differs from previous research in few fundamental ways. First, unlike previous research (Note 1) we made use of our own estimates of capital's and labor's shares of real GDP from two estimated regression equations one for Kenya, and a second for South Africa. Our estimated share of capital and labor income for SSA countries is very different from those used in past studies where labor and capital share of income are assumed to be the same as in industrialized countries. As most SSA countries are labor abundant and capital scarce, the wage rate and labor's share of income is much lower than in industrialized countries while, the opposite is true for capital's share of income. Second, we included a large number of countries 31 in our sample that covers a longer time period 1975-2008. Finally, we did not differentiate between oil and mineral exporting and/or importing countries because our main objective is to identify the various sources of growth and not to identify the reasons for differences of standard of living among countries.

Apart from empirical researchers interested in the area of long-term growth models, numerous other economists have produced a wide range of articles in an attempt to explain the causes for the slow growth of Africa since the first half of the 1970s. Growth in many African countries continued to decline from early 1970s to the middle of 1990s. The explanations for the slow growth of SSAs are numerous and most of them are convincing. Some of the explanations cited for the slow growth of SSA are listed in a survey article by (Collier and Gunning, 1999). The reasons cited for the slow growth of SSA are numerous and the list includes, overvaluation of currencies and restrictions of trade through quotas and tariffs, reliance on state ownership of enterprises, deterioration of the

terms of trade, the prevalence of ethnic and linguistic fractionalization and its distortive effects on Macroeconomic Policies (Easterly and Levine, 1997), corruption of autocratic political leaders with no accountability and transparency, smallness of the size of countries which limits the provision of public services with economies of scale, the prevalence of tropical diseases and, lack of access to sea ports by land-locked countries (Sachs and Warner 1997), the absence of democratic institutions and that limits transparency and accountability by autocratic leaders.

As a result of mismanagement of economic policies and, poor institutional qualities, SSA countries were unable to attract foreign investment except into oil and minerals sectors or, to mobilize domestic saving for investment. With low rate of investment, the growth rates of capital accumulation and GDP stagnated until the middle of 1990s. Since 1995 however, due to recommendations for policy reform by the World Bank, the IMF and, the African Union, many African Countries are reforming their economic policies and institutional qualities. In a recent report by the World Bank on Africa's economic performance titled, "Country Policy and Institutional Assessment, CPIA", (2010), Cape Verdi, Tanzania, Uganda, Ghana, Burkina Faso, Senegal, Mali, and Rwanda are assigned high scores for reforming their economic policies, governance system and institutional qualities.

As indicated in Table 4 of our study, in most of these countries with high CPIA scores, the growth rates of physical capital accumulation and, GDP are much higher than in other SSA countries with low CPIA ratings. The countries with low CPIA scores include Zimbabwe, Comoros, Djibouti, Ivory Coast and a few others. In the countries with low CPIA scores, growth rate of capital accumulation and, GDP are also low.

The rest of the paper is organized as follows: Section 2 is a literature review of the Cobb-Douglas (CD) Model of growth and, derivation of the Growth Accounting Equation. Section 3 presents the sources of data, section 4 presents the statistical results and, Section 5 is a summary and some concluding remarks.

2. Methodology

2.1 The Theoretical Model

The basic model of our analysis is the Cobb-Douglas (CD) production function also known as, the neoclassical production function. The production function predicts that real GDP (Y) is determined by the stock of physical capital (K) net of depreciation, the number of employed workers (L) and, the productivity or efficiency (A) of both factors of production. The equation is specified as,

$$Y = A (K^\alpha L^\beta) \quad (1)$$

With α and β denoting the elasticities of output with respect to capital and labor respectively or, the share of GDP received by capital owners and by workers. (Note 2) In empirical studies, the parameters α and β are estimated by transforming equation (1) into double log econometric model as in equation (2). It is assumed that the production function in equation (1) exhibit constant returns to scale, i.e., $\beta = 1-\alpha$.

$$\ln(Y) = \ln(A) + \alpha \ln(K) + \beta \ln(L) + \varepsilon \quad (2)$$

Where \ln is the natural log and ε is an additive error term. As discussed in footnote 2, an alternative model for estimating α and β is of the form below:

$$\ln(Y) = \ln(A) + \alpha \ln(1-Ws) + \beta \ln(Ws) + \varepsilon \quad (3)$$

Where Y is real GDP, Ws is income share received by labor, and $(1 - Ws)$ is share of income received by capital owners. Substituting the estimated values of β and α in equation (1), the Total Factor Productivity (TFP) variable (A), also known as Solow's Residual can be computed as $(A) = Y/K^\alpha L^\beta$. The time derivative of CD Production function will yield what is known in growth literature as, Growth Accounting Equation. The Growth Accounting Equation is often used in major empirical studies (Denison, 1962, 1979, 1985), to decompose the sources of GDP growth that is accounted by growth rate of the two factors of production (labor and capital) and, by growth rate of total factor productivity (TFP). The growth accounting equation is of the form,

$$\dot{Y} = \dot{a} + \alpha \dot{K} + \beta \dot{L} = \frac{\Delta Y}{Y} = \frac{\Delta A}{A} + \alpha \frac{\Delta K}{K} + \beta \frac{\Delta L}{L} \quad (4)$$

Subtracting $\dot{L} = \Delta L/L$ from both sides of the equation, and substituting $(1-\alpha)$ for β , equation (4) can be written as equation (5) below. In growth literature, equation (5) is a measure of the average productivity of labor. (Abel, Bernanke, and Croushore, 2008).

$$\dot{Y} - \dot{L} = \dot{a} + \alpha(\dot{K} - \dot{L}) = \frac{\Delta Y}{Y} - \frac{\Delta L}{L} = \frac{\Delta A}{A} + \alpha \left(\frac{\Delta K}{K} - \frac{\Delta L}{L} \right) \quad (5)$$

Equation (5) states that the growth rate of productivity of labor is determined by the growth rate of total factor productivity or technology (\dot{a}) and, the growth rate of capital to labor ratio, or $\alpha(\dot{K} - \dot{L})$.

The Human Capital Augmented version of Cobb-Dog Production function is specified as,

$$Y = A (K^\alpha (LH)^\beta) \quad (6.1)$$

Where H denotes human capital embodied in labor, α and β denote capital and labor's share of income respectively.

Defining the total income share of labor $(LH)^\beta$ as consisting of income from raw labor (L^θ) with zero education, (H^λ) , as the return to human capital embodied in labor, and K^α as the share of capital income, the human- capital augmented version of CD Production function can be stated as,

$$Y = A (K^\alpha L^\theta H^\lambda) \quad (6.2)$$

Under the assumption of constant returns to scale, $(\alpha + \theta + \lambda) = 1$ and, $(\lambda + \theta) = \beta$.

Equation (6) can be estimated by transforming it into a natural log form as in below.

$$\ln(Y) = \ln(A) + \alpha \ln(K) + \theta \ln(L) + \lambda \ln(H) + \varepsilon \quad (7)$$

In this paper, we will focus on estimating equation 3, and perform the calculations as in equations 4 and 5, and will tackle the human capital augmented version of the model in a forthcoming paper.

3. Sources of Data and Samples

Our sample includes 31 SSA countries with data for each country covering the period from 1975–2008. (Note 3) The primary source of data is the Extended Penn World Tables, Version 4.0 (Note 4), which includes data on additional variables that are not reported in PWT Version7 (Heston, summers, and Aten, 2011) data.

Unlike previous studies Mankiw, Weil and Romer (1992); Jones and Hall (1999) which exclude oil and mineral exporting countries from their sample, our sample includes all 31 countries in Sub-Sahara Africa region, irrespective of the product composition of their export. Due to the relative abundance and a high export share of natural resource intensive products, SSA countries such as, South Africa, Botswana, Equatorial Guinea, Angola, Nigeria have been able to attract a substantial amount of foreign capital and a subsequent accumulation of the stock of physical capital. Since the stock of physical capital is one of the major sources of economic growth, we didn't think it would be appropriate to exclude mineral and oil exporting countries from our sample.

A complete set of data on wage share of real GDP for only Kenya, South Africa and, Botswana is reported in (EPWT.V.4.0, 2011). For most other SSAs, wage share data is either unavailable or, coverage is limited to no more than 10 years. Among the countries for which data on wage share of real GDP is reported, one can observe that among OECD countries the ratio of wage income to GDP lies within a range of 55–66 percent but, for low-income SSA countries the ratio drops to a range that is as low as 15 - 40 percent. As South Africa's income per person is much higher than in the rest of SSA countries, the ratio of wage income to GDP is about 55 percent. The data on wage share of real GDP as reported in (EPWT. V.4.0, 2011) indicates that labor's share of income in low-income countries is much lower than it is in high-income countries.

In an estimate of labor's share of income using the Cobb-Douglas Model, other studies, (Bernanke & Gurkaynak, 2002) have reported that the average value of the estimated coefficients of wage share of real GDP in a sample of 54 (OECD and low-income) countries, is 0.65 or, 65 percent of GDP. However, among the 54 countries in the sample, the authors report that the estimated coefficients of wage share of income for five SSA countries included in their sample are 0.22 for Burundi, 0.38 for Congo, 0.43 for Ivory Coast, 0.48 for Zambia and, 0.59 for S. Africa. This implies that the average value of the estimated coefficients for the four low-income SSAs (Burundi, Ivory Coast, Congo and Zambia) is only 0.3775.

Since the sample of countries in our study consists of only SSAs, we have chosen not to use a wage share to GDP coefficient of 0.65, as has been the standard practice in most other empirical studies (Mankiw, Jones and Hall, Bernanke) of the neoclassical or Solow's Growth model. Instead of assuming labor's share of income to be 0.65, we made our own estimate of labor's share of income for Kenya and for South Africa from historical data reported in (EPWT.V.4, 2011). The coefficients are estimated using ordinary least squares regression method with White Heteroscedasticity Consistent Standard Errors results are reported in the next section.

Since Kenya's standard of living and structure of economic development is similar to most other low-income SSAs, we made the judgment that our estimated coefficient of labor's share of income obtained from Kenya's wage share data can be used as representative of all other low-income SSAs except for South Africa. Interestingly, our estimated coefficient for Kenya's wage share of GDP, turned-out to be the same as the average

estimate of 0.37 reported in Bernanke's study for four low-income SSA countries. As South Africa is a high income country, our estimated wage share coefficient for South Africa is 0.60 which turned out to be the same as Bernanke's estimate of 0.59.

4. Results of Statistical Estimates

As mentioned in Section 3, we made our own estimate of labor and capital's share of income for Kenya and, for South Africa and the results are as reported in Table 1. Our choice of Kenya to be the representative country of all other SSAs, is influenced by our consideration of factors such as, Kenya's long-standing experience with the free market system where factor price distortions are at a minimum, its macroeconomic and political stability relative to most other SSAs, the availability of a complete set of data on all variables that are of interest to the current study and, the similarity of Kenya's standard of living with other low-income SSAs.

The estimated income share of labor and capital for Kenya and South Africa are reported in Table (1). The dependent variable is the natural log of real GDP (Y) in 2005 purchasing power parity (chain index). The two independent variables are natural log of their estimate of net fixed standardized capital stock (K) in 2005 purchasing power parity, and the natural log of number of employed workers (N). These estimated functions provided the output elasticities with respect to both capital (α) and labor (β).

As indicated in the table, the wage share of GDP (β) for Kenya is 0.37 and, capital's share (α) is 0.63. Both coefficients are statistically significant at the 1 percent level of significance as evidenced by the low values of SEE relative to the estimated value of the coefficients.

Table 1. Estimated Aggregate Production Function for Kenya and South Africa: *Dependent variable*: natural log of real GDP ($\ln(Y)$)

<i>Variable</i>	<i>Kenya</i> [†]	<i>South Africa</i>
Constant β_0	0.7048* (0.0133)	5.8703* (0.6172)
Ln Capital (α)	0.6261* (0.00258)	0.38599* (0.03797)
Ln Labor (β)	0.3721* (0.00271)	0.61218* (0.0341)
Adjusted -R ²	1.0000	0.9833
F-Ratio	1551013	1268.25*
<i>n</i>	39	44

[†]Kenya's production function was estimated using equation (3)

All coefficients are significant at the 99.99percent

Ln = Natural Log

Standard errors in parentheses

Once again, it is interesting to note that the estimated values of our coefficients for Kenya are just about the same as the average value of the estimates obtained in (Bernanke & Gurkaynak, 2002) study for the four low-income SSA countries.

On the other hand, the estimated coefficient of labor's share of income for South Africa is much higher than it is for Kenya. As reported in Table 1, the coefficient of labor's share of income is 0.61 and, capital's share of income is 0.39. Our estimates of (α) and (β) values for South Africa, are just about the same as the estimates in Bernanke's study. In spite of the stark differences in labor's and capital's share of income between low-income and high-income countries, the conventional practice applied in almost all previous empirical studies of growth models, (Mankiw, Romer and Weil, 1992). Bosworth and Collins, Jones and Hall, Bernanke is based on the assumption that the value of (α) for all countries is 0.35 and the value of β is 0.65. To the extent that the sample of countries included in most of the previous studies largely consists of high-income countries, the assumption of a high value of β and, a low value of α may be appropriate (Note 5). However, in SSA countries, where the majority of the labor force is engaged in the informal urban sector and, in subsistence agriculture with little or no physical and, human capital, the productivity and contribution of labor to output growth is very low. In Angola

for example, oil production which is a capital intensive activity accounts for about 85 percent of GDP and, the subsistence agricultural sector which provides the main livelihood for most of the people accounts for about 10 percent of GDP (CIA World Fact book, 2012). Although Angola's case of natural resource endowment is similar to a few other SSA countries, it is not typical of other resource poor SSAs. However, almost all SSA countries except South Africa, share a common characteristic of low productivity of labor and, low wage share of GDP. In view of this consideration, we decided to use our own statistical estimate of Kenya's wage share of GDP and capital's share of income, as representative of all other low-income SSA countries, with South Africa as an exception.

Using 5 years panel data for the period 1975–2008, and an α value of 0.63 and, a β value of 0.37 for 30 low-income SSA countries excluding South Africa, we estimated the Growth Accounting Equation (4) to identify the sources of economic growth in all and in each of the 30 countries. The decomposition of the sources of economic growth for South Africa, is based on its own estimate of $\alpha = 0.61$ and $\beta = 0.0.39$. Table 2 in appendix A provides variable names and definitions and units of measurement.

4.1 Sources of Economic Growth in 31 SSA Countries

Table 3 provides a summary of the sources of growth for all 31 countries taken as a group for the period 1975–2008 and, Tables 4A, 4B present similar estimates for each of the 31 SSAs separately. As can be seen from these tables, growth varied between periods and also between countries.

Table 3. Sources of Economic Growth for 31 Sub-Sahara African Countries for the period 1975 - 2008 (n = 1067)

<i>Period</i>	\dot{Y}	\dot{L}	\dot{K}	<i>CL</i>	<i>CK</i>	\dot{a}	\dot{y}
1975–1979	2.74	2.33	5.33	0.88	3.32	-1.48	0.40
1980–1984	2.68	3.01	2.94	1.14	1.82	-0.29	-0.33
1985–1989	3.89	2.79	1.70	1.06	1.08	1.79	1.10
1990–1994	0.87	3.11	3.06	1.18	1.94	-2.21	-2.24
1995–1999	5.67	2.58	4.40	0.97	2.76	1.95	3.09
2000–2004	4.79	3.20	3.55	1.20	2.21	1.37	1.59
2005–2008	5.76	2.77	8.35	1.04	5.21	-0.52	2.99
<i>Average 75–08, n = 1067</i>	3.74	2.83	4.06	1.07	2.54	0.13	0.90
<i>Average 95–08, n = 434</i>	5.74	2.95	5.48	1.11	3.42	1.21	2.80

The calculations of the contributions of factors of production are based on the estimated production function of Kenya and South Africa ($Y = AK^\alpha L^\beta$) with $\alpha = 0.63$ for Kenya and 0.39 for South Africa.

As presented in Table 3, for the group of 31 countries, the GDP has increased at annual average rate of 3.74 percent during the period 1975–2008. Most of this growth occurred after 1995, a period that coincides with the collapse of the former Soviet Union in 1991. Following the collapse of the socialist system in the former Soviet Union, many SSAs have adopted a free market system, privatized state-owned enterprises and, liberalized restrictions on trade, in part due to reform measures required by International lending institutions such as, the IMF and the World Bank. It is also possible that the strong recovery that took place in industrialized countries and in emerging economies, from 1995 until the beginning of the Financial Crises of 2007, may have contributed to growth of demand for primary export goods originating from SSA countries that led to a subsequent increase in the growth rate of GDP. From 1995 to 2008, SSAs recorded an average growth rate of GDP that was as high as 5.4 percent.

The GDP growth rate is closely correlated with growth rate of physical capital accumulation. As the GDP growth rate accelerated from 2.55 percent before 1995, to 5.74 percent after 1995, the growth rate of physical capital accumulation also accelerated from 2.0 percent before 1995, to 5.48 percent after 1995. Overall, accumulation of capital accounts for a substantial portion of SSAs economic growth. For the period from 1975–2008, Capital accumulation accounts for 68 percent of the growth rate of GDP of 3.74 percent and, labor accounts for 28.6 percent of GDP growth and, Total Factor Productivity (TFP) growth accounts for a meager 3.2 percent of GDP growth. From the figures, reported in Table 2, it can be said that during the period 1975–2008, growth in total factors (capital and labor) of production, accounted for 97 percent of the annual growth rate of GDP of 3.74 percent and, Total Factor Productivity growth accounts for only 3 percent of the growth of output.

The last column in Table 3 indicates the growth rate of labor productivity. As stated in equation (5) and repeated below, the growth rate of labor productivity shown in column (7), can exceed, the growth rate of Total Factor Productivity shown in column (6), only if the growth rate of capital/labor ratio, is positive. If the growth rate of capital/labor ratio zero, Growth rate of total factor productivity will be equal to growth rate of labor productivity.

$$\dot{Y} - \dot{L} = \dot{a} + \alpha(\dot{K} - \dot{L}) = \frac{\Delta Y}{Y} - \frac{\Delta L}{L} = \frac{\Delta A}{A} + \alpha \left(\frac{\Delta K}{K} - \frac{\Delta L}{L} \right) \quad (5)$$

For the sample period 1975–2008, labor productivity increased at an annual rate of 0.9 percent but, Total Factor Productivity (TFP) increased at an annual rate of only 0.13 percent. The difference between the growth rate of labor productivity ($\dot{Y} - \dot{L}$), that exceeds the growth rate of Total Factor productivity (\dot{a}) if positive, is a measure of an increase in labor productivity that is caused by an increase in the growth rate of capital/labor ratio.

$$(\dot{Y} - \dot{L}) - \dot{a} = \alpha (\dot{K} - \dot{L}) \quad (5^*)$$

The Growth of $\alpha (\dot{K} - \dot{L})$, appears to be more pronounced for the period after 1995, a period in which GDP growth and capital growth are much higher than the period before 1995. For all other five-year periods before 1995, except 1975–1979, the growth rate of labor productivity is less than the growth rate of Total Factor Productivity. In this case, the capital to labor ratio must be decreasing and $(\dot{K} - \dot{L})$ will take a negative value. A closer look at the growth rates of capital and labor for each of the 5 year periods, from 1975–1995 presented in Table (3), indicates that growth rate of the labor force \dot{L} , was higher than the growth rate of capital (\dot{K}) for all 5 year periods except in 1975–1979.

For all 5 year periods after 1995, the growth of capital exceeded the growth of labor and consequently the capital- labor ratio has been positive and greater than zero. As long as growth rate of capital exceeds the growth of labor, i.e., $(\dot{K} - \dot{L})$ is positive, the growth rate of labor productivity $\{\dot{a} + \alpha (\dot{K} - \dot{L})\}$, will exceed the growth rate of Total Factor Productivity (\dot{a}) that can result from technological improvement or efficient use of both factors of production. Since 1995, it appears that most SSA countries in particular those who are assigned high CPIA scores by the World Bank for implementing structural and policy reform measures, (Rwanda, Uganda, Tanzania, Ghana and Burkina Faso) have achieved a higher growth rates of GDP, capital accumulation and growth rate of labor productivity. For SSA countries as a whole, Growth rate of GDP has increased from 3.74 percent during (1975–2008) period, to 5.74 percent in (1995–2008). During the same time period, the growth rate of capital accumulation has increased from 4.06 to 5.48 percent and, the growth rate of labor productivity increased from 0.9 to 2.8 percent. The increase in labor productivity from 0.9 percent during (1975–2008) to, 2.80 percent during (1995–2008) period, is caused by an increase of capital per worker ratio and, by a simultaneous increase of total factor productivity (\dot{a}). The rise in total factor productivity from 0.13 to 1.21 percent, could have resulted from economic and institutional reform measures adopted by most SSAs since 1995, or it could be due increased use of the internet. Understanding the exact causes of the rise in total factor productivity would be an interesting topic for future research. If the post 1995 trend improvement in all indicators except, growth of the labor force is maintained into the future, SSA countries have a good prospect of reversing the decline of economic activities and, standard of living witnessed in the 1970s and 1980s.

Table (4A & 4B) in Appendix A shows estimates of Growth Accounting Equation for each of the 31 SSA countries for the Period (1975–2008) and for the period (1995–2008) respectively.

In Tables (4A & 4B), the countries are ranked according to growth rates of GDP in descending order for the two sample periods (1975–2008) and (1995–2008). In most of these countries, with the exception of those with ongoing civil war such as, Zimbabwe, Democratic Republic of Congo, Central African Republic, Sierra Leone, Djibouti, Ivory Coast, and Burundi, there is a noticeable improvement in growth rates of GDP, capital accumulation, total factor productivity and, labor productivity during the period from 1995–2008 compared to the earlier period (1975–2008). In the conflict countries, most of the growth indicators except growth rate of labor force are either low or negative. In particular, growth rates of total factor productivity and, labor productivity among conflict countries, continue to be negative. Oil and precious mineral exporting countries such as Equatorial Guinea, Angola, Chad, Zambia and, Botswana have the highest growth rate of capital accumulation possibly due to, a high rate of Foreign Direct Investment in mining sector.

Table 5 in appendix A contains detailed estimate of the sources of growth for each of the 31 SSA countries for each five year period from (1975–2008).

5. Summary and Conclusions

Previous empirical studies on growth theories and growth accounting estimates are based under the assumption that labor's share of income is 0.65 and, capital's share is 0.35 in all countries irrespective of differences in the

level of per capita of countries. The assumption of a standardized factor share of income in empirical studies would be a valid assumption only if the sample of countries included in the study consists of countries that have a similar level of per capita income. However, a casual observation of a recently published data on wage share of income used in our study, indicates that labor's share of income in low income countries is consistently lower in low income countries than it is in high income countries. We believe, that the assumption and use of a homogenous factor share income for all countries we believe, could lead the researcher to arrive at a biased and incorrect conclusion.

In recognition of the sensitivity of all growth theories to the parameter values of labor and capital share of income, we made our own estimates of factor income share coefficients Kenya and, South Africa. As expected, our regression estimate of labor's share of income is 0.37 for Kenya and, 0.59 for South Africa. Considering that Kenya's standard of living and, level of per capita income is similar to most SSA countries except South Africa, we used Kenya's income share parameters for all other SSAs except for South Africa to decompose the sources of GDP growth in 31 SSAs as a group and, in each country within the group for two time periods 1975–2008 and, 1995–2008.

It is important to note here that despite of the high average growth rate for the sample periods, growth rates fluctuated widely between countries and within each country for the sample periods. It is also clear that growth rates have accelerated for majority of the 31 SSA's during the 1995–2008 period.

Our findings indicate capital accumulation is the most important source of economic growth. For the period (1975–2008), about 69 percent of SSAs GDP growth is accounted by growth of capital accumulation, 28 percent by growth of labor force and, 3 percent by TFA. Since we did not decompose human capital embodied in raw labor, our measure of labor's contribution to GDP growth could be exaggerated. During the same period, labor productivity increased at an average rate of 0.90 mostly due to an increase of capital/labor ratio rather than to growth of technical efficiency or TFP.

A few years after the end of the former Soviet Union, a number of SSA countries reformed their economic and political systems of governance by liberalizing trade regimes, privatizing state owned enterprises, revising investment laws and by improving the institutional quality of governance.

Among the countries that implemented economic and political reform from 1995 until 2008, growth rates of GDP, capital accumulation, total factor productivity (TFP) and, labor productivity have increased significantly compared to the period from (1975–2008). However, in other SSA countries where reform measures are not implemented due to political instability and ongoing civil war ((Zimbabwe, Sierra Leone, Ivory Coast, Democratic Republic of Congo, Comoros, and Djibouti) growth of GDP is close to zero or negative. In such countries TFP and labor productivity growth rates are negative. If Africa continues to reform its economic and political systems, it will remain to be magnet for foreign investment and accumulation of capital which has remained to be a limiting factor of SSAs economic growth.

References

- Abel, Andrew, Ben S. Bernanke, & Dean Croushore. (2008). *Macroeconomics* (Sixth Edition). Boston: Pearson Addison Wesley.
- Bernanke, Ben, & Refet S. Gurkaynak. (2002). Is Growth Exogenous? Taking Mankiw, Romer, and Weil Seriously. *NBER Macroeconomics Annual 2001*, 16(16). Ed. Ben and Kenneth Rogoff Bernanke. Washington: MIT Press, January.
- Bosworth, Barry, & Susan Collins. (2008). *Accounting for Growth: Comparing China and India*, 22. Winter. Central Intelligence Agency. (2012) *World Factbook*. June 5.
- Cohen, Daniel, & Marcelo Soto. (2002). *Why Are Some Countries So Poor? Another Look at the Evidence and a Message of Hope*. Paris: OECD Development Centre. <http://dx.doi.org/10.1787/205835882383>
- Collier, Paul, & Jan Willem Gunning. (1999). *Explaining African Economic Performance*, 37.
- Collins, Susan, & Barry Bosworth. (1996). Economic Growth in East Asia: Accumulation versus Assimilation. *Brookings Papers on Economic Activity*, 2, 135-191.
- Denison, Edward Fulton. (1979). *Accounting for Slower Economic Growth: The United States in the 70's*. Washington, DC: The Brookings Institute.
- Denison, Edward. (1962). *The Sources of Economic Growth in the United States and the Alternatives Before US*. The Brookings Institute. Washington, D. C.

- Easterly, W., & R. Levine. (1997). Africa's Growth Tragedy: Policies and Ethnic Divisions. *Quarterly Journal of Economics*, 112(4), 1203-1250.
- Easterly, William, & Ross Levine. (1998). Troubles with the Neighbours: Africa's Problem, Africa's Opportunity. *Journal of African Economies*, 7(1), 120-142. <http://dx.doi.org/10.1093/oxfordjournals.jae.a020941>
- Hall, R. E., & C. I Jones. (1999). Why Do Some Countries Produce So Much More Output Per Worker Than Others? *The Quarterly Journal of Economics*, 1(114), 83-116. <http://dx.doi.org/10.1162/003355399555954>
- Heston, Allen, Robert Summers, & Bettina Aten. Penn World Tables. Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania. Philadelphia, n.d.
- Mankiw, N. Gregory, David Romer, & David Weil. (1992). A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics*, 107(2), 407-437. <http://dx.doi.org/10.2307/2118477>
- Marquetti, Adalmir, & Duncan Foley. (2011). *Extended Penn World Tables - EPWT Version 4.0*. New York, August.
- Ndulu, Benno, & Stephen A. O'Connell. (2003). *Revised Collins/Bosworth Growth Accounting Decompositions*. March .
- O'Connell, S., & B. Ndulu. (2012). *Africa's growth experience: a focus on sources of growth*. May 8.
- Sachs, Jeffrey, & Andrew Warner. (1997). Sources of Slow Growth in African Economies. *Journal of African Economies*, 6(3), 335-376. <http://dx.doi.org/10.1093/oxfordjournals.jae.a020932>
- Stone, Richard. (1980). Whittling Away at the Residual: Some Thoughts on Denison's Growth Accounting. *Journal of Economic Literature*, XVIII, 1539-1543.
- The Empirics of Growth: An Update. (2003). Washington, D.C.: Brookings Institution, September.
- World Bank. (2012). *Country Policy and Institutional Assessment, CPIA*. 10 June.

Notes

Note 1. For example Mankiw, Romer, and Weil (1992), Nadulu and O'Conner (2000, 2003), Bosworth and Collins (2003) and others.

Note 2. The partial derivative of expression (1) with respect to Labor (L), $\frac{\partial Y}{\partial L} = \beta AK^\alpha L^{\beta-1} = \beta(Y/L)$ and solving for β , yields $\beta = \frac{\partial Y}{\partial L} * \frac{L}{Y}$ which is, elasticity of output with respect to labor. Under the assumption of competitive labor market where the real wage of labor (w) = Marginal product of labor, $\beta = (w \times L)/Y$ which is, the wage share of GDP.

Note 3. Except for Angola and Djibouti, the data is for 1984–2008.

Note 4. Extended Penn Tables (EPWT) version 4.0, August, 2011, by Adalmir Marquetti and Duncan Foley.

Note 5. In a separate regression for all 31 Sub-Sahara countries, using panel data (n =1067) not reported here, our estimated output elasticity with respect to labor is 0.32 and that of capital is 0.68. It is more evidence to support the use of different labor and capital shares than those used for advanced countries.

Appendix A

Table 2. Variables Used in the Study and their Definitions

Variable	Definition	Units
\dot{Y}	Growth rate of real GDP. It is calculated as $\Delta Y/Y$, where Y is GDP in 2005 purchasing power parity as reported in the Extended Penn Tables Version 4.0, (August 2011)	percent
\dot{L}	Growth rate of labor. It is calculated as $\Delta N/N$, where N is number of employed workers as reported in the Extended Penn Tables Version 4.0, (August 2011)	Percent
\dot{K}	Growth rate of capital. It is calculated as $\Delta K/K$; where K is the estimated net fixed standardized capital stock (K) in 2005 purchasing power parity as reported in the Extended Penn Tables Version 4.0, (August, 2011)	Percent
\dot{y}	Growth rate of labor productivity. It is calculated as $\dot{Y} - \dot{L} = \Delta Y/Y - \Delta N/N$ from the data in the Extended Penn Tables Version 4.0.	Percent
CK	Contribution of physical capital = α *(growth rate of physical capital, (\dot{K})). Where α is 0.63 for all Sub-Sahara countries in the sample excluding South Africa. The 0.63 is capital share of real GDP from the estimated aggregate production function of Kenya as reported in table 1. For South Africa only α is 0.39.	percent
CL	Contribution of labor = $(1-\alpha)$ *(growth rate in labor, \dot{L}). Where $(1-\alpha) = 0.37$ for all the countries in the sample except South Africa. For South Africa, labor share is 0.61 as estimated in table 1.	percent
$\hat{\alpha}$	Total Factor Productivity TFP (residual) = $\dot{Y} - CK - CL$ or $TFP = \dot{Y} - \alpha(\dot{K} - \dot{L})$.	percent

Table 4A. Average Annual Growth Rates of Real Output(\dot{Y}), Labor(\dot{L}), Capital(\dot{K}), Labor Productivity(\dot{y}), Sources of Economic Growth and Total Factor Productivity (TFP) for 31 Sub-Saharan Countries for the Period 1975–2008*

Country	\dot{Y}	\dot{L}	\dot{K}	CL	CK	TFP	\dot{y}
Equatorial Guinea	15.47	3.01	19.96	1.11	12.57	1.78	12.46
Botswana	8.50	3.93	9.01	1.46	5.68	1.37	4.57
Angola	6.45	2.29	3.52	0.85	2.21	3.39	4.16
Mauritius	5.38	1.99	5.21	0.74	3.28	1.36	3.39
Cape Verde	5.30	2.46	4.95	0.91	3.12	1.27	2.84
Mali	5.02	2.12	4.50	0.78	2.84	1.40	2.90
Rwanda	4.94	2.99	5.92	1.11	3.73	0.11	1.95
Tanzania	4.63	2.81	4.82	1.04	3.04	0.55	1.82
Uganda	4.53	3.02	5.00	1.12	3.15	0.27	1.51
Chad	4.30	2.44	7.63	0.90	4.81	-1.41	1.86
Burkina Faso	4.18	2.88	5.19	1.07	3.27	-0.16	1.30
Ethiopia	4.06	2.93	3.11	1.09	1.96	1.01	1.12
Congo Republic	3.97	3.11	5.36	1.15	3.38	-0.56	0.86
Mozambique	3.74	2.08	4.68	0.77	2.95	0.02	1.66
Cameroon	3.64	2.82	3.79	1.04	2.39	0.21	0.82
Kenya	3.52	3.57	3.26	1.32	2.05	0.14	-0.06
Senegal	3.46	2.71	5.57	1.00	3.51	-1.05	0.75
Ghana	3.36	3.09	1.64	1.14	1.03	1.18	0.27
Burundi	3.12	3.06	4.82	1.13	3.04	-1.05	0.05
South Africa	3.09	3.01	2.46	1.84	0.96	0.29	0.07
Ivory Coast	2.98	3.48	1.42	1.29	0.90	0.80	-0.50
Nigeria	2.92	2.55	3.15	0.94	1.99	-0.01	0.37
Zambia	2.86	2.91	1.45	1.08	0.91	0.87	-0.05
Malawi	2.69	2.74	0.65	1.02	0.41	1.26	-0.06
Madagascar	2.61	3.11	2.36	1.15	1.49	-0.03	-0.50
Comoros	2.08	3.57	0.07	1.32	0.04	0.71	-1.50
Djibouti	1.49	5.90	3.73	2.18	2.35	-3.04	-4.41
Sierra Leone	1.41	1.36	4.98	0.50	3.14	-2.23	0.05
Central African Republic.	1.20	2.44	-0.06	0.90	-0.04	0.34	-1.24
Congo Democratic Republic	-0.44	2.87	0.26	1.06	0.16	-1.67	-3.32
Zimbabwe	-0.65	1.98	0.45	0.73	0.28	-1.66	-2.62
Average	3.74	2.83	4.06	1.07	2.54	0.12	0.90

*Angola and Djibouti data are from 1984–2008.

$TFP = \frac{\Delta A}{A} = \frac{\Delta Y}{Y} - \alpha \left[\frac{\Delta K}{K} - \frac{\Delta N}{N} \right]$; Where Y is Real GDP in 2005 prices, K is net capital stock, N is number of working

population and α is elasticity of output with respect to capital and estimated for Kenya to equal 0.63 and South Africa of 0.39 aggregate Cobb-Douglas production functions. Labor productivity $(\dot{y}) = \frac{\Delta Y}{Y} - \frac{\Delta N}{N} = \frac{\Delta A}{A} + \alpha \left[\frac{\Delta K}{K} - \frac{\Delta N}{N} \right]$

Table 4B. Average Annual Growth Rates of Real Output(\dot{Y}), Labor(\dot{L}), Capital(\dot{K}), Labor Productivity(\dot{y}), Sources of Economic Growth and Total Factor Productivity (\dot{a}) for 31 Sub-Saharan Countries for the Period 1995–2008*

<i>Country</i>	\dot{Y}	\dot{L}	\dot{K}	<i>CL</i>	<i>CK</i>	\dot{a}	\dot{y}
Equatorial Guinea	35.77	3.25	39.70	1.20	25.01	9.55	32.52
Rwanda	11.27	4.80	4.02	1.78	2.53	6.96	6.47
Angola	10.38	2.45	5.34	0.91	3.36	6.11	7.93
Zambia	8.43	2.31	10.89	0.86	6.86	0.72	6.12
Mozambique	7.97	2.68	7.43	0.99	4.68	2.30	5.29
Ethiopia	7.34	3.58	4.78	1.32	3.01	3.00	3.76
Botswana	7.32	3.53	8.51	1.31	5.36	0.65	3.79
Nigeria	7.02	2.66	6.09	0.98	3.84	2.20	4.36
Uganda	7.00	3.67	7.33	1.36	4.62	1.02	3.33
Tanzania	6.77	3.09	8.86	1.14	5.58	0.05	3.69
Chad	6.72	2.46	5.17	0.91	3.26	2.55	4.26
Burkina Faso	6.64	3.09	12.92	1.14	8.14	-2.65	3.55
Mali	5.79	3.56	2.19	1.32	1.38	3.09	2.23
Ghana	5.33	3.05	3.88	1.13	2.44	1.76	2.28
Cape Verde	5.13	2.96	5.47	1.10	3.44	0.59	2.17
Senegal	4.59	3.02	8.85	1.12	5.58	-2.11	1.56
Mauritius	4.54	1.29	3.97	0.48	2.50	1.56	3.25
South Africa	4.14	2.47	3.95	1.51	1.54	1.09	1.67
Malawi	4.10	2.33	-0.42	0.86	-0.27	3.50	1.77
Congo Republic	3.98	3.00	3.00	1.11	1.89	0.98	0.98
Cameroon	3.66	2.98	0.76	1.10	0.48	2.07	0.67
Kenya	3.25	3.16	4.99	1.17	3.15	-1.06	0.09
Madagascar	3.22	3.22	6.22	1.19	3.92	-1.89	0.00
Burundi	3.01	4.24	0.68	1.57	0.43	1.02	-1.23
Central African Republic	2.11	2.35	-0.30	0.87	-0.19	1.43	-0.24
Congo Democratic Republic	2.00	3.03	-0.73	1.12	-0.46	1.34	-1.03
Ivory Coast	1.95	2.75	2.52	1.02	1.59	-0.66	-0.80
Sierra Leone	1.70	0.96	9.79	0.35	6.17	-4.83	0.74
Comoros	1.42	4.07	-3.42	1.50	-2.16	2.07	-2.65
Djibouti	1.37	5.35	0.21	1.98	0.13	-0.74	-3.98
Zimbabwe	-5.77	-0.04	-2.54	-0.02	-1.60	-4.15	-5.72
Average	5.74	2.95	5.48	1.11	3.42	1.21	2.80

Table 5. Average Annual Growth Rates of Real Output(\dot{Y}), Labor(\dot{L}), Capital(\dot{K}), Labor Productivity(\dot{y}), Sources of Economic Growth and Total Factor Productivity (TFP) for 31 Sub-Sahara Countries for the Period 1975–2008*

<i>Country/Period</i>	\dot{Y}	\dot{L}	\dot{K}	CL	CK	\dot{a}	\dot{y}
Angola	6.45	2.29	3.52	0.85	2.21	3.39	4.16
1980–1984	10.22	2.48	-0.03	0.92	-0.02	9.32	7.74
1985–1989	4.23	1.58	-3.91	0.58	-2.46	6.11	2.66
1990–1994	-3.09	2.52	6.54	0.93	4.12	-8.14	-5.61
1995–1999	9.50	2.31	11.33	0.86	7.14	1.51	7.19
2000–2004	4.15	2.44	-0.39	0.90	-0.25	3.49	1.71
2005–2008	19.26	2.63	5.02	0.97	3.16	15.12	16.63
Botswana	8.50	3.93	9.01	1.46	5.68	1.37	4.57
1975–1979	9.99	4.81	10.50	1.78	6.62	1.59	5.18
1980–1984	9.99	3.67	9.43	1.36	5.94	2.69	6.32
1985–1989	13.60	3.80	5.24	1.41	3.30	8.90	9.80
1990–1994	3.73	4.59	12.26	1.70	7.73	-5.70	-0.86
1995–1999	10.26	4.35	9.09	1.61	5.73	2.92	5.91
2000–2004	5.98	3.15	10.44	1.16	6.58	-1.76	2.83
2005–2008	5.34	2.99	5.39	1.11	3.39	0.84	2.34
Burkina Faso	4.18	2.88	5.19	1.07	3.27	-0.16	1.30
1975–1979	3.93	1.33	8.46	0.49	5.33	-1.90	2.59
1980–1984	0.18	1.99	7.08	0.74	4.46	-5.02	-1.81
1985–1989	5.41	2.84	8.11	1.05	5.11	-0.75	2.57
1990–1994	2.72	3.47	5.53	1.28	3.48	-2.04	-0.75
1995–1999	7.62	3.30	3.50	1.22	2.21	4.20	4.33
2000–2004	5.37	4.25	0.96	1.57	0.61	3.19	1.13
2005–2008	4.01	3.03	2.10	1.12	1.32	1.56	0.98
Burundi	3.12	3.06	4.82	1.13	3.04	-1.05	0.05
1975–1979	4.74	2.62	11.17	0.97	7.04	-3.26	2.12
1980–1984	2.47	3.38	10.86	1.25	6.84	-5.62	-0.91
1985–1989	5.53	2.05	6.37	0.76	4.02	0.75	3.48
1990–1994	0.03	0.93	2.48	0.34	1.56	-1.88	-0.91
1995–1999	3.84	2.73	-3.53	1.01	-2.23	5.06	1.11
2000–2004	1.81	4.86	-0.21	1.80	-0.13	0.14	-3.05
2005–2008	3.47	5.34	7.05	1.97	4.44	-2.94	-1.86
Cameroon	3.64	2.82	3.79	1.04	2.39	0.21	0.82
1975–1979	10.32	2.00	10.84	0.74	6.83	2.75	8.32
1980–1984	6.69	2.33	9.81	0.86	6.18	-0.35	4.37
1985–1989	0.69	3.13	5.13	1.16	3.23	-3.70	-2.44
1990–1994	-3.19	3.37	-2.14	1.25	-1.35	-3.09	-6.57
1995–1999	3.92	3.12	-3.28	1.16	-2.06	4.83	0.80
2000–2004	4.05	2.97	1.99	1.10	1.25	1.70	1.08
2005–2008	2.83	2.83	4.26	1.05	2.68	-0.90	0.00
Cape Verde	5.30	2.46	4.95	0.91	3.12	1.27	2.84
1975–1979	2.33	1.05	4.32	0.39	2.72	-0.79	1.27
1980–1984	4.29	1.77	2.02	0.65	1.27	2.36	2.52
1985–1989	5.09	1.31	2.61	0.48	1.64	2.97	3.79
1990–1994	4.75	2.31	4.20	0.86	2.65	1.25	2.44
1995–1999	8.01	3.59	5.80	1.33	3.65	3.03	4.42
2000–2004	5.20	3.80	5.86	1.41	3.69	0.10	1.40
2005–2008	7.97	3.60	11.08	1.33	6.98	-0.34	4.38
Central African Republic	1.20	2.44	-0.06	0.90	-0.04	0.34	-1.24
1975–1979	1.85	1.84	-4.07	0.68	-2.57	3.74	0.01
1980–1984	0.03	2.68	-1.68	0.99	-1.06	0.10	-2.65
1985–1989	1.28	2.35	3.43	0.87	2.16	-1.75	-1.07
1990–1994	-0.87	3.19	2.77	1.18	1.75	-3.80	-4.06

1995–1999	2.29	2.40	-0.05	0.89	-0.03	1.43	-0.11
2000–2004	-0.89	2.32	-2.75	0.86	-1.73	-0.01	-3.21
2005–2008	5.63	2.32	2.46	0.86	1.55	3.22	3.31
Chad	4.30	2.44	7.63	0.90	4.81	-1.41	1.86
1975–1979	-3.01	1.88	7.19	0.70	4.53	-8.24	-4.90
1980–1984	3.62	1.51	1.33	0.56	0.84	2.22	2.11
1985–1989	6.98	2.04	3.32	0.76	2.09	4.14	4.94
1990–1994	3.07	2.52	3.90	0.93	2.46	-0.32	0.55
1995–1999	2.27	3.43	5.49	1.27	3.46	-2.46	-1.17
2000–2004	14.96	2.94	24.18	1.09	15.23	-1.36	12.02
2005–2008	1.70	2.86	8.14	1.06	5.13	-4.49	-1.16
Comoros	2.08	3.57	0.07	1.32	0.04	0.71	-1.50
1975–1979	4.63	3.80	5.82	1.41	3.66	-0.44	0.83
1980–1984	5.68	1.91	5.72	0.71	3.60	1.37	3.77
1985–1989	-0.22	3.14	0.18	1.16	0.11	-1.49	-3.36
1990–1994	0.08	4.08	-1.65	1.51	-1.04	-0.39	-4.00
1995–1999	0.89	4.59	-3.07	1.70	-1.93	1.12	-3.70
2000–2004	1.22	4.06	-4.56	1.50	-2.87	2.59	-2.83
2005–2008	2.32	3.42	-2.44	1.27	-1.54	2.59	-1.10
Congo Democratic Rep.	-0.44	2.87	0.26	1.06	0.16	-1.67	-3.32
1975–1979	-3.13	2.41	2.53	0.89	1.59	-5.61	-5.54
1980–1984	3.54	2.36	0.89	0.87	0.56	2.11	1.18
1985–1989	0.72	2.80	0.00	1.04	0.00	-0.32	-2.09
1990–1994	-9.76	3.47	0.37	1.29	0.23	-11.27	-13.23
1995–1999	-9.71	2.61	-3.47	0.97	-2.19	-8.49	-12.32
2000–2004	10.37	3.19	-2.50	1.18	-1.58	10.76	7.18
2005–2008	6.19	3.37	4.93	1.25	3.10	1.84	2.82
Congo Republic	3.97	3.11	5.36	1.15	3.38	-0.56	0.86
1975–1979	1.83	2.82	7.29	1.04	4.59	-3.80	-0.99
1980–1984	13.51	3.55	10.30	1.31	6.49	5.71	9.96
1985–1989	0.47	2.08	5.57	0.77	3.51	-3.81	-1.61
1990–1994	0.01	4.29	5.39	1.59	3.39	-4.97	-4.28
1995–1999	5.94	2.90	1.21	1.07	0.76	4.10	3.04
2000–2004	1.38	3.02	2.60	1.12	1.64	-1.37	-1.64
2005–2008	4.62	3.09	5.18	1.14	3.26	0.22	1.53
Djibouti	1.49	5.90	3.73	2.18	2.35	-3.04	-4.41
1980–1984	4.16	-8.04	13.75	-2.98	8.66	-1.53	12.20
1985–1989	-0.93	4.62	3.50	1.71	2.20	-4.85	-5.55
1990–1994	3.71	11.50	11.81	4.25	7.44	-7.98	-7.79
1995–1999	0.07	-2.63	1.34	-0.97	0.84	0.20	2.70
2000–2004	2.02	12.31	-4.49	4.56	-2.83	0.29	-10.30
2005–2008	2.19	6.62	4.67	2.45	2.94	-3.20	-4.43
Equatorial Guinea	15.47	3.01	19.96	1.11	12.57	1.78	12.46
1975–1979	-3.26	-2.32	0.52	-0.86	0.33	-2.73	-0.94
1980–1984	2.97	10.97	-0.51	4.06	-0.32	-0.77	-8.00
1985–1989	3.25	2.22	0.85	0.82	0.54	1.90	1.04
1990–1994	2.07	0.49	23.69	0.18	14.92	-13.04	1.58
1995–1999	58.89	2.11	70.60	0.78	44.48	13.63	56.78
2000–2004	30.28	3.95	26.78	1.46	16.87	11.96	26.34
2005–2008	13.72	3.81	17.23	1.41	10.85	1.46	9.91
Ethiopia	4.06	2.93	3.11	1.09	1.96	1.01	1.12
1975–1979	0.49	1.90	-1.08	0.70	-0.68	0.47	-1.41
1980–1984	2.57	3.16	3.20	1.17	2.02	-0.61	-0.58
1985–1989	2.77	2.34	5.09	0.87	3.20	-1.30	0.43
1990–1994	1.21	2.53	0.57	0.94	0.36	-0.09	-1.32
1995–1999	7.14	2.72	0.30	1.01	0.19	5.94	4.42

2000–2004	3.86	4.22	4.05	1.56	2.55	-0.25	-0.36
2005–2008	11.92	3.85	11.30	1.42	7.12	3.38	8.07
Ghana	3.36	3.09	1.64	1.14	1.03	1.18	0.27
1975–1979	-0.13	1.90	-1.74	0.70	-1.09	0.26	-2.03
1980–1984	0.80	3.68	-3.57	1.36	-2.25	1.69	-2.88
1985–1989	5.11	3.50	-1.59	1.29	-1.00	4.82	1.61
1990–1994	2.67	3.62	2.73	1.34	1.72	-0.39	-0.95
1995–1999	1.80	3.33	5.14	1.23	3.24	-2.67	-1.53
2000–2004	6.96	2.91	2.92	1.08	1.84	4.04	4.05
2005–2008	7.00	2.56	9.04	0.95	5.70	0.36	4.45
Ivory Coast	2.98	3.48	1.42	1.29	0.90	0.80	-0.50
1975–1979	7.74	3.81	11.23	1.41	7.08	-0.74	3.93
1980–1984	1.42	3.88	1.36	1.44	0.85	-0.87	-2.47
1985–1989	5.95	3.93	-4.55	1.45	-2.86	7.36	2.02
1990–1994	-0.28	4.34	-5.44	1.60	-3.42	1.54	-4.61
1995–1999	5.04	3.18	3.61	1.18	2.27	1.59	1.86
2000–2004	-0.90	2.55	1.52	0.94	0.96	-2.80	-3.45
2005–2008	1.63	2.45	2.42	0.91	1.52	-0.79	-0.82
Kenya	3.52	3.57	3.26	1.32	2.05	0.14	-0.06
1975–1979	4.37	3.67	4.77	1.36	3.01	0.00	0.70
1980–1984	2.59	3.94	2.10	1.46	1.32	-0.18	-1.34
1985–1989	5.97	3.84	1.55	1.42	0.98	3.57	2.13
1990–1994	1.89	4.02	-0.24	1.49	-0.15	0.55	-2.14
1995–1999	3.25	3.17	3.59	1.17	2.26	-0.19	0.08
2000–2004	2.62	3.32	3.79	1.23	2.39	-1.00	-0.70
2005–2008	4.05	2.94	8.24	1.09	5.19	-2.24	1.10
Madagascar	2.61	3.11	2.36	1.15	1.49	-0.03	-0.50
1975–1979	-0.82	2.48	1.15	0.92	0.73	-2.46	-3.30
1980–1984	1.71	3.22	-1.06	1.19	-0.67	1.19	-1.51
1985–1989	8.28	3.19	-1.02	1.18	-0.64	7.74	5.09
1990–1994	-0.45	3.25	-0.43	1.20	-0.27	-1.38	-3.70
1995–1999	2.89	2.92	1.87	1.08	1.18	0.63	-0.03
2000–2004	0.94	3.29	5.04	1.22	3.18	-3.45	-2.35
2005–2008	6.48	3.51	13.14	1.30	8.28	-3.10	2.96
Malawi	2.69	2.74	0.65	1.02	0.41	1.26	-0.06
1975–1979	6.79	3.26	10.68	1.20	6.73	-1.15	3.53
1980–1984	-1.69	2.46	0.26	0.91	0.17	-2.77	-4.16
1985–1989	1.95	3.29	-2.94	1.22	-1.85	2.59	-1.34
1990–1994	-0.25	3.13	-2.41	1.16	-1.52	0.11	-3.38
1995–1999	5.43	1.70	-1.75	0.63	-1.10	5.90	3.73
2000–2004	1.66	2.76	-0.69	1.02	-0.43	1.07	-1.10
2005–2008	5.48	2.59	1.57	0.96	0.99	3.54	2.89
Mali	5.02	2.12	4.50	0.78	2.84	1.40	2.90
1975–1979	9.62	1.57	7.95	0.58	5.01	4.03	8.06
1980–1984	-0.30	1.27	3.00	0.47	1.89	-2.66	-1.57
1985–1989	6.93	1.36	5.13	0.50	3.23	3.20	5.57
1990–1994	2.94	1.67	3.69	0.62	2.33	0.00	1.27
1995–1999	5.77	2.03	3.81	0.75	2.40	2.62	3.74
2000–2004	4.46	4.17	2.15	1.54	1.35	1.57	0.29
2005–2008	5.86	2.91	6.12	1.08	3.86	0.92	2.95
Mauritius	5.38	1.99	5.21	0.74	3.28	1.36	3.39
1975–1979	10.08	3.17	11.12	1.17	7.00	1.90	6.90
1980–1984	0.65	2.83	1.39	1.05	0.88	-1.28	-2.19
1985–1989	7.71	2.10	5.52	0.78	3.48	3.46	5.61
1990–1994	5.41	1.80	6.26	0.67	3.94	0.80	3.61
1995–1999	4.75	1.63	6.03	0.60	3.80	0.35	3.12

2000–2004	5.04	0.71	4.19	0.26	2.64	2.14	4.34
2005–2008	3.65	1.61	1.13	0.59	0.71	2.35	2.04
Mozambique	3.74	2.08	4.68	0.77	2.95	0.02	1.66
1975–1979	2.25	2.40	6.53	0.89	4.11	-2.75	-0.16
1980–1984	-1.42	1.65	1.19	0.61	0.75	-2.78	-3.07
1985–1989	1.05	-1.74	0.26	-0.64	0.17	1.53	2.79
1990–1994	1.22	4.32	3.06	1.60	1.93	-2.31	-3.10
1995–1999	7.15	3.94	9.82	1.46	6.18	-0.49	3.22
2000–2004	8.98	2.06	7.13	0.76	4.49	3.73	6.93
2005–2008	7.73	1.90	4.81	0.70	3.03	4.00	5.83
Nigeria	2.92	2.55	3.15	0.94	1.99	-0.01	0.37
1975–1979	-1.41	2.71	14.17	1.00	8.93	-11.34	-4.12
1980–1984	-1.42	2.35	3.06	0.87	1.93	-4.22	-3.78
1985–1989	0.30	2.12	-6.02	0.78	-3.79	3.30	-1.82
1990–1994	2.75	2.75	-6.82	1.02	-4.30	6.03	0.00
1995–1999	2.60	2.93	-3.92	1.08	-2.47	3.98	-0.33
2000–2004	9.85	2.60	-0.75	0.96	-0.47	9.36	7.25
2005–2008	9.00	2.38	27.16	0.88	17.11	-8.99	6.62
Rwanda	4.94	2.99	5.92	1.11	3.73	0.11	1.95
1975–1979	4.90	2.97	12.38	1.10	7.80	-3.99	1.93
1980–1984	3.23	2.80	11.19	1.04	7.05	-4.86	0.43
1985–1989	2.33	2.67	7.30	0.99	4.60	-3.25	-0.34
1990–1994	-8.41	-1.54	-1.89	-0.57	-1.19	-6.65	-6.87
1995–1999	17.59	6.88	-3.03	2.54	-1.91	16.95	10.71
2000–2004	5.44	3.93	3.16	1.46	1.99	1.99	1.50
2005–2008	10.66	3.29	13.90	1.22	8.75	0.69	7.37
Senegal	3.46	2.71	5.57	1.00	3.51	-1.05	0.75
1975–1979	3.80	2.48	3.39	0.92	2.14	0.75	1.32
1980–1984	1.88	2.87	3.08	1.06	1.94	-1.12	-0.99
1985–1989	3.25	3.30	2.99	1.22	1.88	0.15	-0.05
1990–1994	1.76	1.33	3.66	0.49	2.31	-1.04	0.42
1995–1999	5.13	2.80	8.40	1.04	5.29	-1.20	2.33
2000–2004	4.32	3.09	9.33	1.14	5.88	-2.71	1.23
2005–2008	4.25	3.22	8.81	1.19	5.55	-2.49	1.04
Sierra Leone	1.41	1.36	4.98	0.50	3.14	-2.23	0.05
1975–1979	1.99	1.52	3.74	0.56	2.36	-0.93	0.47
1980–1984	2.91	1.59	2.86	0.59	1.80	0.52	1.32
1985–1989	2.46	2.13	0.92	0.79	0.58	1.09	0.33
1990–1994	-2.54	1.31	-1.10	0.48	-0.69	-2.34	-3.85
1995–1999	-12.41	-2.50	-6.98	-0.92	-4.40	-7.09	-9.91
2000–2004	12.07	3.73	-7.39	1.38	-4.65	15.34	8.34
2005–2008	6.37	1.82	52.24	0.67	32.91	-27.21	4.55
South Africa	3.09	3.01	2.46	1.84	0.96	0.29	0.07
1975–1979	3.16	2.63	4.21	1.60	1.64	-0.09	0.53
1980–1984	3.86	3.71	4.23	2.26	1.65	-0.05	0.15
1985–1989	1.40	3.37	-1.37	2.06	-0.53	-0.12	-1.97
1990–1994	0.98	3.86	-1.41	2.36	-0.55	-0.82	-2.88
1995–1999	3.06	2.85	1.66	1.74	0.65	0.67	0.21
2000–2004	3.82	2.22	3.71	1.35	1.45	1.02	1.60
2005–2008	5.89	2.32	7.11	1.42	2.77	1.70	3.57
Tanzania	4.63	2.81	4.82	1.04	3.04	0.55	1.82
1975–1979	3.49	2.50	6.65	0.93	4.19	-1.62	0.99
1980–1984	1.08	2.93	0.30	1.08	0.19	-0.19	-1.85
1985–1989	4.60	3.22	4.29	1.19	2.71	0.70	1.38
1990–1994	3.48	3.55	7.06	1.31	4.45	-2.28	-0.07
1995–1999	5.00	2.84	2.15	1.05	1.36	2.59	2.16

2000–2004	5.30	2.43	3.93	0.90	2.47	1.93	2.87
2005–2008	10.64	2.01	10.49	0.75	6.61	3.28	8.63
Uganda	4.53	3.02	5.00	1.12	3.15	0.27	1.51
1975–1979	-3.36	2.31	-5.02	0.86	-3.16	-1.05	-5.67
1980–1984	1.97	2.64	-0.34	0.98	-0.21	1.21	-0.67
1985–1989	3.41	3.78	6.81	1.40	4.29	-2.28	-0.37
1990–1994	9.84	3.19	7.70	1.18	4.85	3.80	6.64
1995–1999	5.89	2.50	9.32	0.92	5.87	-0.91	3.39
2000–2004	5.22	3.18	6.87	1.18	4.33	-0.29	2.03
2005–2008	9.82	3.71	10.78	1.37	6.79	1.66	6.12
Zambia	2.86	2.91	1.45	1.08	0.91	0.87	-0.05
1975–1979	-3.46	2.46	-0.33	0.91	-0.21	-4.16	-5.91
1980–1984	-1.09	3.75	-5.60	1.39	-3.53	1.05	-4.84
1985–1989	2.89	3.80	-9.55	1.40	-6.02	7.51	-0.90
1990–1994	-2.47	3.33	-5.15	1.23	-3.24	-0.46	-5.80
1995–1999	0.33	2.35	0.50	0.87	0.31	-0.86	-2.03
2000–2004	14.51	2.29	12.61	0.85	7.95	5.72	12.23
2005–2008	10.96	2.30	21.71	0.85	13.68	-3.57	8.66
Zimbabwe	-0.65	1.98	0.45	0.73	0.28	-1.66	-2.62
1975–1979	0.17	1.81	1.02	0.67	0.64	-1.14	-1.64
1980–1984	3.42	3.91	2.33	1.45	1.47	0.50	-0.49
1985–1989	6.03	4.57	0.58	1.69	0.37	3.97	1.46
1990–1994	2.45	3.20	6.45	1.18	4.07	-2.80	-0.75
1995–1999	3.65	1.19	2.60	0.44	1.64	1.57	2.46
2000–2004	-13.41	-0.21	-2.96	-0.08	-1.86	-11.47	-13.20
2005–2008	-7.98	-1.37	-8.45	-0.51	-5.32	-2.15	-6.61
Average	3.74	2.83	4.06	1.07	2.54	0.12	0.90

*Angola and Djibouti data are from 1984–2008.

Investigating Equilibrium Relationship between Macroeconomic Variables and Malaysian Stock Market Index through Bounds Tests Approach

Hussain Ali Bekhet¹ & Mohamed Ibrahim Mugableh¹

¹ Graduate Business School, College of Graduate Studies, University Tenaga Nasional (UNITEN), Malaysia

Correspondence: Hussain Ali Bekhet, Graduate Business School, College of Graduate Studies, University Tenaga Nasional (UNITEN), 43000, Selangor, Malaysia. E-mail: profhussain@uniten.edu.my

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Abstract

The current paper conducts an empirical examination into the long-run and short-run equilibrium relationships between macroeconomic variables and the Malaysian stock market index (SMI) for the 1977-2011 period. Specifically, it employs Ng and Perron (NP) bounds statistics test to detect the boundaries of variables stationarity. Subsequently, the co-integrating relationships among variables are tested using the bounds F-statistic test. Eventually, the long-run and short-run equilibrium relationships are analyzed using Pesaran, Shin, and Smith (PSS) bounds tests Approach. The results indicate that all macroeconomic variables are co-integrated with SMI. Besides, understanding the long-run and short-run equilibrium relationships between macroeconomic variables and SMI could be highly appreciable from the perspectives of policymakers, financial economists, domestic and international investors dealing with Malaysian stock market.

Keywords: stock market index, macroeconomic variables, economic equilibrium, stationarity, bounds test, Malaysia

1. Introduction

Over the past three decades, the issue relating to macroeconomic variables and stock markets generated vast volume of literature and heated debate due to the ability of these variables to enhance stock markets and economies. Specifically, the optimal macroeconomic environment promotes business profitability and boosts economic growth (Pal and Mittal, 2011). The performance of countries' economies and stock markets are measured and determined by macroeconomic variables such as exchange rate (ER), inflation rate (INF), money supply (MS), trade balance (TB) and many other variables.

However, several studies debated the influences of macroeconomic variables on matured and emerging stock markets indices. In the US stock market, Bjornald and Leitemo (2009) examined the influences of macroeconomic variables on S&P500 using vector autoregressive (VAR) Model and monthly time series data for the 1983-2002 period. They found that macroeconomic variables influenced S&P500 positively. On the other hand, Morelli (2002) scanned if the conditional volatility of macroeconomic variables explained the volatility of FTSE100 using generalized autoregressive conditional heteroscedasticity (GARCH) Model and monthly time-series data for the 1967-1995 period. He found that the conditional volatility of the macroeconomic variables did not explain the volatility of FTSE100.

Notable studies conducted to examine the equilibrium relationships between macroeconomic variables and emerging stock market indices. Gunasekarage et al. (2004) investigated the long-run and short-run equilibrium relationships between macroeconomic variables and the Sri Lankan stock market index using vector error correction model (VECM) and monthly time-series data for the 1985-2001 period. They found that macroeconomic variables are co-integrated with the Sri Lankan stock market index. In Malaysian context, few notable studies have been found in our area of interest. Ibrahim and Aziz (2003) inspected the long-run and short-run equilibrium relationships between four macroeconomic variables (industrial production index (IP), consumer price index (CPI), the broad money supply (M2), and ER) and Malaysian stock market index using monthly time series data for the 1977-1998 period. They found positive long-run and short-run equilibrium relationships between Malaysian stock market index and both of CPI and IP. Additionally, they found negative long-run and short-run equilibrium relationships between Malaysian stock market index and both of M2 and ER.

The Malaysian stock market began its developing since the inception in 1977. Within three decades, Malaysia had one of the largest stock markets among the South East Asian countries in terms of domestic market capitalization over US\$390 million in 2011 (World Federation of Exchange, 2012). Furthermore, Malaysian economy has grown continuously of 5.9% per year at the end of 2011(IMF, 2012). Therefore, it would be interesting to provide empirical evidence demonstrating the relationship between macroeconomic variables and the Malaysian stock market index.

However, the current paper contributes to the existing literature in fourfold. First, it examines the long-run and short-run equilibrium relationships between macroeconomic variables [GDP, producer price index (PPI), CPI, the broadest money supply (M3) and ER] and the Malaysian stock market index (SMI) for the 1977-2011 period. Second, it incorporates the latest data for Malaysia, that comprises before and after the financial crises periods represented by Asian financial crisis (AFC) and global financial crisis (GFC). Third, this paper and to the best of researchers' knowledge, is the first that employs Pesaran, Shin, and Smith tests, PSS (2001) bounds tests Approach in matrix elements form to analyze the long-run and short-run equilibrium relationships between macroeconomic variables and SMI. Finally, it utilizes Ng and Perron, NP (2001) bounds statistics test to detect the boundaries of variables stationarity, since this test is more appropriate with small sample sizes.

The equilibrium relationships between stock markets and macroeconomic variables holds implications for investors, as well as for policy makers to recognize and to evaluate changes in economic conditions, or to forecast the future performance of the macro-economy. Besides, the results of this study based on the Malaysian stock market are likely to hold implications for other emerging stock markets.

The reminder of this paper is organized as follows: The next section provides an overview of Malaysian economy and stock market. Section 3 reviews the previous empirical studies using various equilibrium and volatility time-series models. The data selection and methodology are discussed in section 4. Section 5 analyzes the results. Section 6 draws policy implications, while conclusions, future research and limitation are presented in last section.

2. Malaysian Economy and Stock Market Overview

2.1 Malaysian Economy Overview

Since the independence in 1957, Malaysia began its economic transition from being reliant on primary sectors (mining, quarrying, agriculture, forestry and fishing) to depend more on services, construction and manufacturing to imitate the four Asian Dragons economies; China, Singapore, South Korea, and Taiwan (Ghosh and Ariff, 2004). However, during the last three decades, many emerging countries followed financial and economic liberalization by opening their economies and domestic stock markets to international investors that led to enhance economic growth (Ortiz et al., 2006). In 1991, the economic and financial plan was coincided with the financial and economic liberalization. This plan improved productivity and employment in various economic and financial sectors by attracting FDI in Islamic finance, high technology industries, financial services and education system (Ghosh and Ariff, 2004) which boosted Malaysian economic growth rate.

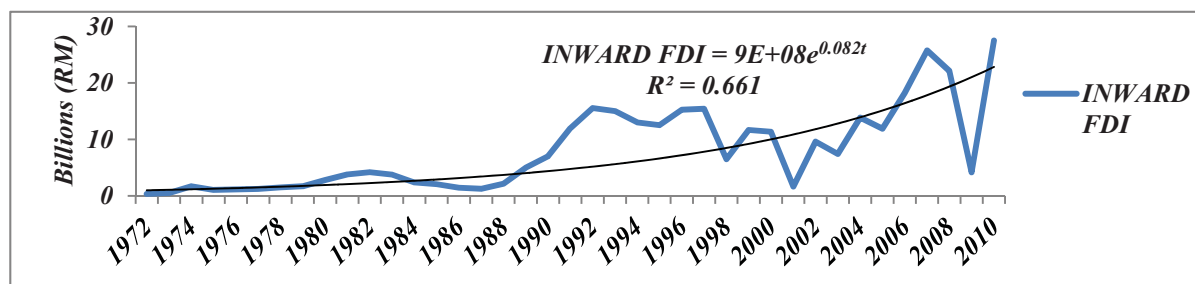


Figure 1. Malaysian inward FDI for the 1972-2010 period

Source: World Development Indicators Data Base, available at: <http://databank.worldbank.org/ddp/home.do>.

Figure 1 shows that inward FDI recorded an annual growth rate of 8.2% for the 1972-2010 period. However, the inward FDI started in 1972 with a value of RM342 million and moved steadily till the first peak in 1992 with a value of RM5,183 billion, then, declined sharply in 1998 at a value of RM2,163 billion as a result of AFC. The inward FDI climbed to reach the second peak in 2007 with a value of RM26 billion, then, declined harshly in

2009 at a value of RM4,162 billion due to GFC. Further, the inward FDI reached the highest peak in 2010 with a value of RM28 billion. A huge value of inward FDI to Malaysia led to enhance economic growth [real gross domestic product (RGDP)] and a decline in unemployment (UEM) rate as shown in Figures 2 and 3 respectively.

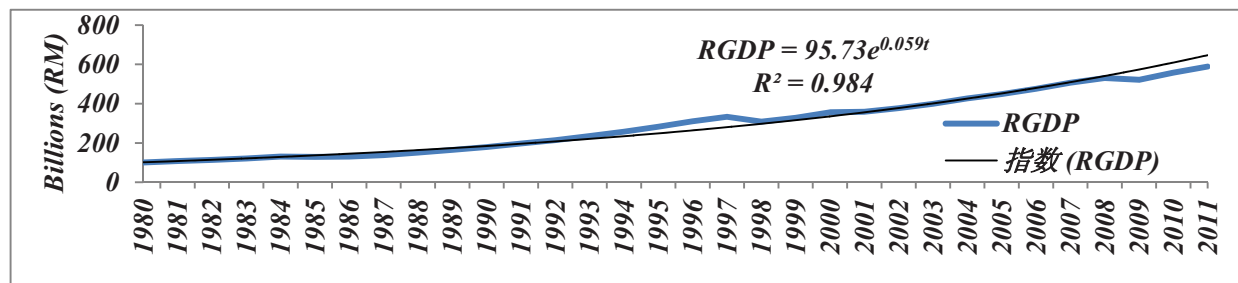


Figure 2. Real Gross Domestic Product for the 1980-2011 period.

Source: International Monetary Fund (2010), World Economic Outlook Databases, available on line at: <http://www.imf.org/external/pups/ft/weo/2010/01/weodata/download.aspx>

Figure 2 reveals that RDGP achieved an annual growth rate of 5.9% for the 1980-2011 period as a result of high levels of foreign and domestic private investments flowed into Malaysia. RGDP decreased dramatically in 1998 with a value of RM309 billion due to AFC, since it was RM334 billion in 1997. Furthermore, RGDP decreased steadily from RM530 billion in 2008 to RM521 billion in 2009 due to GFC. Figure 3 demonstrates that UEM rate decreased dramatically as a result of a huge FDI flows into Malaysia which led to create jobs and increase employment in economic and financial sectors.

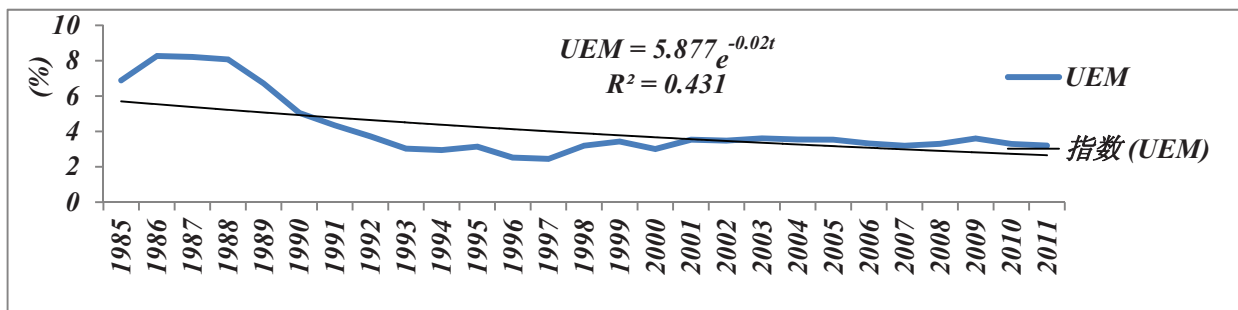


Figure 3. Unemployment Rate for the 1985-2011 period

Source: International Monetary Fund (2010), World Economic Outlook Databases, available on line at: <http://www.imf.org/external/pups/ft/weo/2010/01/weodata/download.aspx>

UEM rate (Figure 3) shows an inverse growth rate of -2% for the 1985-2011 period. However, UEM rate started at 6.9% in 1985 and decreased sharply until the year 1996 with a rate of 2.5% and remained stable from 1994 till 2011.

2.2 Malaysian Stock Market Overview

Malaysian stock market is known as Bursa Malaysia, and considered one of the largest stock markets in South East Asia with 829 listed companies offering a wide range of investment opportunities to domestic and international investors (Bursa Malaysia, 2012). On July 6, 2009 Malaysian stock market followed the latest FTSE Bursa Malaysia index methodology that calculated and disseminated on a real time basis every 15 seconds instead of 60 second to insure that Malaysian stock market reflects the changes in national and global economy (Bursa Malaysia, 2012). However, Malaysian stock market is considered the second among the largest South East Asian stock markets according to its domestic market capitalization. Figure 4 reveals that the annual growth rate of domestic market capitalization for Indonesia, Singapore, Philippines, Thailand and Malaysia are 14.5%, 11%, 8.4%, 7.5% and 6.1% for the 1990-2011 period respectively

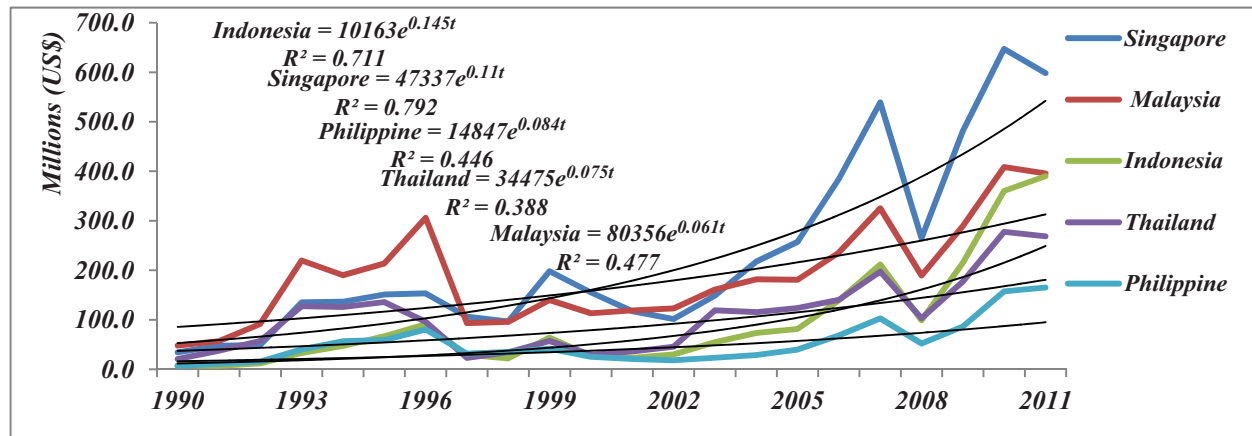


Figure 4. Domestic Market Capitalization for the 1990-2011 period

Source: World Federation of Exchange (2012), available on line at: <http://www.world-exchanges.org/statistics/time-series/value-share-trading>.

Furthermore, Figure 5 reveals that SMI recorded an annual growth rate of 5.7% for the 1977-2011 period.

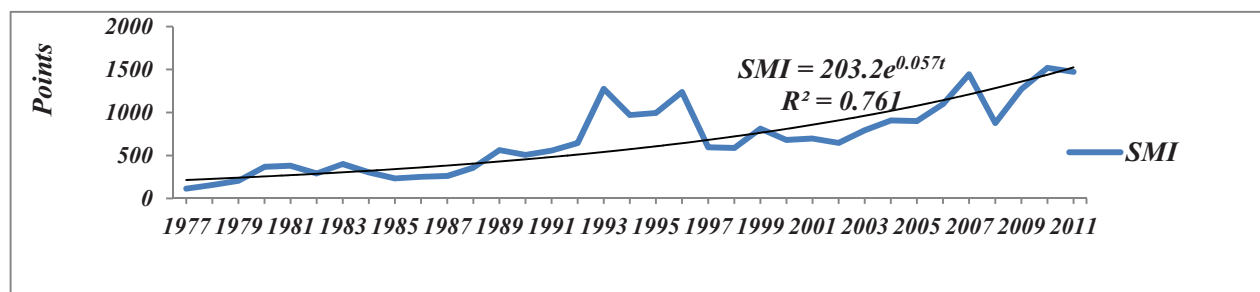


Figure 5. Stock Market Index for the 1977-2011 period

Source: Bursa Malaysia, available on line at: www.bursamalaysia.com.

Before the onslaught of AFC in 1997-98, the performance of SMI rose sharply to reach the first peak in 1993 and the second peak in 1996 with 1275 points and 1238 points respectively. The weakness of SMI in the year 2008 was due to the GFC, whilst SMI declined from 1445 points in 2007 to 877 points in 2008. However, SMI achieved more than 1400 points at the end of 2011. Besides, Figure 3 shows that the trading volume of shares in Malaysian stock market was vivid that achieved a growth rate of 6.7% for the 1993-2011 period.

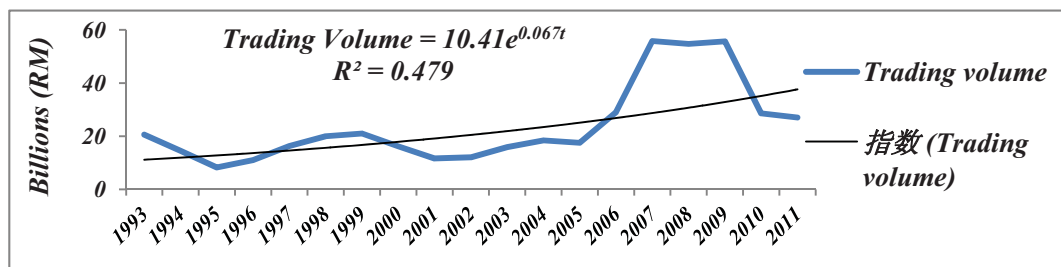


Figure 6. Trading Volume for the 1993-2011 period

Source: Bursa Malaysia, available on line at: www.bursamalaysia.com.

The trading volume started at RM20.6 billion and fell gradually to reach the first sharp decline in 1995 at a value of RM8.24 billion, then, increased slowly to reach the first peak in 2007 with a value of RM55.8 billion. The trading volume remained stable over 2007-2009 period. However, the trading volume declined harshly from RM28.6 billion in 2010 to RM27 billion in 2011.

3. Review of Previous Empirical Studies

Past studies have been widely enriched by various empirical studies that explored the relationships between macroeconomic variables and stock market indices (Aburghi, 2008; Adjasi, 2009; Beltratti and Morano, 2006; Hassapis and Kalyvitis, 2002; Hatemi-J and Morgan, 2009; Humpe and Macmillan, 2009; Kizys and Pierdzioch, 2009; Liu and Shrestha, 2008; Pal and Mittal, 2011). As such, they noticeably argued that macroeconomic variables [GDP, IP, PPI, CPI, ER, M1, M2, M3, gross domestic saving (GDS), gold prices (GP), oil prices (OP), federal funds rate (FFR) and INT] influence stock market indices, and implied that macroeconomic variables affect investors' investment decisions.

Nonetheless, several empirical studies debated the relationships between macroeconomic variables and stock market indices using equilibrium time-series models. The VAR equilibrium time-series model employed by many researchers (Araugo, 2009; Black et al., 2003; Buyuksalvarci and Abdioglu, 2010; Dritsaki, 2005; Li et al., 2010; Muradoglu et al., 2000; Ratanapakom and Sharma, 2007; Tsoukalas, 2003; Verma and Ozuna, 2005; Wongbangpo and Sharma, 2002) to examine the short-run equilibrium relationships between macroeconomic variables and stock market indices. The results found that macroeconomic variables significantly influence stock market indices. However, the VEC equilibrium time-series model applied by others (Adeleke and Gbadebo, 2012; Agrawalla and Tuteja, 2008; Chaudhuri and Smiles, 2004; Filis, 2010; Herve et al., 2011; Hess, 2004; Hosseini et al., 2011; Karacaer and Kapusuzoglu, 2010; Kyereboah and Agyire, 2008; Maysami and Koh, 2000; Muradoglu et al., 2001; Nasseh and Strauss, 2000; Patra and Poshakwale, 2006; Wong et al., 2006) to explore the long-run and short-run equilibrium relationships between macroeconomic variables and stock market indices. These studies revealed that macroeconomic variables significantly change stock market indices.

At the same time, numerous studies analyzed the relationships between macroeconomic variables and stock market indices using GARCH volatility time-series models (Bhar and Malliaris, 2011; Chen, 2009; Erdem et al., 2005; Hanousek and Kocenda, 2011; Hsing, 2011; Hsing and Hsieh, 2012; Kim et al., 2004; Nguyen, 2011; Rangel, 2011). Also, the results indicated that the conditional volatility of macroeconomic variables significantly influence stock market indices.

One of the key objectives of this paper is to analyze the long-run and short-run equilibrium relationships between macroeconomic variables (GDP, PPI, CPI, ER and M3) and SMI by applying the equilibrium time-series bounds tests Approach developed by PSS (2001). Therefore, the formulation of paper hypotheses is essentially based on the previous empirical studies that conducted using VAR and VEC equilibrium time-series models as follows:

H₁: *There are significant long-run equilibrium relationships between macroeconomic variables (GDP, PPI, CPI, ER, and M3) and SMI.*

H₂: *There are significant short-run equilibrium relationships between macroeconomic variables (GDP, PPI, CPI, ER, and M3) and SMI.*

4. Data Selection and Methodology Specification

4.1 Data Selection

Annual time-series data for the macroeconomic variables and SMI for the 1977-2011 period were collected. SMI represents the annual figures of Malaysian stock market index was obtained from Bursa Malaysia (www.bursamalaysia.com). M3 (RM billion) and ER (RM/US\$) were collected from Bank Negara Malaysia (www.bnm.gov.my). GDP denotes the proxy of Malaysian real economic activity (RM billion) was obtained from the World Bank economic indicators data base (<http://databank.worldbank.org/ddp/home.do>). PPI and CPI were collected from Malaysian department of statistics (www.statistics.gov.my). According to the theory variables (M3, ER, GDP, PPI and CPI) could influence stock market indices either positively or negatively (Chaudhuri and Smiles, 2004; Hanousek and Kocenda, 2011; Ibrahim and Aziz, 2003). To stabilize the variables variances and to remove the seasonality, the variables transformations into natural logarithmic forms were used (Montgomery et al., 2008), except ER to make this variable simultaneous with other variables (Chen et al., 1986).

4.2 Methodology Specification

Over the past decades, economists have been aware that estimating time-series econometric models with non-stationary variables leads definitely to spurious results (Gujarati and Porter, 2008). If a variable contains a

unit root, then, it is non-stationary and it is combination with other non-stationary variable leads to non-meaningful or spurious regression (Brooks, 2008). Evidence from the past studies suggested the presence of unit root in most of financial and economic variables (Montgomery et al., 2008). Therefore, it need to differentiate variables either $I(1)$ or $I(d)$ to achieve their stationarity. For this reason, it is necessary to test the presence of unit roots and to differentiate the variables. The current study employs NP bounds statistics test to detect individually the variables stationarity, since this test is more appropriate with small sample sizes.

However, the concept of co-integration reveals the existence of long-run equilibrium relationship among variables, where there is no tendency change, since economic and financial variables are in balance (Gujarati and Porter, 2008). Besides, the concept of co-integration that deals with the long-run relationship among a group of variables, where these variables either $I(0)$, $I(1)$ or $I(d)$ (Gujarati and Porter, 2008) is used to determine the appropriate model. The present study uses the bounds F-statistics test to identify the co-integration among variables.

In time series methodologies, numerous studies examined the long-run and short-run equilibrium relationships between macroeconomic variables and stock market indices using VAR and VEC Models. Under VAR Model, however, all variables are stationary and not co-integrated at the same level either $I(1)$ or $I(2)$ (Engle and Granger, 1987). On another vein, under VECM all variables are stationary and co-integrated at the same level either $I(1)$ or $I(2)$ (Johansen and Juselius, 1990). To examine the long-run and short-run equilibrium relationships between macroeconomic variables (LGDP, LPPI, LCPI, ER and LM3) and LSMI, PSS bounds tests approach is applied. This approach has many advantages compared with VAR and VEC Models. In other words, under PSS approach all variables are stationary and co-integrated at the same level either $I(1)$, $I(0)$ or mutually co-integrated. Furthermore, this approach is more appropriate with small sample sizes (PSS, 2001). In matrix elements, this approach could be formulated as the following system:

$$\begin{bmatrix} \Delta LSMI_t \\ \Delta LGDP_t \\ \Delta LPPI_t \\ \Delta LCPI_t \\ \Delta ER_t \\ \Delta LM3_t \end{bmatrix} = \begin{bmatrix} \gamma_1 \\ \gamma_2 \\ \gamma_3 \\ \gamma_4 \\ \gamma_5 \\ \gamma_6 \end{bmatrix} + \begin{bmatrix} \Gamma_{11} & \Gamma_{12} & \Gamma_{13} & \Gamma_{14} & \Gamma_{15} & \Gamma_{16} \\ \Gamma_{21} & \Gamma_{22} & \Gamma_{23} & \Gamma_{24} & \Gamma_{25} & \Gamma_{26} \\ \Gamma_{31} & \Gamma_{32} & \Gamma_{33} & \Gamma_{34} & \Gamma_{35} & \Gamma_{36} \\ \Gamma_{41} & \Gamma_{42} & \Gamma_{43} & \Gamma_{44} & \Gamma_{45} & \Gamma_{46} \\ \Gamma_{51} & \Gamma_{52} & \Gamma_{53} & \Gamma_{54} & \Gamma_{55} & \Gamma_{56} \\ \Gamma_{61} & \Gamma_{62} & \Gamma_{63} & \Gamma_{64} & \Gamma_{65} & \Gamma_{66} \end{bmatrix} \begin{bmatrix} \Delta LSMI_{t-1} \\ \Delta LGDP_{t-1} \\ \Delta LPPI_{t-1} \\ \Delta LCPI_{t-1} \\ \Delta ER_{t-1} \\ \Delta LM3_{t-1} \end{bmatrix} + \begin{bmatrix} \delta_{11} & \delta_{12} & \delta_{13} & \delta_{14} & \delta_{15} & \delta_{16} \\ \delta_{21} & \delta_{22} & \delta_{23} & \delta_{24} & \delta_{25} & \delta_{26} \\ \delta_{31} & \delta_{32} & \delta_{33} & \delta_{34} & \delta_{35} & \delta_{36} \\ \delta_{41} & \delta_{42} & \delta_{43} & \delta_{44} & \delta_{45} & \delta_{46} \\ \delta_{51} & \delta_{52} & \delta_{53} & \delta_{54} & \delta_{55} & \delta_{56} \\ \delta_{61} & \delta_{62} & \delta_{63} & \delta_{64} & \delta_{65} & \delta_{66} \end{bmatrix} \begin{bmatrix} LSMI_{t-1} \\ LGDP_{t-1} \\ LPPI_{t-1} \\ LCPI_{t-1} \\ ER_{t-1} \\ LM3_{t-1} \end{bmatrix} + \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \\ \eta_4 \\ \eta_5 \\ \eta_6 \end{bmatrix} \begin{bmatrix} ECM_{t-1} \\ ECM_{t-1} \\ ECM_{t-1} \\ ECM_{t-1} \\ ECM_{t-1} \\ ECM_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \\ \varepsilon_4 \\ \varepsilon_5 \\ \varepsilon_6 \end{bmatrix}$$

Δ represents the backshift operator; $\gamma_i (i = 1, \dots, 6)$ and $\varepsilon_i (i = 1, \dots, 6)$ denote intercepts and error terms respectively; ECM_{t-1} represents the one period lagged error term which used to link the long-run equilibrium of the variables with their short-run and to insure the co-integration; $\eta_i (i = 1, \dots, 6)$ denote the coefficients of ECM_{t-1} ; $\delta_{ij} (i, j = 1, \dots, 6)$ and $\Gamma_{ij} (i, j = 1, \dots, 6)$ represent the long-run and short-run coefficients of variables respectively.

The H_0 of no co-integration among the variables is tested by setting the δ_{ij} of the one lagged variables equal to zero i.e., $H_0: \delta_{ij} = 0$, against the H_1 of co-integration among variables where δ_{ij} of one lagged variables are not equal to zero i.e., $H_1: \delta_{ij} \neq 0$.

The calculated F-statistics are compared with the critical values tabulated at statistical tables in PSS (2001). If the calculated F-statistics are greater than the upper bounds, then the H_0 are definitely rejected, which means that the variables included in the models are shared long-run relationships among themselves (PSS, 2001). If the calculated F-statistics are smaller than the lower bounds, then the H_0 are accepted, which means that the variables included in the models are not shared long-run relationships among themselves (PSS, 2001). However, if the calculated F-statistics fall between the upper and the lower bounds values, then, the decisions are inconclusive to either accept or reject the H_0 (PSS, 2001).

However, after specifying stationarity and co-integration tests we proceed on analyzing the long-run and short-run coefficients as well as the error correction terms of the above system.

5. Results Analyses

5.1 Stationarity Bounds Statistics Test

Table 1 reports the stationarity results of NP bound statistics test which is carried out on the logarithms of the variables and using the deterministic components of intercept and trend.

Table 1. Stationarity Results of Bounds Statistics Test

Stages	Variables	MZ_a^{GLS}	MZ_a^{GLS} Critical		MZ_t^{GLS} Critical		MSB^{GLS} Critical		MP_T^{GLS} Critical	
			Values	Values	Values	Values	Values	Values		
Lower Bound	LSMI	-13.87	-23.81	-2.60	-2.62	0.187	0.185	6.75	6.67	
	LGDP	-2.29	-23.82	-0.96	-2.63	0.42	0.186	34.84	6.68	
	LPPI	-5.02	-23.83	-1.54	-3.42	0.31	0.14	17.93	4.03	
	LCPI	-6.32	-23.84	-1.67	-3.43	0.26	0.13	14.37	4.02	
	ER	-7.12	-23.86	-1.77	-3.44	0.25	0.12	12.95	4.01	
	LM3	-394.64*	-23.81	-14.00*	-3.45	0.04*	0.11	0.32*	4.04	
Upper Bound	Δ LSMI	-32.57*	-23.88	-4.03*	-3.45	0.12*	0.16	2.82*	4.03	
	Δ LGDP	-16.19***	-14.20	-2.74***	-2.66	0.17***	0.19	6.25***	6.67	
	Δ LPPI	-16.14***	-14.21	-2.84***	-2.62	0.18***	0.18	5.67***	6.68	
	Δ LCPI	-16.42***	-14.22	-2.86***	-2.63	0.17***	0.17	5.56***	6.67	
	Δ ER	-16.24***	-14.23	-2.85***	-2.64	0.18***	0.16	5.62***	6.69	
	Δ LM3	-12.91	-14.25	-2.54	-2.62	0.20	0.15	7.06	6.66	

Note: (1) *, ***, denote significance at 1 and 10% level respectively.

(2) MZ_a^{GLS} , MZ_t^{GLS} and MSB^{GLS} are the enhancements of Phillips and Perron (1988) statistics tests. They used to correct the size distortions when residuals are negatively correlated.

Source: Output of Eviews 7.2 Econometric Software.

Table 1 shows that all variables are non-stationary at the lower bound except LM3 which is stationary at the 1% significant level. At the upper bound, however, all the variables are stationary, but with different significance levels. Specifically, LGDP, LPPI, LCPI and ER are stationary at 10% significance level, while LSMI is stationary at 1% significance level. The results indicate that all variables employed in regression are stationary and would not cause spurious regression results.

5.2 Bounds F-statistics Test

Given that all the variables are stationary, we can apply the bounds F-statistics as suggested by PSS (2001) to test the H_0 of no co-integration among variables. Table 2 provides the results of calculated and critical values of bounds F-statistics test.

Table 2. Bounds F-statistics Test Results

Models	Calculated F-statistics ²	Critical values of F-statistics ¹		
		Significance Level	Lower Bound	Upper Bound
LSMI _t	3.46**	1%	1.99	1.94
LGDP _t	2.97*	2.5%	2.27	3.28
LPPI _t	2.75*	5%	2.55	3.61
LCPI _t	3.47**	10%	2.88	3.99
ER _t	2.08*			
LM3 _t	3.88***			

Notes: (1) PSS (2001), Critical Values Table; (2). *, **, ***, **** denote significance at 1, 2.5, 5 and 10% levels, respectively.

Source: Output of Micro-fit 4.1 Econometric Software.

Table 2 reveals that the H_0 of no co-integration in all models are rejected, but with different significance levels. The H_0 is rejected in LSMI_t and LCPI_t models at 2.5% and 5% significance level respectively.

For the $LGDP_t$, $LPPI_t$ and ER_t models the decisions are inconclusive to either accept or reject H_0 and in this study we reject the H_0 . Also, it concludes that all variables are co-integrated with $LSMI_t$ in the long-run and any deviations may occur in the short-run. The results are confirmed with others results studies (Chaudhuri and Smiles, 2004; Hanousek and Kocenda, 2011; Ibrahim and Aziz, 2003).

5.3 Long-run and Error Correction Analyses

The presence of long-run equilibrium relationships among variables does not imply the perfect co-integration (Engle and Granger, 1987). That is, if the error correction terms are significant with negative signs, then, the error correction terms are stable and co-integration, the causality in the long-run is achieved. Table 3 provides the long-run coefficients and error correction terms of the models in the present paper (See, Section 4.2).

Table 3. Long-run and Error Correction Coefficients

Models	Constant	$LSMI_{t-1}$	$LGDP_{t-1}$	$LPPI_{t-1}$	$LCPI_{t-1}$	ER_{t-1}	$LM3_{t-1}$	ECM_{t-1}
$\Delta LSMI_t$	-16.84		2.13**	-2.02*	-4.59*	-0.20***	-0.96***	-1.37*
$\Delta LGDP_t$	12.78*	-0.41***		0.07	0.15	0.04***	0.40*	-0.88*
$\Delta LPPI_t$	-66.37*	-0.41***	5.21*		-0.17	-0.26*	-2.08	-0.33*
$\Delta LCPI_t$	0.52	0.13*	0.13	-0.08		0.06	0.07	1.00*
ΔER_t	-22.42	-2.59	3.37	-5.66**	-7.8		2.95	-0.53*
$\Delta LM3_t$	-25.02*	-0.02	1.85*	-0.32***	20.86**	-0.16*		-0.57*

Note: *, **, *** denote significance at 1, 5 and 10% level respectively.

Source: Output of Micro-fit 4.1 Econometric Software.

Table 3 shows that at 1% significance level, $LGDP_{t-1}$ is positively associated with $LM3_t$ model, and the reverse does hold. $LPPI_{t-1}$ and $LCPI_{t-1}$ are negatively associated with $LSMI_t$ model, while $LPPI_{t-1}$ and ER_{t-1} are negatively associated with $LM3_t$ model. However, $LPPI_{t-1}$ is negatively associated with ER_t model. At 5% significance level, $LCPI_{t-1}$, $LGDP_{t-1}$ and ER_{t-1} are positively associated with $LM3_t$, $LSMI_t$ and $LCPI_t$ models respectively, while ER_{t-1} is negatively associated with $LPPI_t$ model. At 10% significance level, $LGDP_{t-1}$, ER_{t-1} and $LM3_{t-1}$ are negatively associated with $LPPI_t$, $LSMI_t$ and $LCPI_t$ models, while ER_{t-1} is positively associated with $LGDP_t$ model.

Furthermore, Table 3 illustrates that the coefficients of (ECM_{t-1}) 's are significant with appropriate signs. Thus, the perfect co-integration and causality among variables are achieved. Further, the highly significant of ECM_{t-1} implies a quite speed of achieving the long-run equilibrium. Specifically, the $\Delta LSMI_t$ model records the highest ECM_{t-1} in absolute value among other models suggesting that 137% of any previous disequilibrium in the long-run would be shortly corrected back in the current year, while, $LPPI_t$ model records the lowest ECM_{t-1} in absolute value suggesting a very low speed toward its long-run equilibrium.

5.4 Short-run Analysis

After conducting long-run and error correction analyses we proceed for analyzing the short-run status of the models. So, table 4 presents the results of the short-run analysis. These results reveal that the lagged variables in $\Delta LSMI_t$ model are significant and the variables are Granger cause $\Delta LSMI_t$ in the short-run, while the lagged variables of $\Delta LCPI_t$ are not Granger cause $\Delta LGDP_t$, $\Delta LPPI_t$ and $\Delta LM3_t$ models. On the other hand, the lagged variables of $\Delta LSMI_t$, and $\Delta LM3_t$ are Granger cause $\Delta LCPI_t$ model, while the lagged variables of $\Delta LGDP_t$ and $\Delta LSMI_t$ are not Granger cause ΔER_t and $\Delta LM3_t$ models respectively.

Table 4. Short-run Results

<i>Variables Lagged Values</i>	<i>Models</i>					
	ΔLSMI_t	ΔLGDP_t	ΔLPPI_t	ΔLCPI_t	ΔER_t	ΔLM3_t
ΔLSMI_t		0.03**	-0.04	-0.01	-0.97*	0.03
ΔLSMI_{t-1}	0.26***		0.06**	-0.09*	0.29***	0.03
ΔLSMI_{t-2}				-0.04**		
ΔLGDP_t	-2.91***		1.11*	0.12	1.78	0.53***
ΔLGDP_{t-1}		0.03	0.19			
ΔLGDP_{t-2}		0.18	0.35**			
ΔLPPI_t	-272*	0.42*		0.08		0.04
ΔLPPI_{t-1}	-1.53***	0.06			-2.09***	0.13
ΔLPPI_{t-2}	-1.20	0.14				0.29**
ΔLCPI_t	-1.02		-0.06		0.02	-0.23
ΔLCPI_{t-1}	4.75*				4.21*	
ΔLCPI_{t-2}	2.24**				1.84	
ΔER_t	-0.64*		-0.03	0.01		0.00
ΔER_{t-1}		-0.09*	0.12*			0.05***
ΔER_{t-2}			0.09*			0.04***
ΔLM3_t	1.32***	0.36*	0.69*	0.07	1.56***	
ΔLM3_{t-1}				-0.29*		-0.18
ΔLM3_{t-2}				-0.28**		
Constant	-23.08	11.27*	-22.08*	0.53	-11.89	-14.27*

Note: *, **, *** denote significance at 1, 5 and 10% level.

Source: Output of Micro-fit 4.1 Econometric Software.

6. Policy Implications

The results of this study suggest that Malaysian policy makers should pay more attention to the effects of monetary policies and economic activity measurement on stock market. Specifically, the results are confirmed with earlier results of Ibrahim (1999) who found that the money supplies are positively and negatively associated with SMI in both long-run and short-run. The contraction of money supply leads to lower interest rate, lower firm investment, and then, decreases the attractiveness of investors to invest in stock market. In sharp contrast, the expansion of money supply leads to raise stock market index due to more liquidity, more output and portfolio adjustment (Hsing and Hsieh, 2012). However, a further increase in money supply reduces stock market index because of inflationary influences and its negative effects on stock market index. Besides, the results are confirmed with the results of Hanousek and Kocenda (2011) who revealed that the GDP is positively and negatively associated with the emerging European stock market indices. A high GDP in a particular industry, such as the Malaysian manufacturing industry is a sign that the firms in that industry are performing well, thereby leads to increase their share prices in stock market. In sharp contrast, a low GDP is a sign that these firms are not performing well, which lead to decrease their share prices in stock market. Indeed, the results are consistency with the results of Ibrahim and Aziz (2003) study who found that the ER is negatively associated with Malaysian stock market index in the long-run and short-run.

In addition, Malaysian policy makers, also, should be aware to the importance of inward FDI in enhancing economic growth. The attraction of FDI into Malaysia creates jobs and employment in economic and financial sectors, improves production and management techniques and moreover, increases the competitiveness in domestic and international markets.

7. Conclusions, Future Research and Limitation

The present paper examines the long-run and short-run equilibrium relationships between macroeconomic variables (GDP, PPI, CPI, ER, and M3) and SMI using annual time-series data for the 1977-2011 period. However, it employs NP bounds statistics test to detect the variables stationarity and bounds F-statistic for testing the co-integrating relationships among variables. The long-run and short-run equilibrium relationships among variables are analyzed using PSS bounds tests Approach. Results of NP test show that the H0 of non-stationary is rejected at all cases except one variable. More specifically, the variables SMI, GDP, PPI, CPI, ER, and M3 are stationary at the upper bound, while the variable GDP is stationary at the lower bound. The results of bounds F-statistics test reveal that all variables are co-integrated with SMI. In addition, the results

of PSS bounds tests Approach show the presence of long-run and short-run equilibrium relationships between all macroeconomic variables and SMI. In particular, PPI, CPI, ER, and M3 are negatively associated with SMI in the long-run, while GDP is positively associated. Additionally, GDP, PPI, and ER are negatively associated with SMI in the short-run, while CPI and M3 are positively associated.

The study adds to the existing literature and focuses on the long-run and short-run equilibrium relationships between macroeconomic variables and stock market index in Malaysia as an emerging stock market rather than matured stock markets (case of US or the UK) which have been frequently studied in the past. Finally, the results of this paper are of particular interest and importance to policy makers, financial economists, domestic investors and international investors dealing with Malaysian economy and stock market. In fact, future research could broaden this study by adding more variables that have significant influences on stock prices such as oil prices and inward FDI or including more than one country to draw robust results.

From statistical perspective, the main limitation of this study is the small sample size of 35 observations which has a limiting factor, since the number of lags that use, consumes the number of observations and leads to specification errors in the analysis (Gujarati & Porter, 2008).

References

- Abugri, B. A. (2008). Empirical relationship between macroeconomic volatility and stock returns: Evidence from Latin American markets. *International Review of Financial Analysis*, 17, 396-410. <http://dx.doi.org/10.1016/j.irfa.2006.09.002>
- Adeleke, A. I., & Gbadebo, A. O. (2012). Macroeconomic policy and returns on equities: Empirical evidence from the Nigerian capital market. *International Research Journal of Finance and Economics*, 83, 106-119.
- Adjasi, K. D. C. (2009). Macroeconomic uncertainty and conditional stock-price volatility in frontier African markets: Evidence from Ghana. *The Journal of Risk Finance*, 10(4), 333-349. <http://dx.doi.org/10.1108/15265940910980641>
- Agrawalla, R. K., & Tuteja, S. K. (2008). Share prices and macroeconomic variables in India. *Journal of Management Research*, 8(3), 137-146.
- Araujo, E. (2009). Macroeconomic shocks and the co-movement of stock returns in Latin America. *Emerging Markets Review*, 10, 331-344. <http://dx.doi.org/10.1016/j.ememar.2009.08.003>
- Beltratti, A., & Morano, C. (2006). Breaks and Persistency: macroeconomic causes of stock market volatility. *Journal of Econometrics*, 131, 151-177. <http://dx.doi.org/10.1016/j.jeconom.2005.01.007>
- Bhar, R., & Malliaris, A. G. (2011). Dividends, momentums, and macroeconomic variables as determinants of the US equity premium across economic regimes. *Review of Behavioral Finance*, 3, 27-53. <http://dx.doi.org/10.1002/rbf.14>
- Bjornland, H. C. & Leimtemo, K. (2009). Identifying the interdependence between US monetary policy and the stock market. *Journal of Monetary Economics*, 56, 275-282.
- Black, A., Fraser, P., & Groenewold, N. (2003). U.S. Stock prices and macroeconomic fundamentals. *International Review of Economics and Finance*, 12, 345-367. [http://dx.doi.org/10.1016/S1059-0560\(03\)00016-9](http://dx.doi.org/10.1016/S1059-0560(03)00016-9)
- Brooks, C. (2008). *Introductory econometrics for finance*. 2nd Edition, Cambridge University press, New York, USA. <http://dx.doi.org/10.1017/CBO9780511841644>
- Bursa Malaysia. (2012). FTSE Bursa Malaysia Index Series, available on line at: http://www.ftse.com/Indices/FTSE_Bursa_Malaysia_Index_Series/Downloads/FTSE_Bursa_Malaysia_Index_Series_FAQv3.pdf
- Buyuksalvarci, A., & Abdioglu, H. (2010). The causal relationship between stock prices and macroeconomic variables: A case study for Turkey. *International Journal of Economic Perspectives*, 4(4), 601-610.
- Chaudhuri, K., & Smiles, S. (2004). Stock market and aggregate economic activity: Evidence from Australia. *Applied Financial Economics*, 14(2), 121-129. <http://dx.doi.org/10.1080/0960310042000176399>
- Chen, N., Richard R., & Stephen, A. R. (1986). Economic forces and the stock market. *Journal of Business*, 59(3), 383-403. <http://dx.doi.org/10.1086/296344>
- Chen, S. (2009). Predicting the bear stock market: Macroeconomic variables as leading indicators. *Journal of Banking and Finance*, 33, 211-223. <http://dx.doi.org/10.1016/j.jbankfin.2008.07.013>

- Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for auto-regression time series with a unit root. *Journal of the American Statistical Association*, 10, 291-321.
- Dritsaki, M. (2005). Linkage between stock market and macroeconomic fundamentals: Case study of Athens stock exchange. *Journal of Financial Management and Analysis*, 18(1), 38-47.
- Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation estimation and testing. *Econometrica*, 55, 251-276. <http://dx.doi.org/10.2307/1913236>
- Erdem, C., Arslan, K. C., & Sema, M. (2005). Effects of macroeconomic variables on Istanbul stock exchange indexes. *Applied Financial Economics*, 15(14), 987-994. <http://dx.doi.org/10.1080/09603100500120365>
- Filis, G. (2010). Macro economy, stock market and oil prices: Do meaningful relationships exist among their cyclical fluctuations? *Energy Economics*, 32, 877-886. <http://dx.doi.org/10.1016/j.eneco.2010.03.010>
- Ghosh, D. K., & Ariff, M. (2004). *Global financial markets*. 1st edition. USA, Greenwood Publishing group.
- Gujarati, D., & Porter, D. (2008). *Basic econometrics*. 5th edition, USA, New York, the McGraw-Hill companies.
- Gujarati, D., & Porter, D. (2008). *Basic econometrics*. 5th edition, New York, USA, McGraw-Hill companies.
- Gunasekarage, A., Pisdtasalasai, A., & Power, D. (2004). Macroeconomic influence on the stock market: Evidence from an emerging market in South Asia. *Journal of Emerging Market Finance*, 3(3), 285-304. <http://dx.doi.org/10.1177/097265270400300304>
- Hanousek, J., & Kocenda, E. (2011). Foreign news and spillovers in emerging European stock markets. *Review of International Economics*, 19(1), 170-188. <http://dx.doi.org/10.1111/j.1467-9396.2010.00939.x>
- Hassapis, C., & Kalyvits, S. (2002). Investigating the links between growth and real stock price changes with empirical evidence from the G-7 economies. *The Quarterly Review of Economics and Finance*, 42, 543-575. [http://dx.doi.org/10.1016/S1062-9769\(01\)00111-9](http://dx.doi.org/10.1016/S1062-9769(01)00111-9)
- Hatemi-J, A., & Morgan, B. (2009). An empirical analysis of the informational efficiency of Australian equity markets. *Journal of Economic Studies*, 36(5), 437-445. <http://dx.doi.org/10.1108/01443580910992366>
- Herve, D. B. G., Chanmalai, B., & Shen, Y. (2011). The study of causal relationships between stock markets indices and macroeconomic variables in Cote d'Ivoire: Evidence from Error-Correction Models and Granger causality test. *International Journal of Business and Management*, 6(12), 146-170.
- Hess, M.K. (2004). Dynamic and asymmetric impacts of macroeconomic fundamentals on an integrated stock market. *International Financial Markets, Institutions & Money*, 14, 455-471. <http://dx.doi.org/10.1016/j.intfin.2003.12.005>
- Hosseini, S. M., Ahmad, Z., & Lai, Y. W. (2011). The role of macroeconomic variables on stock market index in China and India. *International Journal of Economics and Finance*, 3(6), 233-244. <http://dx.doi.org/10.5539/ijef.v3n6p233>
- Hsing, Y. (2011). Effects of macroeconomic variables on the stock market: The case of the Czech Republic. *Theoretical and Applied Economics*, 7(560), 53-64.
- Hsing, Y., & Hsieh, W. (2012). Impacts of macroeconomic variables on the stock market index in Poland: New evidence. *Journal of Business Economics and Management*, 13(2), 334-343. <http://dx.doi.org/10.3846/16111699.2011.620133>
- Humpe, A., & Macmillan, P. (2009). Can macroeconomics variables explain long-term stock market movements? A comparison of the US and Japan. *Applied Financial Economics*, 19(2), 111-119. <http://dx.doi.org/10.1080/09603100701748956>
- Ibrahim, M. H. (1999). Macroeconomic variables and stock prices in Malaysia: an empirical analysis. *Asian Economic Journal*, 13(2), 219-231. <http://dx.doi.org/10.1111/1467-8381.00082>
- Ibrahim, M. H., & Aziz, H. (2003). Macroeconomic variables and the Malaysian equity market a view through rolling subsamples. *Journal of Economic Studies*, 30, 6-27. <http://dx.doi.org/10.1108/01443580310455241>
- Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on co-integration-with applications to the demand for money. *Oxford Bulletin of Economics and Statistics*, 52, 169-210. <http://dx.doi.org/10.1111/j.1468-0084.1990.mp52002003.x>
- Karacaer, S., & Kapusuzoglu, A. (2010). Investigating causal relations among stock market and macroeconomic

- variables: Evidence from Turkey. *International Journal of Economic Perspectives*, 4(3), 501-507.
- Kim, S., McKenzie, M. D., & Faff, R. W. (2004). Macroeconomic news announcements and the role of expectations: evidence for US bond, stock and foreign exchange markets. *Journal of Multinational Financial Management*, 14, 217-232. <http://dx.doi.org/10.1016/j.mulfin.2003.02.001>
- Kizys, R., & Pierdzioch, C. (2009). Changes in the international co-movement of stock returns and asymmetric macroeconomic shocks. *Journal of International Financial Markets, Institutions and Money*, 19, 289-305. <http://dx.doi.org/10.1016/j.intfin.2008.01.002>
- Kyereboah, A., & Agyire, K. (2008). Impact of macroeconomic indicators on stock market performance: The case of the Ghana Stock Exchange. *Journal of Risk Finance*, 9(4), 365-378. <http://dx.doi.org/10.1108/15265940810895025>
- Li, Y. D., Iscan, T. B., & Xu, K. (2010). The impact of monetary policy shocks on stock prices: Evidence from Canada and the United States. *Journal of International Money and Finance*, 29, 876-896. <http://dx.doi.org/10.1016/j.jimonfin.2010.03.008>
- Liu, M., & Shrestha, K. M. (2008). Analysis of the long-term relationship between macro-economy variables and the Chinese stock market using heteroscedastic co-integration. *Managerial Finance*, 34(11), 744-755. <http://dx.doi.org/10.1108/03074350810900479>
- Maradoglu, G., Taskin, F., & Bigan, I. (2000). Causality between stock returns and macroeconomic variables in emerging markets. *Russian and East European Finance and Trade*, 36(6), 33-53.
- Maysami, R. C., & Koh, T. S. (2000). A vector error correction model of the Singapore stock market. *International Review of Economics and Finance*, 9, 79-96. [http://dx.doi.org/10.1016/S1059-0560\(99\)00042-8](http://dx.doi.org/10.1016/S1059-0560(99)00042-8)
- Mishkin, F. S. (2004). *The economics of money, banking, financial markets*. 7th edition, the Addison-Wesley series in econometrics, USA.
- Montgomery, D. S., Jennings, C. L., & Kulahci, M. (2008). *Introduction to time series analysis and forecasting*. 1st edition, Canada, John Wiley & Sons.
- Morelli, D. (2002). The relationship between conditional stock market volatility and conditional macroeconomic volatility Empirical evidence based on UK data. *International Review of Financial Analysis*, 11, 101-110. [http://dx.doi.org/10.1016/S1057-5219\(01\)00066-7](http://dx.doi.org/10.1016/S1057-5219(01)00066-7)
- Muradoglu, G., Metin, K., & Argac, R. (2001). Is there a long run relationship between stock returns and monetary variables: Evidence from an emerging market. *Applied Financial Economics*, 11, 641-649. <http://dx.doi.org/10.1080/09603100110094411>
- Nasseh, A., & Strauss, J. (2000). Stock prices and domestic and international macroeconomic activity: a co-integration approach. *The Quarterly Review of Economics and Finance*, 40, 229-245. [http://dx.doi.org/10.1016/S1062-9769\(99\)00054-X](http://dx.doi.org/10.1016/S1062-9769(99)00054-X)
- Ng, S., & Perron, P. (2001). Lag length and the construction of unit root tests with good size and power. *Econometrica*, 69(6), 1519-1554. <http://dx.doi.org/10.1111/1468-0262.00256>
- Nguyen, T. (2011). US macroeconomic news spillover effects on Vietnamese stock market. *Journal of Risk Finance*, 12(5), 1-16. <http://dx.doi.org/10.1108/15265941111176127>
- Ortiz, E., Cabello, A., & Jesus, R. D. (2006). Long-run inflation and exchange rates hedge of stocks in Brazil and Mexico. *Global Economy Journal*, 6(3), 1-29. <http://dx.doi.org/10.2202/1524-5861.1188>
- Pal, K., & Mittal, R. (2011). Impact of macroeconomic indicators on Indian capital markets. *Journal of Risk Finance*, 12(2), 84-97. <http://dx.doi.org/10.1108/15265941111112811>
- Patra, T., & Poshakwale, S. (2006). Economic variables and stock market returns: evidence from the Athens stock exchange. *Applied Financial Economics*, 16(13), 993-1005. <http://dx.doi.org/10.1080/09603100500426523>
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approach to the analysis of level relationships. *Journal of Applied Econometrics*, 16, 289-326. <http://dx.doi.org/10.1002/jae.616>
- Rangel, J. G. (2011). Macroeconomic news, announcements, and stock market jump intensity dynamics. *Journal of Banking and Finance*, 35, 1263-1276. <http://dx.doi.org/10.1016/j.jbankfin.2010.10.009>
- Ratanapakom, O., & Sharma, C.S. (2007). Dynamic analysis between the US stock returns and the

- macroeconomic variables. *Applied Financial Economics*, 17(5), 369-377.
<http://dx.doi.org/10.1080/09603100600638944>
- Tsoukalas, D. (2003). Macroeconomic factors and stock prices in the emerging Cypriot equity market. *Managerial Finance*, 29(4), 87-92. <http://dx.doi.org/10.1108/03074350310768300>
- Verma, R., & Ozuna, T. (2005). Are emerging equity markets responsive to cross-country macroeconomic movements? Evidence from Latin America. *Journal of International Finance Markets, Institutions and Money*, 15, 73-87. <http://dx.doi.org/10.1016/j.intfin.2004.02.003>
- Wong, W.K., Khan, H., & Du, J. (2006). Do money and interest rates matter for stock prices? An econometric study of Singapore and USA. *The Singapore Economic Review*, 51(1), 31-51.
<http://dx.doi.org/10.1142/S0217590806002214>
- Wongbangpo, P., & Sharma, S. (2002). Stock market and macroeconomic fundamental dynamic interactions: ASEAN-5 countries. *Journal of Asian Economics*, 13, 27-51.
[http://dx.doi.org/10.1016/S1049-0078\(01\)00111-7](http://dx.doi.org/10.1016/S1049-0078(01)00111-7)

Debt Overhang and Economic Growth in HIPC Countries: The Case of Southern African Development Community (SADC)

Musebu Sichula

Correspondence: Musebu Sichula, School of Finance, Shanghai University of Finance and Economics, Shanghai, 777 Guoding Road, 200433, China. E-mail: musebu.sichula@gmail.com

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Abstract

This paper examines the paradox of debt overhang in the Heavily Indebted Poor Countries (HIPC) of the Southern African Development Community (SADC). The purpose is to show debt overhang existence and the effect of debt relief (HIPC) on these countries. We used a combination of models to highlight the empirical evidence of the debt overhang theory in particular for SADC HIPC completion countries. Financial modeling was conducted to where a linear relationship was measured of debt indicators on economic output. A typical debt overhang model was adapted that was modified to show the effect of debt relief effects on both the economic output and private capital, eventually a causality test is done on economic output, private capital and debt service obligations using the Granger causality test. Results demonstrate that a significant relationship does exist between external debt and GDP. As external debt decreases it shows an increase in GDP. Also as countries in the region attain HIPC completion it greatly increases GDP, assumed to be due to a decrease in debt service obligations. Terms of trade significantly affects the private capital. As government capital expenditure decreases it shows an increase in private capital that can be used in investment and economic development within these countries. Debt service does not have any direct effect on GDP or private capital unless via forms of macroeconomic variables like debt. In conclusion debt overhang is still a paradox that may exist but debt relief plays a major role in GDP growth for these countries.

Keywords: HIPC completion point countries, SADC, external debt, economic growth, debt servicing, and debt overhang

1. Introduction

There have been various definitions in research that underline the external debt and economic growth relationship but the most common one is the debt overhang. Many have called it the debt overhang paradox. The theory was first discussed as far back as 1977 by Myers. His concept was based on a company's decision of borrowing. Later writers like Krugman (1998) and Sachs (1984, 1986) likened it to the debt situation of a country and its ability to meet debt servicing obligations and how debt relief would actually benefit the creditor receiving some payment. Debt overhang occurs if the stock of external debt in a country exceeds a country's repayment ability with some future probability, such as expected debt service increasingly depends on a country's output level. Krugman (1988) and Sachs (1989) stated that debt overhang exists when the country's debt service burden is so heavy that a large portion of the current output accrues to foreign lenders and consequently creates disincentive to invest. Debt service is therefore considered as an implicit tax, thereby discouraging investment and stifling economic growth which makes it virtually impossible for highly indebted countries to escape poverty (Clements et al. 2005 et al. Fonchamayo 2009). The hypothesis suggests that if there is some likelihood in the future that external debt will be larger than the country's repayment ability, the expected debt-service costs would discourage further domestic and foreign investment and harm economic growth (Pattillio, 2002). It has been postulated that debt overhang occurs at the peak of the debt Laffer curve. High debt service burden increases expected future taxes on the private sector and lowers private investment. Resources that might have funded investments are consumed by debt servicing. In addition, debt overhang can worsen economic performance by changing the quality of investment.

Debt relief is expected to stimulate growth by releasing resources from debt service to investments in infrastructure and institutions. Such investments in turn enhance domestic investment as well as attract private foreign investment. This began the discussion and the birth of initiatives of debt relief like HIPC (Heavily

Indebted Poor Countries). Observers note that growth declined during the 1980s when debt accumulated and growth accelerated during the 1990s when debt reduction occurred. Many models have been developed and tested on low income countries to show that the main way that the accumulation of external debt affects economic growth is via the reduction of investment. Other models developed using panel data for 29 HIPC countries from 1984 to 2000 have shown variables that affect the accumulation of external debt. These variables may vary from exchange rate, interest payments and control variables like governance indicators (Anoruo, Dimkpah and Ahmad, 2006). A key model often used to show this relationship is the neoclassical growth model. It tends to be the base of most research concerning this relationship and variables may be altered to show which variables show the most significant link, as we have done in this paper (Adegbite and Ayadi, 2008).

The model used to show our Debt overhang effect is based on a variant of Elbadawi, Ndulu and Ndungu (1999) model of external debt sustainability. The model has two versions namely: rate of growth and external debt relationship which investigates the debt overhang and financial constraint hypothesis; private investment and external debt relationship which investigates both demand side and the credit constraints.

In conclusion the purpose of this paper is to highlight the existence of debt overhang not only in this region but in general. Also to show the effect of debt relief (HIPC) on growth and private investment that are the main factors behind the debt overhang concept.

2. Literature Review

In most literature that confirms the hypothesis, a major limitation is that it does not elaborate on the details of the relationship-in particular; it does not address the question of whether there is a perceptible difference in the initial period of a debt build-up, and the later period when the repayment pressures become overwhelming.

The aspect of debt servicing is the key element to external debt management by a country. Writers like Domar (1944) and Krugman (1988) and Sachs (1989) felt that debt service is similar to an implicit tax, that has the ability to discourage investment and hence stifling economic growth which makes it virtually impossible for highly indebted countries to escape poverty (Clements et al. 2005). This concept is famously coined as "Debt overhang". They presented models addressing the incentive effects of debt reduction for a country suffering from debt overhang. The tenant of these models is that in reducing the face value of external debt, investment will be increased and debt service payments encouraged. Claessens (1990)'s paper presents some estimates, using secondary market prices of commercial bank debt of the Debt Laffer curves for highly indebted and sub-Saharan African countries. He shows evidence that only a few indebted countries are actually on the wrong side of their Debt Laffer curve. Writers like Bulow and Rogoff (1991) disagreed and suggested that the borrower's underdevelopment was due more to their own economic mismanagement than to the burden of external debt and thus debt overhang was a symptom rather than a cause of low economic growth in the indebted countries.

Deshpande (1997)'s paper attempts to explore the debt overhang hypothesis by an empirical examination of the investment experience of 13 severely indebted countries (HICs). He is able to demonstrate that, in countries with a debt overhang; external debt captures many of the effects of other explanatory variables that traditionally explain investment, the relationship between external debt and investment is consistently a negative one; His paper attempts to examine empirically the linkages between external debt and domestic investment on the basis of the experience of the above mentioned HICs during 1971-1991. Basically it attempts to demonstrate that in the countries with debt overhang, the pressure of debt repayment not only dominates policies, which affect investment, but also shape expectations. This is in addition to an earlier exercise by himself in 1993 where he tried to address the problem of debt overhang both theoretically and empirically. The result was that over the 20-year period between 1970 and 1990, the investment to GDP ratio was found to exhibit an inverse U-shape, with the negative relationship holding only after a certain debt to GDP ratio has been reached. The debt burden of HIPC countries was massive, for example in 1998 the ratio of debt stock to GNP for Sao Tome and Guinea-Bissau was 680% and 500%, while in 1995, Rwanda and Malawi spent 79% and 76% of their export revenue on debt servicing (World Bank, 2000). Prompting other studies of debt overhang as an IMF paper done by Pattillio, Poirson and Ricci (2002) that found that reasonable levels of external debt help finance productive investment that may be expected to enhance growth, but beyond a certain level additional indebtedness may reduce growth. Their argument is represented in the debt "Laffer curve", which posits that larger debt stocks tend to be associated with lower probabilities of debt repayment. This concept was coined by Sachs (1989) through the notion of "debt overhang". Debt overhang for a country exists when the country's debt service burden is so heavy that a large portion of the current output accrues to foreign lenders and consequently creates disincentive to invest. Pattillio, Poirson and Ricci (2003) extend and translate the debt Laffer curve and try and use this instrument to show the effects of debt on growth, by identifying

the peak point where debt begins to have a negative effect on growth. In their paper they go deeper into analyzing through what channels external debt affects growth. They investigate whether debt affects growth mostly through an effect on factor accumulation or on total productivity growth. They discover that the negative impact of high debt on growth appears to operate both through a strong negative effect on physical capital accumulation and total factor productivity growth. Similar supports of the debt overhang concept were Elbadawi, Ndulu and Ndungu (1997) that found that while current debt inflows enhanced economic growth, past debt accumulation, which was viewed as a proxy for debt overhang had a negative impact on economic growth. They were able to also confirm that the liquidity constraints caused by rising external debt servicing payments, reduced exports and thus hampered economic growth. It is fair to say that most literature shows that no one debt overhang model analyzes the effects on growth explicitly; most are by implication of an economic variable like investment or others. This view was not accepted by Easterly (2002) who felt that HIPC provided with debt relief in the past, merely led to poor behavior and more debt accumulation. Cordella (2005) found a negative marginal relationship between debt and growth at “intermediate” levels of debt. Kasibhatla, Sen and Stewart (2007) in their paper, try to raise the empirical validity of the debt overhang hypothesis. They discover that debt overhang impedes growth in Latin American economies severely and the impact was moderately negative in the Asian region. Their results are consistent with Battacharya and Clements (2004) who found that for 55 low income countries over the period 1970-1999 with high levels of debt depressed economic growth after present value of debt reached 15-20% of GDP. In their 2004 paper, Arslanalp and Henry claimed that the HIPCs do not suffer from debt overhang. Rather than most writers these did not align to the concept of debt overhang.

Adegbite, Ayadi and Ayadi (2008) investigated the impact of huge external debt with its servicing requirements on economic growth on the Nigerian economy to make meaningful inference of the impact of debt relief given to the country in 2006. Their research focus was on investigating the linear and nonlinear effects of debt on growth and investment using OLS and GLS. In summary the paper explores the impact of external debt burden on the economy by analyzing the applicability of “debt overhang theory” and the “crowding out” effect of debt in Nigeria.

Koeda (2008) paper presents a theoretical model to explain how debt overhang generated in low-income countries and discusses its implications for aid design and debt relief. It finds that the extent of debt overhang and the effectiveness of debt relief depend on a recipient country’s initial economic conditions and level of total factor productivity, showing that an LIC that has no effective tools to raise the country’s total factor productivity (TFP) may have an incentive to accumulate a significant amount of concessional debt and allocate resources to consumption rather than investment. His paper was an extension to Cohen and Sachs (1986)’s sovereign debt model as a concessional lending problems and numerically demonstrates how a link between debt and low growth may be generated in LICs.

3. Methodology and Model

3.1 Data

This study is carried out over the period 1970-2011, which is the period of time within which these countries accumulated debt and past the HIPC period upon which they received extensive debt relief. This data is obtained from the World Development Indicators (WDI) and Global Financial indicators (GFI). The paper focuses on panel data taken from the 5 SADC HIPC completion point countries namely; Zambia, Mozambique, Malawi, Tanzania and Madagascar. Besides being completion countries in the region these countries were chosen due to their strong regional similarities. These countries are Southern African based countries heavily reliant on natural resources for growth and trade heavily with China. They have in place Poverty Reduction Strategy Paper (PRSP), the maintenance of a sound macroeconomic policy framework, regular publication of information on public finances, and reform of the governance of their resources. In these countries, the basis of a virtuous circle of improved domestic saving and investment, increased external assistance, sustained higher economic growth, and improved prospects for achieving the Millennium Development Goals have been established. These countries do not yet, unfortunately, constitute a critical mass to drive the entire region on a generalized path of higher growth and poverty reduction. Basically the 5 countries reached completion point around the 2001-2006. The completion point marks the end of the HIPC process, after countries have met the requirements for reaching the decision point, this the stage at which countries start receiving debt relief on an interim basis. I represent this variable by inserting a dummy variable from the year of completion (HIPC). The growth model chosen is adapted from the Solow (1956) type neoclassical growth model.

3.2 Econometric Model

The debt overhang theory as stated is a theory that postulates that if there is likelihood in the future that the debt of country will become much larger than the country's ability to repay the debt, expected debt service obligations will have an ability to discourage further domestic investment and thus harm growth. It therefore acts as a tax towards investors. It is a variant of the model used by Elbadawi, Ndulu and Ndung'u (1999) of external debt sustainability.

The equations below investigate the impact of large external debt stock with its servicing requirements and the completion point effect on growth and its resultant fiscal deficit on private investment. A dummy variable is placed into the equation to account for activity before most of the countries' HIPC completion points when debt was not yet written off and after 2001-2006 (period of time all 5 countries had reached completion point) to show the effect of reaching the completion point on growth. The equation is given below:

$$Y_{git} = \alpha_0 + \alpha_1 \frac{EXDEBT}{GNI} it + \alpha_2 \frac{GCAPIT}{GDP} it + \alpha_3 \frac{DSERV}{GDP} it + \alpha_4 TOT_{it} + \alpha_5 HIPC_{it} + \alpha_6 EXR_{it} + \alpha_7 CP_{it} + \mu_t \quad (1)$$

$$PRIVCAP_{it} = \beta_0 + \beta_1 \frac{EXDEBT}{GNI} it + \beta_2 \frac{GCAPIT}{GDP} it + \beta_3 \frac{DSERV}{GDP} it + \beta_4 TOT_{it} + \beta_5 HIPC_{it} + \beta_6 EXR_{it} + \beta_7 CP_{it} + \mu_t \quad (2)$$

Where Y_g measures the rate of output growth which is GDP growth (annual). The TOT (Terms of Trade) that measures external shock (measured as terms of trade variability) that is normally included in such an equation. We place a dummy variable to account for debt relief (HIPC completion year for the country), this is represented by HIPC. The GCAPIT/GDP is the public investment (measured as capital expenditure) to GDP while EXDEBT/GNI is the ratio of external debt to gross national income. Investment is, to a large extent, a country specific issue, and therefore, variables determining it, are likely to vary considerably across countries. Hence we attempt to adopt a standard approach to make inter-country comparisons meaningful. We use the variable PRIVCAP as the measure of private investment. Inventory investment variable faces a problem of volatility and also that factors explaining it are far too varied to permit cross-country standardization (Deshpande, 1997). Private capital is deflated by GDP to overcome the variation in country sizes. The separation of public and private investment is the most desirable, but limitations in data availability prevent this. For developed and developing countries alike, econometric estimation of the investment function has not been very robust, and there is no consensus on which variables are most important in explaining investment. DSERV/GDP is the debt service to GDP calculation. Two other explanatory variables are included that of exchange rate (EXR) and corruption index (CP). Dependent and independent variables tend to be proxy based on theoretical and/or empirical justifications. It is needed to emphasize that the purpose of this exercise is basically to see the nature of the relationship between external debt burden and the levels of domestic investment and not to build a model for investment behavior per se. The latter part of this equation tries to measure the effects of debt overhang concept. Each of the different models in circulation – the neoclassical model, the accelerator model, the profits model, the Q model and so forth-has its adherents and its critics, and the results clearly vary according to the theoretical framework used. Due to the importance of expectations, the relationship between external debt and investment would actually be a dynamic one with debt affecting investment with a lag.

To finally explore our debt overhang relationship we carry out a Granger causality test. This test is a statistical hypothesis test for determining whether one time series statistically causes another. In this case we test if the time series of GDP can causes private capital investment We also check the effect of debt servicing on GDP and private capital investment using the following equations:

$$Y_t = \alpha_0 + \sum_{i=1}^{K_1} \alpha_i Y_{t-i} + \sum_{i=1}^{K_2} \beta_i X_{t-i} + \varepsilon_t \quad (3)$$

$$X_t = \gamma_0 + \sum_{i=1}^{K_3} \gamma_i Y_{t-i} + \sum_{i=1}^{K_4} \delta_i X_{t-i} + \vartheta_t \quad (4)$$

Hsiao (1981) suggests searching over the lag lengths (k1 to k4) and applying an information criterion to determine the optimal length of the lag structure.

4. Results and Discussion

Table 1. Descriptive statistics

	TOT	DSERV_GDP	GCAPIT_GDP	EXDEBT_GNI	GDP	PRIVCAP
Mean	111.1000	3.612500	112.6250	132.6625	4.225000	2.862500
Median	100.0000	3.000000	111.0000	126.5000	5.000000	2.000000
Maximum	207.0000	18.00000	134.0000	367.0000	17.00000	12.00000
Minimum	71.00000	0.000000	92.00000	24.00000	-13.00000	0.000000
Std. Dev.	30.31923	2.978802	8.549743	71.94846	4.472065	2.773034
Skewness	1.350231	1.898088	0.631326	0.836747	-1.056120	1.046460
Kurtosis	4.388705	8.987589	3.455654	4.026374	6.287523	3.426729
Jarque-Bera	30.73664	167.5406	6.006375	12.84675	50.89787	15.20804
Probability	0.000000	0.000000	0.049629	0.001623	0.000000	0.000498
Sum	8888.000	289.0000	9010.000	10613.00	338.0000	229.0000
Sum Sq. Dev.	72621.20	700.9875	5774.750	408949.9	1579.950	607.4875
Observations	80	80	80	80	80	80

As shown in Table 1 we carry out some basic descriptive statistics on the key variables used in our model. This describes features of a collection of data.

Table 2. Correlation matrix

	GDP	EXDEBT_GNI	GCAPIT_GDP	DSERV_GDP	TOT
GDP	1.000000	-0.111275	0.089802	-0.233207	-0.039893
EXDEBT_GNI	-0.111275	1.000000	0.172932	0.371277	0.273615
GCAPIT_GDP	0.089802	0.172932	1.000000	-0.184438	-0.269359
DSERV_GDP	-0.233207	0.371277	-0.184438	1.000000	0.273369
TOT	-0.039893	0.273615	-0.269359	0.273369	1.000000

As shown in table 2, we formulate a correlation matrix on the key variables in our formula. This merely shows correlation coefficients between variables.

4.1 Panel Unit Root Tests

We use the ADF test based on the hypothesis that all series in the panel are assumed to exhibit non stationary behavior. This null hypothesis might be rejected if a fraction of the series in the panel appears to be stationary. The unit root is to test if time series variables are stationary or not. We analyzed individual unit root tests for the variables included in our model. We apply the ADF unit root to check stationarity of the variables for all the 5 countries. The dependent variables of GDP and private capital (PRIVCAP) are all stationary at level. All other independent variables were also found to be stationary, except exchange rate which is made stationary at 2nd difference. The results of the unit root have been summarized in table 3;

Table 3. Unit root test

Variables	ADF-Statistics	Critical Value	Decision
External debt (% of GNI)	-2.693872	1% = -3.469451 5% = -2.878618 10% = -2.575954	Stationary at 10%
GDP	-6.681975	1% = -3.470179 5% = -2.878937 10% = -2.576124	Stationary at all critical values
Debt servicing (% of GDP)	-9.24736	1% = -3.470679 5% = -2.879155 10% = -2.576241	Stationary at all critical values
Private capital	-4.289114	1% = -3.487046 5% = -2.886290 10% = -2.580046	Stationary at all critical values
Terms of trade	-3.648358	1% = -3.476472 5% = -2.881685 10% = -2.577591	Stationary at all critical values
Exchange rate	-5.952236	1% = -3.483312 5% = -2.884665 10% = -2.579180	Stationary at 2 nd difference

4.2 Regression Analysis

The regression results have been summarized in the table 4. The equation involving GDP has an R-squared of 43% and a good Durbin Watson that may suggest no auto correlation. As expected as external debt decreases, these countries will show positive growth in GDP; this may be due to other factors like growth in exports being used to grow their economies. Most of these countries use government spending as a driving force towards development, in areas of infrastructure development. The coefficient of HIPC shows some statistical significance and shows that as more countries in this region reach the completion point the more positive their growth. This is due to their debt relief upon completion which allows them to free resources to invest in their economies.

The second debt overhang equation shows the results of a nonlinear private investment and cash-constraint model. This model is utilized to capture the disincentive nature of debt and its servicing requirements on investment. This equation has an R-squared of 15% and a favorable Durbin Watson, indicating that it leans more towards no auto correlation. As government capital expenditure decreases it shows a positive increase in private capital this may indicate private sector taking a more active role in building the economy. The HIPC dummy variable shows no significance but instead the terms of trade variables shows a positive effect on private investment as favorable terms of trade will induce the private sector into economic growth participation. Though its significance is debatable.

Table 4. Regression on GDP and private capital

Dependent Variables	EXDEBT/	GCAPIT/	DSERV/		HIPC	CP	EXR	TOT	R-Square	Adjusted	Durbin	Constant
	GNI	GDP	GDP	R-Square						Watson		
GDP	-0.359 (0.05)	-0.208 (0.9)	0.176 (0.37)	0.359 (0.22)	0.05 (0.75)	-0.02 (0.67)	0.068 (0.9)	0.43	0.28	2.1	3.44	
PRIVCAP	0.0255 (0.93)	-0.322 (0.91)	0.09 (0.81)	-0.116 (0.84)	-0.135 (0.63)	0.03 (0.8)	1.28 (0.21)	0.15	-0.09	1.88	-3.09	

4.3 Granger Causality Test

The results of Granger causality test in the table 5 show that private capital does Granger cause GDP and debt service. Private investment greatly contributes to the economic growth of any country and will have some bearing on the finance that is sourced by the government to maintain debt servicing. GDP does Granger cause private capital and debt servicing. The wealth of the economy will determine the status of the private sector. A

healthy economy with high GDP will attract high private sector participation. The health of the economy will determine the ability of a country to service its debt. A country with high growth will be more capable to service its debt. Debt service does not Granger cause GDP or cause private capital. This further may shed some light on the fact that debt service alone cannot directly cause GDP growth but must be via some avenue like private investment, as the debt overhang theory suggests.

Table 5. Granger causality test results

Hypothesis:	Obs	F-Statistic	Probability	Decision
PRIVCAP does Granger Cause GDP	109	2.41249	0.09459	Yes
GDP does Granger Cause PRIVCAP		1.73578	0.18133	Yes
DSERV_GDP does Granger Cause GDP	157	0.45080	0.63797	No
GDP does Granger Cause DSERV_GDP		5.63029	0.00438	Yes
DSERV_GDP Granger Cause PRIVCAP	106	0.32508	0.72323	No
PRIVCAP does Granger Cause DSERV_GDP		1.76602	0.17625	Yes

5. Conclusion

The role that external debt plays in a country cannot be overstated. High external debts can erode confidence in economic reforms and thus diminish the sustainability of what might be an otherwise sound economic strategy. Its ability to build an economy and also reduce growth is a very powerful macroeconomic concept. Its use is based on the ability to acquire and manage it. External debt granted in concessional loans, with conditions attached and as grants still have the ability to increase the external debt servicing problems of most HIPC countries. Most literature points to the debt overhang as playing a major role in reducing growth via debt. The debt overhang concept is based on external debt affecting economic growth via investment. As external debt grows its debt service payments act as a disincentive to investors and affects economic growth. As our paper shows, HIPC countries that have for years suffered the brunt of external debt burdens by having high debt service obligations have suffered from economic decline. The initiative was meant to alleviate these problems by offering some debt relief. It is obvious from the result of completion point countries (that are given high debt relief upon meeting certain conditions) that one of the biggest effects of completion is economic growth. This might be true for the SADC region and not for other HIPC completion countries in other regions. Further research will definitely yield better conclusions on the role of completion in alleviating debt and causing economic growth. It would also give an overall indication of the success of the initiative.

Many factors led to the growth of external debts in these HIPC countries and the vicious circle went on for most of them in this region after gaining independence. As these countries gained knowledge of their economies they began to acquire more debts for infrastructure development at the peril of creditors “hungry” for higher yields on their money. This led to higher interest payments and a need to borrow to sustain this. Variables like exchange rate and corruption have the ability to cause growth in external debt, as resources are easily misdirected to personal ventures by government officials. This aspect is very prevalent not only in the SADC region but in Africa as a whole. The whole concept became a vicious circle that failed to move these countries out of the debt-poverty trap. Though African data is very insufficient to show a more meaningful relationship.

Reduction of external debt and HIPC completion point attainment are the key forms of growth in these countries. As these countries are resource based heavily dependent on the demand from China. Unlike other growth variables like savings and export growth are hardly used, showing the need for these countries to diversify into such variables for growth rather than external debt. The role of HIPC completion point in increasing growth cannot be overstated. It has the ability to reduce debt servicing obligations. The private capital equations show an interesting observation: as governments reduce capital expenditure it actually shows an increase in private capital with favorable terms of trade playing a key positive role in increasing private capital. It is debatable on the factors that actually cause external debt to reduce economic growth and private capital maybe just one of the many measures as evidenced from the huge amounts of literature devoted to this relationship. There is no direct debt overhang model that directly targets investment, but our causality test shows that a debt servicing does not directly cause GDP or private capital but ultimately it must via some macroeconomic variable like debt. Most of the countries in our study have long relied on foreign direct investment as a means of economic growth.

It must be noted that the initiative goals and mandate was enhanced to include a general benefit to the living standards rather than focus on arbitrary indicators in the economy. This saw the birth of the MDGs that focus on halving poverty by more than half by 2015 and hence improving living standards in these areas. In conclusion the benefit of HIPC completion point countries in the SADC region cannot be debated and also the balancing act required maintaining the relationship between external debt and economic growth cannot be over emphasized. Its effect may or may not be caused by investment as a standalone but maybe with other economic variables lending a hand. This should act as an incentive for HIPC non completion countries to attain completion.

Countries within SADC must maintain external debt at levels that ensure manageable debt servicing. No country can grow without debt but thresholds of how much debt can actually hinder growth must be drawn up. Diversification in other growth methods using savings and sophisticated export sector must be investigated. The SADC grouping must introduce a regulation sector concerning debt and management of it for the region. This can be done by working closely with the IMF and World Bank in initiatives like HIPC and MDGs. This would require more data availability from the countries in the region and in Africa in general.

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References

- Adegbite, E. O., Ayadi, F. S., & Ayadi, O. F. (2008). The impact of Nigeria's external debt on economic growth. *International Journal of Emerging Markets*, 13(3), 285-301. <http://dx.doi.org/10.1108/17468800810883693>
- Adepoju, A. A., Salau, A. S., & Obayelu, A. E. (2007). The effects of external debt management on sustainable economic growth and development: lessons from Nigeria. Paper No.2147, Munich Personal RePEC Archive (MPRA), Munich.
- Ahmad, S. (2011). Forecasting dual-gap for Pakistan. *Salma* 6(2) <http://www.lahoreschoolofeconomics.edu.pk.2001.08>
- Ahmed, M. M. (2008). External debts, growth and peace in the Sudan: Some serious challenges facing the country in the post-conflict era. <http://www.cmi.no/sudan/doc/?id=964>.
- Ajayi, L. B., & Oke, M. O. (2012). Effect of External debt on economic growth and development in Nigeria. *International Journal of Business and Social Science*, 13(12), 297-304.
- Ajayi, S. I. (1997). An analysis of external debt and capital flights in the Heavily Indebted Poor Countries of Sub-Saharan Africa. In Zubair Iqbal and Ravi Kanbur (Eds.), *External Finance for Low-Income Countries* (pp. 77-117). IMF
- Amaeteng, A., & Amoako, A. (2002). Unidirectional and positive causal relationship between foreign debt service and GDP growth. Annual report and statement of account: CBN statistical Bulletin. *CBN economic and financial review*, 36, 22-44.
- Anoruo, E., Dimkpah, Y., & Ahmad, Y. (2006). Dynamics of External Debts among Heavily Indebted Poor Countries (HIPCs): A Panel data Approach. *Journal of International Business Research*, 5(1), 41-52.
- Appelyard, R. D., & Field (jnr), J. A. (2001). *International Economics*. (4th ed.), China: China Machine Press.
- Arslanalp, S., & Henry, P. B. (2004). Helping the poor to help themselves: Debt relief or aid? Research papers 10230, National Bureau of Economic Research.
- Asiedu, E. (2003). Debt relief and institutional reform: a focus on Heavily Indebted Poor Countries. *The Quarterly Review of Economics and Finance*, 43, 614-626. [http://dx.doi.org/10.1016/S1062-9769\(03\)00038-3](http://dx.doi.org/10.1016/S1062-9769(03)00038-3)
- Asiedu, E., & Villamil, A. P. (2000). Discount factors and thresholds: Foreign investment when enforcement is imperfect. *Macroeconomic Dynamics*, 4, 1-20. <http://dx.doi.org/10.1017/S1365100500014012>
- Asiedu, E., & Villamil, A. P. (2002). Imperfect enforcement, foreign aid and foreign investment. *Macroeconomic Dynamics*, 6, 476-495. <http://dx.doi.org/10.1017/S1365100501010070>
- Asley, B. (2002). Debt burden is not a problem of freely resource to debt services payment. *Principle of International Finance*, 1, 142-147.

- Bayraktar, N., & Fofack, H. (2011). Introduction to: Post-HIPC growth dynamics in Sub-Saharan Africa. Poverty Reduction and Economic Management Network, Gender and Development Unit, Policy Research Working Paper 5924.
- Benhabib, J., & Spiegel, M. M. (2000). The role of financial development in growth and investment. *Journal Economic Growth*, 5,341-360. <http://dx.doi.org/10.1023/A:1026599402490>
- Blundell, R., Bond, s., & Windmeijer, F. (2000). Estimation in dynamic panel data models: improving on the performance of standard GMM estimation. IFS working paper W 00/12, Bulow, J., Rogoff, K. (1991) .Sovereign debt repurchases: no cure for overhang. *Quarterly Journal of Economics*, 106, 1219-1235.
- Bond, S., Hoeffler, A., & Temple, J. (2001) .GMM estimations of empirical growth, unpublished manuscript.
- Borensztein, E. (1990). Debt overhang, credit rationing and investment. *Journal of Development Economics*, 32, 315-335. [http://dx.doi.org/10.1016/0304-3878\(90\)90041-9](http://dx.doi.org/10.1016/0304-3878(90)90041-9)
- Burnside, C., & Dollar, D. (2000). Aid policies and growth. *American Economic Review*, 90, 847-869. <http://dx.doi.org/10.1257/aer.90.4.847>
- Campos, J. E., Lien, D., Pradhan, S. (1999). The impact of corruption on investment: Predictability matters. *World Development*, 27, 1059-1067. [http://dx.doi.org/10.1016/S0305-750X\(99\)00040-6](http://dx.doi.org/10.1016/S0305-750X(99)00040-6)
- Clements, B., Bhattacharya, R., & Nguyen, T. (2003). External debt, public investment and growth in low income countries. IMF working paper WP/03,249.
- Cohen, D., & Sachs, J. (1986). Growth and external debt under risk of debt repudiation. *European Economic Review* 30, 529-560. [http://dx.doi.org/10.1016/0014-2921\(86\)90007-3](http://dx.doi.org/10.1016/0014-2921(86)90007-3)
- Colaco, F. X. (1985). International capital flows and economic development. *Finance and Development*, 83(3).
- Cordella, T., Ricci, A., & Arranz, R. (2005). Debt Overhang or Debt Irrelevance? Revisiting the Debt-Growth Link. International Monetary Fund, WP 5,223 and McGraw-Hill education.
- Dawson, J. W. (2003). Causality in freedom-growth relationship. *European Journal of Political Economy*, 19, 479-495. [http://dx.doi.org/10.1016/S0176-2680\(03\)00009-0](http://dx.doi.org/10.1016/S0176-2680(03)00009-0)
- De Haan, J., & Sturm, J. E. (2000). On the Relationship between economic freedom and economic growth. *European Journal of Political Economy*, 16, 215-241. [http://dx.doi.org/10.1016/S0176-2680\(99\)00065-8](http://dx.doi.org/10.1016/S0176-2680(99)00065-8)
- De Larosiere, J. (1984). The growth of public debt and the need for fiscal discipline. IMF paper.
- Deshpande, A. (1997). The debt overhang and the disincentive to invest. *Journal of Development Economics*, 52, 169-187. [http://dx.doi.org/10.1016/S0304-3878\(96\)00435-X](http://dx.doi.org/10.1016/S0304-3878(96)00435-X)
- Domar, E. D. (1944). The burden of the debt and the national income. *American Economic Review*, 34(4), 798-827.
- Dornbusch, R., Fischer, S., & Startz, R. (2003). *Macroeconomics* (8th ed). Dalian: The McGraw-Hill Education.
- Easterly, W. (1999). How did highly indebted poor countries become highly indebted? *Reviewing two decades of debt relief. Mimeo*. <http://dx.doi.org/10.1596/1813-9450-2225>
- Edwards, S. (1998). Openness productivity, and growth: what do we really know? *Economics Journal*, 108, 383-98. <http://dx.doi.org/10.1111/1468-0297.00293>
- Elbadawi, I. A., Benno, J., Ndulu, C., & Njuguna, N. (1997). Debt overhang and economic growth in Sub-Saharan Africa. In Zubair Iqbal and Ravi Kanbur (Eds.), *External finance for low-Income Countries*(49-76), IMF
- Ellig, J. (2001). *Dynamic Competition and Public Policy: Technology, Innovation and Antitrust Issues*. Cambridge: Cambridge University Press. <http://dx.doi.org/10.1017/CBO9781139164610>
- Fonchamnyo, C. D. (2009). Debt Relief Incentives in Highly Indebted Poor Countries (HIPC): An Empirical Assessment. *International Atlantic Economic Society*, 15, 322-335.
- Greene, H. W. (1997). *Econometric Analysis* (3rd ed). New Jersey: Prentice hall.
- Gross, D. (2011). *The new freedom. Newsweek*. Special edition issues, 8-10.

- Gunter. (2003). Achieving long-term debt sustainability in all Heavily Indebted Poor Countries (HIPCs). Discussion paper prepared for the Intergovernmental group of 24 (G24) XVI Technical group meeting in Trinidad and Tobago.
- Gwartney, J., & Lawson, P. (2009). Economic Freedom of the World: Annual report. Economic Freedom Network.
- Hunt, S. D. (2007). Economic growth: should policy focus on investment or dynamic competition. *European Business Review*, 19(4), 279-91. <http://dx.doi.org/10.1108/09555340710760116>
- IMF. (2001). IMF and World Bank support US\$# billion in debt service relief for Tanzania under Enhanced HIPC initiative. Retrieved on February 23, 2012 from <http://www.imf.org/external/np/sec/pr/2001/pr0148.html>.
- IMF. (2011). Debt relief under the Heavily Indebted Poor Countries (HIPC) Initiative: A factsheet. Mimeo.
- IMF/IDA. (1999). Republic of Mozambique Initiative for HIPC completion point document. Retrieved on February 16, 2012, from <http://www.imf.org/external/np/hipc/mozhipc.pdf>.
- Jubilee debt campaign. (February 23, 2012). Retrieved from <http://www.jubileedebtcampaign.org.uk/Malawi+3481.twl>]. Mangani, F. Social and Economic implications of HIPC in Zambia. Retrieved on February 14, 2012 from <http://www.jctr.org.zm/downloads/hipc-final.pdf>.
- Kasibhatla, M. K., Sen, S., & Stewart, B. D. (2007). Debt overhang and economic growth-the Asian and the Latin American experiences. *Economic Systems*, 31, 3-11. <http://dx.doi.org/10.1016/j.ecosys.2006.12.002>
- Koeda, J. (2008). A debt overhang model for low-income countries. *International Monetary Fund*, 55(4), 654-676.
- Krugman, P. (1988). Financing versus forgiving a debt overhang. NBER Working Paper 2486.
- Mauro, P. (1995). Corruption and growth. *Quarterly Journal of Economics*, 110, 681-712. <http://dx.doi.org/10.2307/2946696>
- Mehran, H. (1986). External debt management. *Finance & Development*, 23, 32-43.
- Miller, J., & Holmes, K. R. (2010). Index of Economic Freedom. *The Wall Street Journal*.
- Muhanji, S., & Ojah, K. (2011). External shocks and persistence of external debt in open vulnerable economies: The case of Africa. *Econ. Model.* <http://dx.doi.org/10.1016/j.econmod.2011.02.020>
- Myers, C. S. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, 5, 147-175. [http://dx.doi.org/10.1016/0304-405X\(77\)90015-0](http://dx.doi.org/10.1016/0304-405X(77)90015-0)
- Olson, M., Sarna, N., & Swamy, A. (2000). Governance and growth: A simple hypothesis explaining cross-country differences in productivity growth. *Public Choice*, 102, 341-364. <http://dx.doi.org/10.1023/A:1005067115159>
- Pattillio, C., Poirson, H., & Ricci, L. (2002). External debt and growth. Finance and development. *IMF magazine*, 39(2).
- Pattillio, C., Poirson, H., Ricci, L., Kraay, A., & Rigobon, R. (2003). Through what channels does external debt affect growth? *The Brooking trade forum*, 229-277.
- Photius Coutsoukis. (February 20, 2012). Madagascar Balance of Payments and debt. Retrieved from http://www.photius.com/countries/Madagascar/economy/Madagascar_economy_balance_of_payments_~288.html.
- Rebucci, A. (February, 16, 2012). Why did Mozambique fall into debt? Retrieved from http://www.afrol.com/Countries/Mozambique/backgr_debt_history.htm.
- Relationship of public debt. (February 6, 2011). Retrieved from <http://www.wisegeek.com/m/what-is-the-relationship-between-public-debt>.
- Roux, P. le, & Grolach, V. (2011). An econometric analysis of the impact of economic freedom on economic growth in the SADC. *Journal for Studies in Economics and Econometrics*, 35(2).
- Sachs, D. J. (2002). Resolving the debt crisis of low income countries. *Brookings papers on economic activity*, 1.

- Sachs, J. (1989). The debt overhang of developing countries. In Calvo, G. A., Fidlay, R. P., Kouri & De Macedo, J. B. (Eds.), *Debt stabilization and development: Essays in memory of Carlos Diaz-Alejandro*(pp.80-102). Oxford and Cambridge, MA: Blackwell.
- SADC. (2010). Retrieved from <http://www.sadc.int/>
- Schaefer, B. D. (2006). How Economic Freedom is central to development in Sub-Saharan Africa, Annual Report.
- Siregar, R. Y., & Pontines, V. (2005). External debt and exchange rate overshooting: The case of selected East Asian countries. Retrieved on January 20, 2012, from http://www.apeaweb.org/confer/hito05/papers/siregar_pointines.pdf
- Snowdon, B., & Vance, H. R. (2005). *Modern Macroeconomics*, United Kingdom: Edward Elgar Publishing Limited.
- Soludo, C. C. (2003). Debt poverty and inequality. In Okonjo-Iweala, Soludo and Mulitar (Eds.), *The Debt trap in Nigeria* (pp. 23-74) Africa World Press.
- The CIA World fact book. (February 9, 2011). Retrieved from <http://www.cia.gov/library/publications/the-world-factbook/geos/za.html>.
- Thirlwall, A. P. (2003). The mobilization of savings for growth and development in developing countries. Departamento de Programacion Monetaria e investigacion Econmica.Documento de trabajo, 2.
- Ubok-Udom, E. U. (1978). Development through debt: rationalizing the costs of external borrowing. *The Nigerian Journal of Economic and Social Studies*, 20, 48-56.
- Udoka, O. C., & Anyingang, A. R. (2010). Relationship between external debt management policies and economic growth in Nigeria. *International Journal of Financial Research*, 1(1), 2-13. <http://dx.doi.org/10.5430/ijfr.v1n1p2>
- Watchel, P. (1998). Current account balances and external debt in Transition economies: Lessons for Central Asia, International Conference in honor of the 5th anniversary of the Kyrgyz [online]. Retrieved from <http://www.imf.org/external/np/eu2/Kyrgyz/pdf/pw.pdf>

A Study of “Inflation Indexed Bonds” in Indian Debt Market

Vaibhav Jain

Correspondence: Vaibhav Jain, Fund Manager, Quality Capital Limited, Gurgaon, KD 46 C Ashok Vihar, Phase-1, Delhi 110052, India. Tel: 91-965-407-9394. E-mail: vaibhav.jain1987@gmail.com

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Abstract

This research attempts to explain India as an upcoming Debt Market with the introduction of the new instruments like “*Inflation Indexed Bonds*” (both for the retail and the institutional buyers) followed by the explanation about both the technical and the conceptual aspect of the “Inflation Indexed Bonds (IIB)” and their applicability in Indian Debt Market.

After discussing about the literature on IIB's, in the last section, we have seen the yield of a hypothetical “Inflation Indexed Bond” higher as compared to “Normal bond” (non-inflation adjusted). We have also commented upon the real value of the returns keeping in mind the Investor's perspective (purchasing power) and his behavior in buying and evaluating such instruments. Lastly, we have compared both the bonds in the rising inflation scenario. We have analyzed that for an Inflation Indexed Bond, bond value increases with increase in the Inflation and vice-versa but for a Normal Bond, it remains unaffected by the rising Inflation levels (keeping interest/reinvestment rate as constant for both the bonds).

Keywords: inflation, normal bond, inflation indexed bond, WPI, CPI, purchasing power

1. Indian Debt Market: An Overview

The equity market is much more popular than the debt market in India whereas the reverse is true for most parts of the world. In the absence of such maturity in debt market the banking system would be larger than it otherwise would be, making it tougher in moving a crisis outside the banking system and letting the government to stand back. The rationale behind the need for developed debt market is for the development of a diversified financial system with banks and nonbanks operating in equity markets and debt markets that will enhance the risk pooling and risk sharing opportunities for investors and borrowers. As quoted by *Alan Greenspan* that *coexistence of domestic bond market and banking system helps each to act as a backstop for the other*. “*Efficient financial intermediation*” and “*Developing the derivatives market to facilitate hedging mechanisms*” could be few other reasons quoted for the need of the develop debt market in a country.

In March 2011, the government bond market represented 40% of GDP, compared with the corporate bond market, which amounted to just 7% of GDP (Table 1).

India's government bond market has grown steadily largely due to the need to finance the fiscal deficit and is comparable to many government bond markets in emerging East Asia (39.5%). At 40% of GDP, the Indian government debt market compares well with its neighbouring countries. “The corporate bond market is less developed than most in emerging East Asia, with private placements dominating. At 7% of GDP, corporate bonds are comparable to levels in the Philippines and Indonesia, where corporate finance is less well-developed, as well as with the People's Republic of China (PRC) and Vietnam, where state-ownership remains dominant”.

Table 1. India and EEA Bond Markets (% of GDP), March2011

	Government	Corporate	Total
China, People's Rep. of	46.1	4.7	50.8
Hong Kong, China	8.7	35.3	44
Indonesia	17.1	2	19.1
Korea, Rep. of	48.8	61.8	110.6
Malaysia	48.1	37.5	85.6
Philippines	33.3	3.5	36.8
Singapore	41.2	30.7	72
Thailand	40.7	15.9	56.6
Vietnam	14.6	2.1	16.7
India	36.1	3.9	40

Sources: Asian Bonds Online, Bank for International Settlements, and Reserve Bank of India.

"The Indian bond market is, however, less well-developed. While having seen rapid development and growth in size, the government bond market remains largely illiquid. Its corporate bond market remains restricted in regards to participants, largely arbitrage-driven (as opposed to driven by strategic needs of issuers) and also highly illiquid. The lack of development is anomalous for two reasons: First, India has developed world-class markets for equities and for Equity Derivatives supported by high-quality infrastructure. And second, the infrastructure for the bond market, particularly the government bond market, is similarly of high quality."

Though significant improvements have been made in the primary market, the secondary market continued to be plagued by certain shortcomings like dominance of a few players, strategy of holding to maturity by leading players (inability to provide depth), the pre-1992 "telephone market" continued to exist (prevents information dissemination and hence price discovery is limited) and low retail participation in Government Securities (G-Secs) market continues to exist even today. It is believed and researched that there is tremendous potential for widening the investor base for Government securities among retail investors. This can be done by, increasing their (investors) awareness about Government securities as an option for investment and improving liquidity in the secondary market that will provide them with an exit route. Also infrastructure is seen as the vital element in the further development and deepening of the market. Hence, in order to accomplish the purpose of introducing the retail investors with an additional investment avenue, in the next chapter we will conduct a "Study of Inflation Indexed Bond" as a new instrument in such an under-developed Debt market both for the benefit of the investors as well as the government or the issuer.

2. Introduction of Inflation Indexed Bonds (IIB, Commonly Known as "Treasury Inflation Protection Securities" (TIPS) in the U.S)

In order to provide a stable investment return (growing of purchasing power) in the increasing prices (Inflation) scenario, "Inflation Indexed Bonds" can be treated as a weapon to accomplish the purpose (Fabozzi, 7th Edition). It is done by adjusting the principal of TIPS (U.S) (called as IIB's in India) with Changing CPI i.e. Consumer Price Index/ WPI (base year 1993-94 i.e. 100) i.e. Wholesale Price Index (which is an indicator of inflation in INDIA). The characteristics of IIB's help the consumer to get the returns (based on the elevated principal) that exactly matches the purchasing power of their original investment as defined by the WPI (for India). It also pays the semi-annual cash flows/interest payments/coupons linked to the WPI-indexed principal amounts (see illustration 1 in Table 2). In short, it provides high real yield (Table 2), low correlation to traditional financial assets, and muted volatility.

Table 2. (Illustration1) Cash Flows of a Basic Inflation Indexed Bonds

	Purchase	First Annual Coupon	Interim Annual Coupon	Last Annual Coupon	Principal	Return(Per annum)
Date	1/1/2000	1/1/2001	1/1/2005	1/1/2010	1/1/2010	1/1/2010
Real Rs. Cash Flow	-1000	40	40	40	1000	4.00%
WPI (Base=100)	100	106	133.8225578	179.0847697	179.0848	6.00%
Indexed Principal	1000	1060	1338.225578	1790.847697	1790.848	n/a
Nominal Rs. Cash Flow	-1000	42.40	53.53	71.63	1790.848	10.24%

This Table compares the Real vs. Nominal value of the cash flow whereby the coupon and principal are linked to the WPI for an imaginary annual coupon bearing bond and hence shows the high real yield of such a bond (for calculations, refer to Appendix). (Fabozzi, 7th edition)

TIPS were launched by U.S Treasury a way back in 1997 and until 2004 issued more than \$200 billion of the securities. Even in the United Kingdom (issued for the first time in 1981, {refer to table 3 below}), it accounts for more than 20% of the government bonds outstanding. But in India, it was first issued on 29th December 1997 in the form of “6% Capital Indexed Bonds 2002” whereby only principal was indexed to the inflation keeping the semi-annual coupons payments naked/unhedged. But due to less popularity and complex calculations, it didn't pick up by the investors at that time both in the primary and secondary market. Hence, our study of “Inflation Indexed Bonds” (a refinement of “Capital Indexed Bonds”) in Indian context would primarily involve the “*introduction of the market participants to this important new investment instrument*” based on comparison from various perspectives.

Table 3. Introduction of Indexed Bonds and Inflation Rates

Date	Country	Inflation Index	Inflation Rate
1945	Finland	WPI	6.40
1952	Sweden	CPI	2.00
1955	Iceland	CPI	15.70
1966	Chile	CPI	22.20
1972	Argentina	WPI	19.70
1981	United Kingdom	CPI	14.00
1989	Mexico	CPI	114.80
1994	Sweden	CPI	4.40
1997	United States	CPI	3.00
1999	France-Domestic	CPI ex tobacco	1.30
1999	France-Eurozone	Eurozone HICP ex tobacco	1.50
2003	Greece	Eurozone HICP ex tobacco	4.00
2003	Italy-Eurozone	Eurozone HICP ex tobacco	2.80
2004	Japan	CPI ex fresh food	-0.10

WPI: Wholesale Price Index; Inflation: in year prior to introduction except Iceland, for which the prior 5-year average inflation is reported.

Source: John Y. Campbell and Robert J. Shiller, “A scorecard for Indexed Government Debt”. NBER Working Paper no. 5587 May 1996. © 1996 John Y. Campbell and Robert J. Shiller and PIMCO.

Characteristics and Need of “Inflation Indexed Bonds”

Inflation indexed bonds (IIBs) provide insurance to investors from inflation and on the other hand cost savings for the Government on account of reduction in coupon payments with lowering inflation rate, elimination of uncertainty risk premium, and containing inflationary expectations (RBI, 2010). As the need for instruments that can minimize or diversify the investor's risk increases in a rising prices (“Inflation”) scenario, so IIB's can be seen as a solution that can even provide depth to the Government Securities market. Hence, IIB's can be seen favorable from both the issuers as well as the investor's perspective. The reasons that lead to such conclusion are as follows:

2.1 Hedge for Inflation

Investors are exposed to the inflation risk over the tenure of their investment in other fixed income bearing bonds. Hence, this looks as a good idea for the preference of these bonds by the investors as the returns they earned out of these bonds carries their real value in the inflationary economy. Real value of an investment (refers to illustration 1, table 2) return can be defined as the inflation adjusted return and can be expressed by the following formula.

$$I + I = (I + r)*(I + E (I)) \quad (1)$$

Where:

- I = Nominal Interest Rate;
- r = Real Interest Rate;
- E (I) = Expected Inflation Rate.

Therefore, “IIBs give the investors long-term assets with a fixed long-term real yield insulating them against inflation as their real yields are indexed to actual inflation”. (RBI, 2010)

2.2 Risk Diversification

IIB's can be considered as a way of diversification of the portfolio by the investors as the principal of these bonds is linked to the change in WPI (indicator of inflation). So in the event of the rising prices (Table 13) and rising interest rates in the economy, these bonds outperform the normal fixed income bearing bonds. This feature makes it more favorable to include such bonds in the portfolio. Kothari and Shanken (2004) conclude that "US TIPS may have potential benefits for investors and that substantial weight might be given to these instruments in an efficient portfolio." IIB's also helps the retired pensioners as it provides an assured real return because of which the money worth doesn't depreciate even at the end of the investment horizon.

2.3 Motivation for the Issuer

2.3.1 Cost Saver to Issuer

As derived from the nature of the IIB's in regard to the lower Coupon payments, it sometimes (when the actual inflation equals the expected inflation) cost less to the government as the issuer of these bonds. For instance, during 2000-01 to 2009-10, average annual inflation in India was 5.1 per cent and ranged 3.4 - 8.3 per cent. Going by the past trend of inflation (5.1 per cent) and assuming that real coupon rate emerges to be 2.0 per cent in the auction, the cost of borrowing through IIBs would be 7.1 per cent. The weighted average cost of market borrowings through dated securities during 2009-10 and 2010-11 (up to December 6, 2010) was 7.23 per cent and 7.86 per cent, respectively (RBI, 2010). Based on the assumptions for the average inflation during the life of the bond vis-a-vis other parameters like real yield etc and also on the basis of the scenario analysis carried out over the life of the security, it has been found out that government may save money on issuance of such bonds.

On the contrary, if the actual inflation differs the expected then the IIB's would no more act as a cost saver (compared to the normal bond) to the issuer as the "liquidity premium asked by investors on IIBs (as it may be less liquid initially due to lack of a critical mass) may turn out to be higher than the cost savings accruing on account of removing the uncertainty premium" RBI (2010).

2.3.2 Real Yield (Price to Yield Relationship)

The real yield on "Inflation Indexed Bonds" remains the same even with the increase in Inflation compared with the Normal Bond whose price would increase with the decrease in inflation and vice versa. So a Normal bond when issued in high inflationary period would become very costly (coupons) when the inflation comes down or vice versa keeping the IIB's unchanged in comparison with its real yield in such a scenario and hence benefiting the issuer (Government).

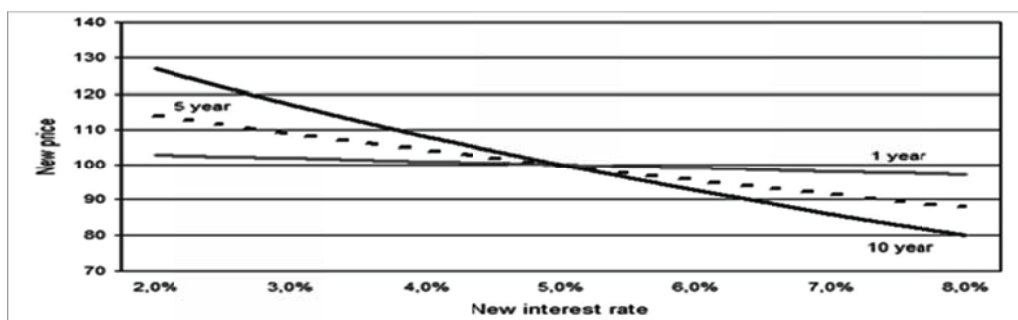


Figure 1. The price/yield curve

Figure 1 Shows the Price/ Yield relationship for a normal bond. Bond prices increases with decrease in the Interest Rate and vice-versa. Hence, Bonds issued in higher inflation would increase in value when the inflation comes down (interest rates also falls in falling inflation). 10 year bond value becomes as low as Rs.80 when the interest rates went up till 8% and increased to Rs. 125 when interest rates were as low as 2%. This is not the case with an "Inflation Indexed Bonds" as the principal is linked to the changing Inflation rates (WPI) and hence keeping its real yield constant over the life of the security.

A Snapshot of the Advantages and Disadvantages of IIB's

Advantages:

- Unlike regular Fixed Deposit or bond, the principal is indexed (or adjusted) to the inflation periodically and the interest/coupon is paid on this inflation-adjusted principal.

- In other words, it hedges your returns against increase in Inflation or rising in prices based on Wholesale Price Index (WPI).
- Works well for the individuals having low risk preference and also it will fetch you more money in rising prices (Inflation) even if you stay invested.
- In the Inflationary times, the real rate of returns on Inflation Indexed Bonds may be greater than any other fixed rate bonds.
- For example, a 10 year-Inflation Indexed Bond with coupon rate of 8% paid semi-annually with Inflation Rate of 5% when compared to the similar but fixed rate bond, IIB's would be worth more both in the principal repayment as well as coupon payments.

Disadvantages:

- Preference is given to CPI as a measure of Inflation when we see the rest of the world. Hence, need for Consumer Price Index (CPI) instead of Wholesale Price Index (WPI) as it does not reflect commodities prices in an efficient way.
- Issued primarily to keep the investors protected from inflation, so normally issued with low coupons/interest rate attached to it compared to Fixed Coupon Bonds.
- Lack of knowledge amongst investors will make these bonds less popular as it involves complex calculations for Indexation according to Reference Rate on changing WPI.
- Infrequent issues by the government because of less popularity amongst investors.
- IIB's is an instrument for the inflationary market and hence might be of disadvantage in falling prices (Deflationary market).

3. Structure of "Inflation Indexed Bonds" in Indian Debt Market: An Insight into Technical and Conceptual Framework

"The main variants of IIBs prevalent internationally are Capital Indexed Bonds (CIBs), Interest Indexed Bonds, Current Pay Bond, Annuity Indexed Bonds etc" (RBI,2010). The basic feature of the IIBs is that the coupon rate for the bond is specified in real terms (i.e. Inflation adjusted). Among all the variants, Capital Indexed Bonds are very popular and being issued in Canada, USA, UK and South Africa (refer to Table 3). In CIBs, principal is indexed (inflation adjusted) and real interest/ coupon is calculated on the indexed principal. For example, an IIB is issued at face value of Rs. 1000 and real coupon rate is 4 per cent and paid annually. If the cumulative inflation at the time of coupon payment is 6.0 per cent, the principal for calculating coupon payout will become Rs. 1060 and coupon payment will be Rs. 42.4 (for calculations, refer to Table 2 illustration 1 above). In case of a deflationary scenario, real coupon will be calculated on indexed principal that will be lower than its par value but at the time of redemption, principal repaid will be equivalent to its par value (can be called as a floor cap). For instance, if cumulative inflation is -6.0 per cent (deflation), then indexed principal would be Rs. 940 and real coupon payout would be Rs. 37.6 (4% of the indexed principal of Rs. 940). Thus, investors receive inflation adjusted interest payments periodically and also inflation adjusted principal repayments at the time of redemption or its original par value, whichever is higher.

To understand the Inflation Indexed Bond's structure resulted from the refinement of the earlier issues in the form of CIB's in the year 1997 redemption on 2005, one has to take into consideration the following technical aspect. Those are:

- Indexation
- Tenure
- Settlement Price
- Issuance Method

3.1 Indexation

Most Developed countries such as the United States, the United Kingdom, Japan, France, Canada, Singapore and China use the Consumer Price Index (CPI) to calculate inflation. "CPI is a statistical time-series measure of a weighted average of prices of a specified set of goods and services purchased by consumers. It is a price index that tracks the prices of a specified basket of consumer goods and services, providing a measure of inflation". The benefit of CPI as an indicator of inflation, as this actually measures the increase in price that a consumer will ultimately have to pay for. India is the only major country that uses a Wholesale Price Index (WPI) to measure

inflation. A research paper of prominent economists *V Shunmugam and D G Prasad* pointed out that *WPI does not properly measure the exact price rise an end-consumer will experience because, as the same suggests, it is at the wholesale level*. However, due to the unavailability of a single figure on CPI for the consumption basket of all section of society in India makes it impractical to be used in indexation of IIB's (RBI, 2010). Reserve Bank of India proposes the use of WPI for indexation which was earlier the same as in the case of "Capital Indexed Bonds of 1997" but with a slighter modification. The frequency of WPI has now been changed from weekly to monthly since November 2009 and also the "Base Year" of the WPI has been updated from 1993-94 to 2004-05 along with broadening the basket to incorporate more items from both organized and un-organized sectors making it more suitable for indexation purpose (as per the recommendations of *the Working Group for Revision of WPI Index* (Chairman: Prof. Abhijit Sen)).

An Index ratio is hence calculated keeping in mind all the above calculations and recommendations and can be represented by the following formula.

$$\text{Index Ratio}_{\text{Set Date}} = (\text{Ref WPI}_{\text{Set Date}}) / (\text{Ref WPI}_{\text{Issue Date}}) \quad (2)$$

(Where "Set Date" = Interest payment date/settlement date & "Issue Date" = Original Issue Date of the bond.)

Interpolation using "Ref WPI" for the first day of the calendar month and the first day of the following calendar month should be used in order to calculate the index ratio for any specific date using WPI. It can be done with the help of the following formula.

$$\text{Ref WPI}_{\text{Set Date}} = \text{Ref WPI}_M + ((t-1)/D) * (\text{Ref WPI}_{M+1} - \text{Ref WPI}_M) \quad (3)$$

Where Ref WPI_M = Ref WPI for the first day of the calendar month in which Date falls

Ref WPI_{M+1} = Ref WPI for the first day of the calendar month following the settlement date

D = Number of days in month (e.g. 31 days in January) and t = settlement date (e.g. January 15).)

Table 4. Wholesale Price Index (WPI, Monthly data from 2005-2011)

Month/Year	2005	2006	2007	2008	2009	2010	2011
January		105.2	112.3	117.3	124.2	134.8	147.4
February		105.4	112.4	118.8	122.9	134.8	146
March		105.5	112.7	121.4	123.2	135.8	148
April	102.8	107.6	114.4	123.5	124.6	138.3	
May	102.5	108.5	114.6	124	125.5	138.8	
June	102.9	109.7	114.8	127.3	126.4	139.4	
July	104	110.6	115.6	128.6	127.8	140.6	
August	104.1	111.3	115.9	128.9	129.3	140.7	
September	104.8	112	116	128.5	129.9	141.5	
October	105.2	112.5	116.3	128.6	130.5	142.4	
November	105.4	112.4	116.7	126.7	132.4	143.1	
December	104.7	112.1	116.6	124.3	132.9	145.4	

*Figures for the latest two months are provisional. Latest two months are to be reckoned with reference to the latest monthly press release issued. Base Year 2004-05 = 100 (For All Commodities). Presently, provisional WPI is released with a lag of two weeks and final WPI with a lag of two and half month (For example: Provisional WPI for 31st March 2008 and Final WPI for 31st January 2008 would be 14th April 2008.)

Source: Office of the Economic Adviser to the Government of India, Ministry of Commerce and Industry

Example for Interpolation (As quoted from the technical paper from RBI,2010):

For instance, for the settlement date on 30th December, final WPI would be available for the month of August and September. Final WPI for the month of September would only be available on 14th of December and hence, it could be used for interpolation to calculate reference WPI for any day on or after 14th December. Thus, reference WPI as under:

$$\text{Ref WPI}_{30\text{th December}} = \text{Ref WPI}_{\text{August}} + ((30-1)/31) * (\text{Ref WPI}_{\text{September}} - \text{Ref WPI}_{\text{August}}) \quad (4)$$

But for settlement date on December 12th, final WPI for the month of September will not be available to calculate reference WPI for interpolation. "Thus, in order to overcome this anomaly, it is proposed that final WPI with a lag of four months may be used as Ref WPI for the first day of the calendar month in which 'Issue

Date' and 'Set Date' falls". Hence, new calculations in order to interpolate with a lag of four months would look like :

$$\text{Ref WPI}_{30\text{th December}} = \text{Ref WPI}_{\text{July}} + ((30-1)/31) * (\text{Ref WPI}_{\text{August}} - \text{Ref WPI}_{\text{July}}) \quad (5)$$

$$\text{Ref WPI}_{12\text{th December}} = \text{Ref WPI}_{\text{July}} + ((12-1)/31) * (\text{Ref WPI}_{\text{August}} - \text{Ref WPI}_{\text{July}}) \quad (6)$$

With the help of the above calculations, an Index Ratio can be found out and hence the Principal of the bond can be adjusted by multiplying the Index ratio (Index Ratio_{Set Date}) with the Principal of the bond which can be called as "Inflation Compensation/ Inflation Reward".

$$\text{Inflation Compensation}_{\text{Set Date}} = (\text{Principal} \times \text{Index Ratio}_{\text{Set Date}}) \quad (7)$$

There are certain propositions made by the Reserve Bank of India in respect of the "Changing base of WPI" because of addition or subtraction of additional goods and services thereby affecting the actual coupons and principal of the bond. These are: "As and when WPI index is being revised on technical grounds (coverage, base year, etc.), the new WPI index will be used for indexation purposes and the past value of new WPI index would be computed through linking factor or splicing the base.

Further, it is also proposed that Ref WPI and Index Ratio (IR) for a specific date may be truncated to six decimal places and rounded off to five decimal places" (RBI,2010).

3.2 Tenure

It has been researched that the tenure of this kind of an instrument can vary from 5 years to more than 15 years depending upon the preference by the different Financial Institutions, Banks, Pension Funds, Insurance Companies etc. But keeping in mind the newness of this product, we have tried to form a hypothetical bond issued for the tenure of 5 years (Note 1) keeping the rest of its features as proposed by the Reserve Bank of India.

3.3 Settlement Price

The Settlement price of an "Inflation Indexed Bonds" would be the par value of the bond in a primary auction whereby the IIB would be issued at par and investors would be asked to bid in terms of the 'real yield' whereas, in the secondary market or re-issuance of the bond, the investors can either bid at 'price of the bond' (assuming inflation at zero) or in terms of the 'real yield' (implicit cut-off real yield would be computed from the cut-off price, as implicit cut-off yield is being calculated in case of nominal fixed rate bonds (RBI,2010)).

$$\text{Set Price}_{\text{Date}} = (\text{Real Cut off Price} + \text{Real Accrued Interest}_{\text{Set Date}}) * \text{Index Ratio}_{\text{Set Date}} \quad (8)$$

(Note: Real Cut off Price + Real Accrued Interest_{Set Date} = can also be called as a "Dirty Price" of a bond opposite to the 'Clean Price' which is excluding the above two components.)

Hence, the nominal fixed rate bonds, the sum of *cut-off price* and *Accrued Real Interest* would be multiplied with *Index Ratio* (Refer to Table 6 for Index ratio of a hypothetical bond).

Alternatively, "the settlement price can also be computed directly by multiplying the sum of the cut-off price emerging in the reissuance of the Inflation Indexed Bonds and accrued real interest by index ratio" (RBI,2010).

But in the case of 'Real Yield' it is "real cash flows" discounted with *cut-off real yield* emerging in the auction (or real yield at which trade in secondary market trade would take place) and sum of these *discounted real cash flows* would be multiplied with *Index Ratio*.

$$\text{Settlement Price} = \text{Discounted Real Cash Flows} * \text{Index Ratio} \quad (9)$$

Hence, "it is proposed by the Reserve Bank of India that investors may be asked to bid in terms of price during re-issuance/ secondary market trade and settlement price may be computed directly by multiplying the sum of the cut-off price emerging in the reissuance/trading of the IIB and accrued real interest by Index Ratio".

3.4 Issuance Method

There are various methods through which Inflation Indexed Bonds (IIB's) get issued in different parts of the world like *Auction*, *Tap Sale* and *Book Building process*. 'Auction' process which is the most famous and preferred method for the treasuries around the world involves transferring the responsibility for pricing the bond to investors by asking them to bid for it. 'Tap sale' which involves fixing the *real coupon rate* as per the market expectations but is ineffective as the issuer finds it difficult to assess the term structure of real rate because of the absence of any credible method. 'Book Building' is another method to issue IIB's but it proves to be unfavorable as it involves aggressive marketing by the merchant banker that leads to *huge costs* and also this method may be viable when size of the issuance is quite large and investor's base is also wide consisting of international

investors. But due to the unfavorable experience faced by the treasuries of various countries (for instance, UK experimented with tap sales of IIBs in 1988, and thereafter reverted to the auction system due to limitations of this method), it has been suggested that India should adopt the “*Auction*” Process as the size of the IIBs issuance is not going to be very large in an under developed Indian Debt Market.

4. Comparison between Inflation Indexed Bond vs. Nominal Fixed Coupon Bond

4.1 Based on Returns- An Edge over Other Fixed Rate Bonds (Numerical Example)

In order to check the applicability of Inflation Indexed Bonds as a hedge against Inflation and also the returns at the time of coupon payments and principal repayment to the investors. We will first compare a hypothetical Inflation Indexed Bond with a Nominal Fixed Coupon Bond to validate the higher nominal and real rate of returns enjoyed by IIB's. Further, by deriving data for the actual Inflation from “Office of the Economic Adviser to the Government of India, Ministry of Commerce and Industry” (Table 4), we will comment upon the capital erosion in Nominal Fixed Coupon Bond vs. Inflation Indexed Bonds. Towards the end of the discussion, we will recommend IIB's not only to a particular class of investors (as investors and market participants understand these bonds only for the pensioners, retired people etc) in India but also to the mass as in the case of retail participation in Equity market. It can also help the government to deepen their under developed debt market and to safeguard the investors from the rising prices due to inflation.

Our computation of hypothetical bond involves some *assumptions*. Those are:

- The Inflation Indexed Bonds in our example are issued with a real rate of return (i.e. 3% per annum with semi-annual compounding) attached to it.
- For the sake of simplicity, IIB is issued directly to the investors (with the pre-set real return and price) instead of investors bidding for it (as in the case of an issuance through the Auction process) and also he/she will retain the bond till its maturity and will not sell it in the secondary market, so there would be no cut-off price, accrued interest, dirty price etc.
- As the previous version of IIB's i.e. Capital Indexed Bond involved complex calculation for calculating the Index ratio etc. Hence in this case, we have taken a situation whereby the bond is issued at the 1st day of December and hence needs no interpolation for the settlement date both for the coupon payments as well as redemption (this is for the simplicity sake of the investor's to understand this new instrument).
- The bond is issued for the tenure of 5 years which is different from the proposition made by the “Reserve Bank of India of 10-12 years”. This is because, being a new product IIB's first had to show its commitment to the investors for providing a hedge for inflation.
- Figures for the inflation (I.e. WPI) are taken for “All Commodities” (monthly figures instead of weekly) keeping 2004-05 (base year i.e. 100) as base till 2011.
- Reference WPI and all the calculations are as per the technical discussion of the structure of IIB's given in this paper and indexed by RBI in their study.
- Hence for June, “Ref WPI” will be taken as February and for December it would be August (refer to Table 4 for WPI figures).
- Further, As per the proposal made by Reserve Bank of India, Ref WPI and Index Ratio (IR) for a specific date has been truncated to six decimal places and rounded off to five decimal places

Following is the information regarding the ‘Normal Fixed Coupon’ bond as well as Inflation Indexed Bonds

Inflation Indexed Bond

Reserve Bank of India issues 3%, 5-year Inflation Indexed Bond on 1st December 2005 redemption on 2010 (1st December 2010) linked to Wholesale Price Index (Table 4) (Base year 2004-2005=100) with a face value of Rs.1000, Semi-Annual compounding with reset dates as per the changing WPI figures from the "Office of the Economic advisor, MCI" (Note 2).

Nominal Fixed Coupon Bond

XYZ Ltd Issues, 5 year, 9% bond with face value of Rs. 1000 on 1st December 2005 at par, redemption on 1st December 2010.

Steps in computing the Nominal Rate of Return for *Inflation Indexed Bond*:

Formulas used:

- 1) Index Ratio_{Set Date} = (Ref WPI_{Set Date})/(Ref WPI_{Issue Date})
- 2) Indexed Principal/Inflation Compensation_{Set Date} = (Principal × Index Ratio_{Set Date})

3) Coupon = (3%/2) * Indexed Principal

Reference Wholesale Price Index (WPI) Figures:

For June, “Ref WPI” will be taken as *February* and for December it would be *August* (refer to Table 4 for WPI figures).

Table 5. Wholesale Price Index (WPI, Monthly data from 2005-2010) with semi-annual coupon payments

Year	Month	WPI (lagged 4 month)
2006	June	105.4
2006	December	111.3
2007	June	112.4
2007	December	115.9
2008	June	118.8
2008	December	128.9
2009	June	122.9
2009	December	129.3
2010	June	134.8
2010	December	140.7

*Above dates are the coupon payment dates (reset dates) for an IIB. Base Year 2004-05 = 100 (For All Commodities). Presently, provisional WPI is released with a lag of two weeks and final WPI with a lag of two and half month (For example: Provisional WPI for 31st March 2008 and Final WPI for 31st January 2008 would be 14th April 2008.). But the above table shows the WPI figures with a lag of 4 months in order to avoid the errors while interpolation. (For example: Final WPI for 1st December 2005 would be 1st August 2005 and for 1st June 2005, it would be 1st February 2005 and similar for every coupon date.)

Source: Office of the Economic Adviser to the Government of India, Ministry of Commerce and Industry

WPI on “Issue Date” (i.e. 1st December 2005) is 104.1 and on the final “Settlement Date” (i.e. 1st December 2010) is 140.7

Calculation of Index Ratio (Table 6):

$$\text{Index Ratio}_{\text{Set Date}} = (\text{Ref WPI}_{\text{Set Date}}) / (\text{Ref WPI}_{\text{Issue Date}})$$

For example: Index Ratio for ‘Set date’ as 1st June 2006 (i.e. first coupon payment date) would be :

$(\text{Ref WPI}_{1^{\text{st}} \text{ June } 2006} / \text{Ref WPI}_{1^{\text{st}} \text{ December } 2005}) = (105.4/104.1) = 1.01249$ (truncated and rounded off to 5 places of decimals)

And similarly for the ‘Settlement date’ i.e. 1st December 2010 it is :

$(\text{Ref WPI}_{1^{\text{st}} \text{ December } 2010} / \text{Ref WPI}_{1^{\text{st}} \text{ December } 2005}) = (140.7/104.1) = 1.35159$ (truncated and rounded off to 5 places of decimals).

Table 6. Wholesale Price Index (WPI, Monthly data from 2005-2010) with semi-annual coupon payments and Index Ratio calculation on reset dates (Interest payment dates)

Year	Month	WPI (lagged 4 month)	Index Ratio
2005	December	104.1	
2006	June	105.4	1.01249
2006	December	111.3	1.06916
2007	June	112.4	1.07973
2007	December	115.9	1.11335
2008	June	118.8	1.14121
2008	December	128.9	1.23823
2009	June	122.9	1.18060
2009	December	129.3	1.24207
2010	June	134.8	1.29491
2010	December	140.7	1.35159

*Above dates are the coupon payment dates (reset dates) for an IIB. Base Year 2004-05 = 100 (For All Commodities). Final WPI for 1st December 2005 would be 1st August 2005 and for 1st June 2005, it would be 1st February 2005 and similar for every coupon date. Index Ratio is calculated keeping the Ref WPI Base as “Issue Date” i.e. 1st December 2005 (104.1).

Calculation of Inflation Compensation/ Indexed Principal (Table 7):

$$\text{Indexed Principal/Inflation Compensation}_{\text{Set Date}} = (\text{Principal} \times \text{Index Ratio}_{\text{Set Date}})$$

For example: Indexed Principal/Inflation Compensation 'Set date' as 1st June 2006 (i.e. first coupon payment date) would be : $(\text{Principal} \times \text{Index Ratio}_{1^{\text{st}} \text{ June } 2006}) = (1000 * 1.01249)$ i.e. 1012.49

And similarly for the 'Settlement date' i.e. 1st December 2010 it is :

$$(\text{Principal} \times \text{Index Ratio}_{1^{\text{st}} \text{ December } 2010}) = (1000 * 1.35159) \text{ i.e. } 1351.59$$

Table 7. Wholesale Price Index (WPI, Monthly data from 2005-2010) with semi-annual coupon payments, Index Ratio and Indexed Principal (Inflation Compensation) calculation on reset dates (Interest payment dates) based on index ratio (Face value of a bond is Rs.1000)

Year	Month	WPI (lagged 4 month)	Index Ratio	Inflation Compensation
2005	December	104.1		
2006	June	105.4	1.01249	1012.49
2006	December	111.3	1.06916	1069.16
2007	June	112.4	1.07973	1079.73
2007	December	115.9	1.11335	1113.35
2008	June	118.8	1.14121	1141.21
2008	December	128.9	1.23823	1238.23
2009	June	122.9	1.18060	1180.60
2009	December	129.3	1.24207	1242.07
2010	June	134.8	1.29491	1294.91
2010	December	140.7	1.35159	1351.59

*Above dates are the coupon payment dates (reset dates) for an IIB. Base Year 2004-05 = 100 (For All Commodities). Final WPI for 1st December 2005 would be 1st August 2005 and for 1st June 2005, it would be 1st February 2005 and similar for every coupon date. Index Ratio is calculated keeping the Ref WPI Base as "Issue Date" i.e. 1st December 2005 (104.1). Inflation compensation or Indexed Principal is calculated by multiplying the index ratio by the face value of the bond i.e. Rs.1000 in this case. (Though the Principal is indexed to Inflation on every reset date (Coupon date) but the final payout would only be at the time of redemption i.e. 1st December 2010)

Calculation of Coupon on Indexed Principal (Table 8):

$$\text{Coupon} = (3\%/2) * \text{Indexed Principal}$$

For example: Coupon on 'Set date' as 1st June 2006 (i.e. first coupon payment date) would be :

$$((3\%/2) * \text{Indexed Principal}) = (0.015 * 1012.49) \text{ i.e. } 15.1873$$

And similarly for the 'Settlement date' i.e. 1st December 2010 it is:

$$((3\%/2) * \text{Indexed Principal}) = (0.015 * 1351.59) \text{ i.e. } 20.2737$$

Hence, we can say that at the time of redemption i.e. on 1st December 2010 (after 5 years) an investor for such bonds will get the the Indexed Principal repayment along with the coupon adjusted for inflation. The Cash Flow in our case would be (Table 8): $1351.59 + 20.2737 = 1371.8587$

Kindly note, that in the case of IIB, though the Principal is indexed to Inflation on every reset date (Coupon date) but the final payout would only be at the time of redemption i.e. 1st December 2010. In some cases, we can even see the principal and coupon of these bonds going down with the decreasing Inflation (for example, WPI on 1st June 2009 is 122.9 (Principal = Rs. 1180.60 and Coupon = Rs. 17.70893) which was 128.9 on 1st December 2008 (Principal = 1238.23 and Coupon = 18.5734) hence reducing the principal as well as coupon.

Table 8. Wholesale Price Index (WPI, Monthly data from 2005-2010) with semi-annual coupon payments, Index Ratio, Indexed Principal (Inflation Compensation) and Coupon calculation on reset dates (Interest payment dates) based on 3% per annum (with semi-annual compounding i.e. 1.5%) times Indexed Principal

Year	Month	WPI (lagged 4 month)	Index Ratio	Inflation Compensation	Coupon
2005	December	104.1			
2006	June	105.4	1.01249	1012.49	15.18731
2006	December	111.3	1.06916	1069.16	16.03746
2007	June	112.4	1.07973	1079.73	16.19596
2007	December	115.9	1.11335	1113.35	16.70028
2008	June	118.8	1.14121	1141.21	17.11815
2008	December	128.9	1.23823	1238.23	18.57348
2009	June	122.9	1.18060	1180.60	17.70893
2009	December	129.3	1.24207	1242.07	18.63112
2010	June	134.8	1.29491	1294.91	19.42363
2010	December	140.7	1.35159	1351.59	20.27377

*Above dates are the coupon payment dates (reset dates) for an IIB. Base Year 2004-05 = 100 (For All Commodities). Final WPI for 1st December 2005 would be 1st August 2005 and for 1st June 2005, it would be 1st February 2005 and similar for every coupon date. Index Ratio is calculated keeping the Ref WPI Base as "Issue Date" i.e. 1st December 2005 (104.1). Coupon is calculated at the rate of 3% per annum (i.e. 1.5% six monthly) on the Indexed Principal on reset dates.

Calculation of Nominal Rate of Return with the help of Inflation (WPI) and Real Rate of Return (Coupon Rate) in order to compare it with a Nominal Fixed Coupon Rate Bond (Table 9) :

$$I + I = (I + r) * (I + E(I))$$

Where:

- I = Nominal Interest Rate;
- r = Real Interest Rate;
- E (I) = Expected Inflation Rate.

For Example: Nominal (Six monthly) Rate of Return for 1st June 2006 can be computed as:

$$\text{Nominal Rate}_{\text{June 2006}} = ((1 + 1.5\%) * (1 + 5.400\%)) - 1 = 6.981\%$$

$$\text{Nominal Rate}_{\text{December 2006}} = ((1 + 1.5\%) * (1 + 5.598\%)) - 1 = 7.181\%$$

Nominal (Yearly) Rate of Return for the year 2006 can be computed as:

$$\text{Nominal Rate of Return 2006} = \text{Nominal Rate}_{\text{June 2006}} + \text{Nominal Rate}_{\text{December 2006}} = 6.981\% + 7.181\% = 14.1627\%.$$

Table 9. Wholesale Price Index (WPI, Monthly data from 2005-2010 with Base year as 2004-05: 100) with Semi-annual inflation, Coupon rates (as fixed by the government) and Nominal Rate of return (both semi-annually and yearly)

Year	Month	WPI	Inflation (WPI)	Coupon	Nominal Rate (Semi-Annual)	Nominal Rate (Yearly)
2004-05		100				
2006	June	105.4	5.400%	1.50%	6.9810%	
2006	December	111.3	5.598%	1.50%	7.1817%	14.1627%
2007	June	112.4	0.988%	1.50%	2.5030%	
2007	December	115.9	3.114%	1.50%	4.660%	7.163%
2008	June	118.8	2.502%	1.50%	4.0397%	
2008	December	128.9	8.502%	1.50%	10.1292%	14.1689%
2009	June	122.9	-4.655%	1.50%	-3.225%	
2009	December	129.3	5.207%	1.50%	6.785%	3.561%
2010	June	134.8	4.254%	1.50%	5.8175%	
2010	December	140.7	4.377%	1.50%	5.9425%	11.76%
						10.1633%

*Above dates are reset dates for an IIB. Base Year 2004-05 = 100 (For All Commodities). Final WPI for 1st December 2005 would be 1st August 2005 and for 1st June 2005, it would be 1st February 2005 and similar for every coupon date. Inflation rate (WPI) is calculated by

comparing the previous WPI figures and hence dividing it by current WPI figures (Inflation (June, 2006) = (WPI June, 2006)/ (WPI Base year)). Coupon rate is fixed at the rate of 3% per annum (i.e. 1.5% six monthly) by the issuer of the bond. Hence, Six monthly and yearly Nominal rate can be found out by the below mentioned formula.

Hence, the Average yearly Nominal Rate of Return, of an “Inflation Indexed Bond” with 3% real rate of coupon (Semi-Annual compounding), issued for the period of 5-years i.e. on 1st December 2005 redemption on 2010 (1st December 2010) linked to Wholesale Price Index with a Face Value of Rs.1000 with reset dates as per the changing WPI figures is coming out to be 10.1633%.

Steps in computing the Nominal Rate of Return for a “Nominal Fixed Coupon Bond”:

XYZ Ltd Issued, 5 year, 9% bond with face value of Rs. 1000 on 1st December 2005 at par, redemption on 1st December 2010.

We can calculate the Coupon for “Nominal Fixed Coupon Bond” with semi-annual compounding with the help of the following formula:

Coupon = (9%/2) * Principal or Face value of the Bond

I.e. Coupon_{June 2006} = (9%/2) * 1000 = Rs. 45

At the time of Redemption (December 2010) = Principal + Coupon_{December 2010} = 1000 + 45 = 1045

Table 10. Nominal Fixed Coupon Bond that pays 9% per annum (4.5% semi-annual compounding) issued on 1st December 2005 at par (Rs.1000), redemption on 1st December 2010 for 5 years

Year	Coupon Date	Cash Inflow (Rs.)
2006	June	45
2006	December	45
2007	June	45
2007	December	45
2008	June	45
2008	December	45
2009	June	45
2009	December	45
2010	June	45
2010	December	1045

*Above dates are the coupon payment dates for a Nominal Fixed Coupon that pays Coupons/Interest on every Six months starting from 1st December 2005 till 1st December 2010 along with the repayment of Face value/par value/redemption value of Rs.1000.

We can say that at the time of redemption i.e. on 1st December 2010 (after 5 years) an investor for such bonds will get the the Principal repayment along with the coupon. The Cash Flow in our case would be (Table 10): 1000 (Redeemed at par) + 45 (Coupon) = 1045

Hence, the Nominal Rate of Return, of an “Nominal Fixed Coupon Bond” with 9% Nominal rate of coupon (Semi-Annual compounding), issued for the period of 5-years i.e. on 1st December 2005 redemption on 2010 (1st December 2010) with a Face Value of Rs.1000 is coming out to be 9% (as the bond is issued and redeemed at par).

4.2 Based on Nominal Rate of Return and Future Cash Flow at the Time of Repayment (An Investor's Perspective)

With reference to the above calculations, we can now conclude that Nominal Yield on an Inflation Indexed Bonds linked to Wholesale Price Index (Table 4) (Base year 2004-2005=100) with a face value of Rs.1000, Semi-Annual compounding (3% real return per annum) with reset dates as per the changing WPI figures resulted in superior return of 10.1633% as compared to the Nominal Fixed Coupon Bond with Nominal Yield of 9%. The Cash Inflow for investors of these bonds at the time of repayment of their Principal along with the Coupon (Rs.) is Rs.1045 in the case of ‘Nominal Fixed Coupon Bond’ but it is as high as Rs.1371.8587 in the case of an ‘Inflation Indexed Bond’.

In simple words, a retail investor will analyze the growth of Indexed principal in the case of ‘Inflation Indexed Bond’ at the rate of $((1351.59 - 1000) / 1000) * 100 = 35.16\%$ (in 5 years i.e. around 6.21% year-on-year growth rate) in addition with 3% per annum as real rate, whereas in the case of ‘Nominal Fixed Coupon Bond’, the

principal remains the same i.e. Rs.1000 at the time of repayment. A Nominal Bond pays the investors coupon at the rate of 9% per annum (4.5% every six month) but due to a shortcoming of Yield-to-Maturity Curve, the investors would find difficulty in investing the coupons at the same rate (which is one of the assumptions in “Nominal Fixed Coupon Bond’s Yield-to-Maturity (YTM) curve) in falling interest rate market. Though the technical concept behind the calculation of growth rate is wrong but this is the way an individual investor analyze an instrument. In the next section, for simplicity sake, we will analyze the “purchasing power” of an investor at 1st December 2005 (start of an investment) compared to the “purchasing power” at “1st December 2010 (redemption date) and will comment on the probability of capital erosion (less chances) in the case of IIB’s and also in the case of ‘Nominal Fixed Coupon Bond’.

Table 11. Compares the two kinds of bond on the basis of ‘Nominal Rate of Return’ and ‘Cash Inflow at Redemption’

Basis/Bond Type	Nominal Fixed Coupon Bond	Inflation Indexed Bond
Nominal Rate of Return	9%	10.1633%
Cash Inflow at Redemption	1045	1371.8587

*Above figures are computed for a hypothetical ‘Nominal Fixed Coupon’ and ‘Inflation Indexed Bond’ that pays Coupons/Interest on every Six months starting from 1st December 2005 till 1st December 2010 for the bond with Face value of Rs.1000.

5. Acceptability and Applicability of Inflation Indexed Bonds

5.1 An Insight into Purchasing Power

‘Purchasing Power’ can be defined as the number of goods/services that can be bought with a unit of currency. It is known that the purchasing power declines with the increasing prices in a country (or in other words, it decreases with an increase in inflation). Hence, purchasing power is inversely proportional to Inflation keeping the income level of an individual as constant. For example, the purchasing power of a rupee in the year 1950 was far more than in the year 2011. But in the case of “Inflation Indexed Bonds” as the bond’s principal and coupon are linked with WPI figures (an indicator of Inflation), the purchasing power can be seen as positive with an increasing prices scenario. As compared to the investment in a Nominal Fixed Coupon Bond, whereby it pays a higher nominal rate of return during the tenure of its investment, IIB’s can be preferred as it pays comparatively lower coupon rate during the tenure but reset according to the changing WPI figures which leads to a hedged (against inflation) Principal and Coupon payment at the time of redemption. Repayments from IIB’s and Nominal Fixed Coupon Bonds can be questioned for the purchasing power at the time of redemption and hence can be checked for the potential loss due to capital erosion (in the case of the Nominal Bonds). Hence, in order to compare the investor’s worth at the time of repayment of both the bonds, we will take into consideration a situation whereby we will compare the price of a car in the year 2005 and the price of the same car in the year 2010 i.e. Prices at the start of the investment cycle (i.e. December 2005) compared with the prices at redemption (i.e. December 2010). By doing so, we will show whether the investors by investing in these bonds are capable of buying the same car from the investment repayment after 5 years (i.e. December 2010) which he/she could anyways bought it at the start (i.e. December 2005) without investing in these bonds.

Alternatively, we will also compare the future value based on the ‘*coupon reinvestment*’ for both ‘Normal Bond’ as well as ‘Inflation Indexed Bond’ at a fixed interest rate over the investment horizon which is in line with an assumption made by the yield-to-maturity curve.

Nominal Fixed Coupon Bonds vs. Inflation Indexed Bond

5.2 Comparison from the Investor’s Perspective (No Reinvestment of Coupons)

Let’s understand the investment’s worth in this kind of a financial instrument by taking an example as we have already considered the cash flows and the nominal yield involved with this bond (For evidence: Refer to Table 10). As we are examining the purchasing power from the principal repayment of both these bonds from the investor’s perspective, hence we have assumed that the investor will consume the interim coupon payments and will not reinvest it at the prevailing interest rate.

This type of an assumption is fundamentally incorrect and hence in the next section we have critically examined both the bonds by reinvesting the coupon payments at the rate of 9% constant over the investment horizon.

Suppose, on 1st December 2005, an individual investor (Mr. Brajesh) who is well versed and equipped with the financial knowledge and loves investing in Indian Debt Market, plans to buy a Maruti Suzuki made Wagon R.

But his interests in bond markets induced him towards an alternative option of a “9% Nominal Fixed Coupon Bond” (discussed earlier) which stands to redeem after 5 years (on 1st December 2010). So, in order to reap the benefit of a 9% nearly risk-free return (as bonds are considered to be a safe mode of investment), he bought 300 such bonds and deferred the decision of buying a car for 5 years. There is an additional option to invest in an “Inflation Indexed Bond” but due to its newness and low real rate of return of 3%, he is reluctant to invest in such a bond.

Wagon R on 1st December 2005 priced at around Rs.300000 (ex-showroom price).

Mr. Brajesh enjoyed his coupon payments at the rate of 4.5% on every six months (9% per annum) till the end of 5 years. Alternatively, if he would have invested in Inflation Indexed Bonds, it would have only paid him a real return of approximately 1.5% (before inflation adjusted) on every six months. On knowing this, Mr. Brajesh was very happy and proud of his investment in that 9% Nominal Fixed Coupon Bond.

After 5 years i.e. on 1st December 2010, at the time of the principal repayment, Mr. Brajesh got back his par value of Rs. 1000 back along with the last coupon payment of Rs. 45 on a single bond (he bought 300 bonds) whereas in the case of an Inflation Indexed Bonds, it repaid the principal of Rs. 1351.59 along with the last coupon payment of Rs. 20.2737 (for evidence: See Table 8 above).

With the principal repayment of Rs. 300000 (300 bonds of Rs. 1000 each) Mr. Brajesh went to his nearest Maruti Suzuki Showroom in order to buy Wagon R, which he initially deferred because of his investment in the Debt market, he realized that:

Wagon R on 1st December 2010 priced at around Rs.360000 (ex-showroom price).

He found out that with the principal repayment from a ‘Nominal Fixed Coupon Bond’ paying as high as 9%, he was incapable of buying the same car due to the inflation and other factors as the prices have already risen from Rs.300000 in the year 2005 to Rs.360000 in 2010.

He also realized that investment in an *Inflation Indexed Bonds* could have fetched him enough money to even buy a bigger car (i.e. IIB repaid Rs. 1351.59 on single bond means on an investment of 300 bonds, he could have got Rs.405477 as principal alone).

Hence, by critically examining the above given illustration, it can be concluded that in the case of *Nominal Fixed Coupon Bonds* there is capital erosion along with the declining purchasing power with increasing inflation which is not the case with an *Inflation Indexed Bond*.

5.3 Comparison Based on Technical and Fundamental Approach (Reinvestment of Coupons)

We have already seen the nominal return and the principal repayment keeping in mind the investor’s perspective. But in order to validate our findings with the financial literature, we have to calculate the investment’s worth by reinvesting the interim coupon payments in both the cases as previously we have assumed that an investor will not reinvest such payments. Thus, in order to compare both the bonds on a common platform, we will assume that the coupons payments will be reinvested at the rate of 9% for both ‘Normal Bond’ as well as ‘Inflation Indexed Bond’ over the life of the investment i.e. 5 years. It can be seen from Table 12, that the first coupon payment by both the bonds on 1st June 2006 (i.e. six months after the investment begins) is reinvested at the rate of 4.5% (9% with semi-annual compounding) for 9 periods (1 period = 6 months) followed by others till the end of the fifth year. At the time of repayment, value of the bond can be calculated by adding the principal along with the reinvested coupons.

After 5 years with coupon reinvestment at the rate of 9%, a ‘9% Nominal Fixed Coupon Bond’ is worth for Rs. 1552.97 whereas ‘3% Inflation Indexed Bond’ is worth Rs. 1565.3578 on a face value of Rs. 1000. Hence, it can be seen that the ‘Inflation Indexed Bond’ is priced above as compared to the ‘Nominal Fixed Coupon Bond’. Additionally, the nominal yield of 9% in the case of ‘Nominal Fixed Coupon Bond’ is computed with an assumption regarding the reinvestment at the same interest rate during the investment horizon which would be difficult in the case of ‘falling/decreasing interest rate scenario’. Practically, it would also be difficult to invest such small amount (coupon payments) every six months at such a higher interest rate (one of the motives to study the investment’s worth without the coupon reinvestment in the previous section).

Table 12. Nominal Fixed Coupon Bond vs. Inflation Indexed Bond that reinvests the coupon payments @ 9% per annum (4.5% semi-annual compounding) issued on 1st December 2005 at par (Rs.1000), redemption on 1st December 2010 for 5 years

Investment			Normal Bond		Inflation Indexed Bond	
Tenure	Year	Month	Coupons	Reinvest @ 9% p.a.	Coupons	Reinvest @ 9% p.a.
9	2006	June	45.00	66.87	15.18731	22.5698
8	2006	December	45.00	63.99	16.03746	22.8068
7	2007	June	45.00	61.24	16.19596	22.0404
6	2007	December	45.00	58.60	16.70028	21.7481
5	2008	June	45.00	56.08	17.11815	21.3323
4	2008	December	45.00	53.66	18.57348	22.1492
3	2009	June	45.00	51.35	17.70893	20.2088
2	2009	December	45.00	49.14	18.63112	20.3456
1	2010	June	45.00	47.03	19.42363	20.2976
0	2010	December	1045.00	1045.00	1371.85879	1371.8587
				1552.97		1565.3578

*Above figures are computed for a 'Nominal Fixed Coupon' and 'Inflation Indexed Bond' that reinvests Coupons/Interest on every Six months starting from 1st December 2005 till 1st December 2010 for the bond with Face value of Rs.1000. Investment tenures shows the time period for which the given coupon payments are reinvested at the rate of 4.5% semi-annually (hence are given in 6 months). Investment tenure of 9 shows that the coupon is reinvested for 4.5 years (9 periods of six months each) starting from the first coupon payment i.e. on 1st June 2006 until the redemption date i.e. 1st December 2010 where the coupon received is not reinvested (as it is the end of the investment horizon).

That's why for the sake of convenience & simplicity and also by looking at the principal repayment i.e. of Rs.1371.8587 in case of Inflation Indexed Bond (without coupon reinvestment) it can now be said to be much relevant and easily computable return and hence maintains the purchasing power of the investors (as explained in the example related to car above).

5.4 Comparison Based on Rising Inflation in the Economy

In order to compare the sensitivity of the bond values (at the time of redemption) towards the change in inflation rates for both the 'Normal Fixed Coupon Bond' as well as 'Inflation Indexed Bond', we have made the following scenarios starting from 5% to 12% inflation levels. Bond values at redemption are calculated by keeping the reinvestment rate constant at the rate of 9% for all the inflation levels. This kind of an assumption is practically unfair to keep as with the higher inflation, the Reserve Bank of India will increase the interest rates and motivates the investors to save more and more in order to control the liquidity in the economy. But in our case, this kind of an unfair assumption will help us to study the sensitivity of the bond values with changing inflation rates on a common platform. The figures for the Wholesale Price Index (WPI) is adjusted towards the repayment period (end of the investment horizon) for the mentioned inflation rate keeping the other values same (this is done in order to keep the bond value unaffected by the reinvestment rate, as the principal and coupon on redemption date (final settlement date) will not be further invested) as given by the 'Office of the Economic Adviser to the Government of India, Ministry of Commerce and Industry'. As the principal and coupons in the case of an Inflation Indexed Bond are indexed to the changing WPI figures, hence we can see a positive relationship between 'Bond Value' at the time of repayment and 'Inflation Rate' whereas in the case of a 'Normal Fixed Coupon Bond' the Bond Value is unaffected with the changing Inflation rate (keeping the interest rate as constant). Such positive relationship can be depicted from the Figure 2 given below.

Table 13. Bond Value on redemption with different Inflation levels for Nominal Fixed Coupon Bond and Inflation Indexed Bond that reinvests the coupon payments @ 9% per annum (4.5% semi-annual compounding) issued on 1st December 2005 at par (Rs.1000), redemption on 1st December 2010 for 5 years

Inflation	Inflation Indexed Bond	Normal Fixed Coupon Bond
5%	1441.61	1552.97
6%	1503.87	1552.97
7%	1568.87	1552.97
8%	1636.77	1552.97
9%	1707.68	1552.97
10%	1781.71	1552.97
11%	1858.71	1552.97
12%	1939.62	1552.97

*Above figures are computed for a 'Nominal Fixed Coupon' and 'Inflation Indexed Bond' that reinvests Coupons/Interest on every Six months starting from 1st December 2005 till 1st December 2010 for the bond with Face value of Rs.1000 starting from the first coupon payment i.e. on 1st June 2006 until the redemption date i.e. 1st December 2010 where the coupon received is not reinvested (as it is the end of the investment horizon). Figures are computed at different inflation levels keeping the other factors like reinvestment rate, interest rate as constant.

We can now see that the Inflation Indexed Bond is valued higher as compared to the Normal Bond when the inflation exceeds 6%. Starting from 5% inflation with IIB valued at Rs.1441.61, the Normal Bond value (of Rs.1552.97) would be the same for all the inflation levels until 12% where IIB was quoting at as higher as Rs.1939.63.

Hence, by looking at various comparisons first on the basis of a numerical example along with the purchasing power testing with and without coupon reinvestment and now by comparing the bond value in various inflation levels, we can strongly recommend the superiority of an 'Inflation Indexed Bond' as compared to a 'Normal Fixed Coupon Bond' even with a nominal rate of 9%.

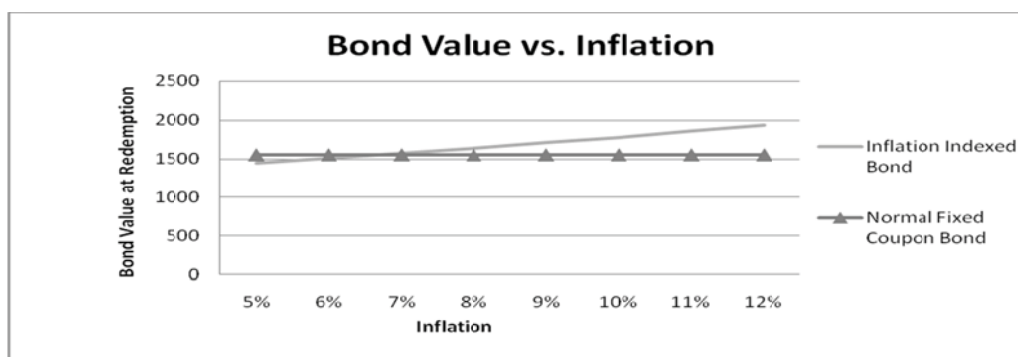


Figure 2. Relationship between 'Bond Value' with 'Inflation' in the case of 'Inflation Indexed Bond' as well as a 'Normal Fixed Coupon Bond'

Figure 2 Shows the Bond Value/Inflation relationship for a normal bond as well as the Inflation Indexed Bond. For an Inflation Indexed Bond, bond value increases with increase in the Inflation and vice-versa but for a normal bond, it remains unaffected by the rising Inflation levels (keeping interest/reinvestment rate as constant for both the bonds).

For an Inflation Indexed Bond, bond value increases with increase in the Inflation and vice-versa but for a Normal Bond, it remains unaffected by the rising Inflation levels (keeping interest / reinvestment rate as constant for both the bonds). 5-year bond value becomes as high as Rs.1939.62 when the inflation rates went up till 12% and decreased to Rs. 1441.61 when inflation rates were as low as 5%. This is not the case with a "Normal Bond" as the principal is not linked to the changing Inflation rates (WPI) and hence keeping its value constant over the life of the security.

6. Conclusions and Recommendations

In the end, we can conclude by quoting few observations and findings based on our analysis of Inflation Indexed Bonds as a new instrument/product for the Indian under-developed Debt market. In our research we have studied the need, advantages, disadvantages, structure and also the technical and conceptual framework of the product. We have compared the Normal Bond with an Inflation Indexed Bond on various parameters starting from the formation of a hypothetical bond that relates to the features as guided by the Reserve Bank of India in their technical discussion about the instrument. In our comparison based on *Nominal Rate of Return* and *Future Cash Flow* at the time of repayment keeping in mind the investor's perspective, we have found out that the Nominal Yield on an Inflation Indexed Bonds linked to Wholesale Price Index (Table 4) (Base year 2004-2005=100) with a face value of Rs.1000, Semi-Annual compounding (3% real return per annum) with reset dates as per the changing WPI figures resulted in superior return of 10.1633% as compared to the Nominal Fixed Coupon Bond with Nominal Yield of 9%. The Cash Inflow for investors of these bonds at the time of repayment of their principal along with the coupon (Rs.) will be Rs.1045 in the case of '*Nominal Fixed Coupon Bond*' but it would be as high as Rs.1371.8587 in the case of an '*Inflation Indexed Bond*'. Further in the study, we have also commented upon *the Acceptability and Applicability of Inflation Indexed Bonds* based on *purchasing power* of the investors. We can now say that IIB's can be preferred as it pays comparatively lower coupon rate during the tenure but reset according to the changing WPI figures which leads to a hedged (against inflation) Principal and Coupon payment at the time of redemption (as we have already seen that the investors by investing in these bonds are capable of buying the same car from the investment repayment after 5 years i.e. December 2010, which he/she could anyways bought it at the start (i.e. December 2005) without investing in these bonds). We have further segregated the comparison based on "*No Reinvestment of Coupons*" whereby the investors will not reinvest the coupon at the prevailing interest rate (9% in our case) and "*Reinvestment of Coupons*" whereby the investors will reinvest the coupon paid to him at the prevailing interest rate i.e. 9% for both IIB's and Normal Bond. In the case of "*No Reinvestment of Coupons*" there was capital erosion in the case of Normal Bond along with the declining purchasing power with increasing inflation which was not the case with an *Inflation Indexed Bond*. After 5 years with "*Coupon reinvestment*" at the rate of 9%, a '*9% Nominal Fixed Coupon Bond*' was worth for Rs. 1552.97 whereas '*3% Inflation Indexed Bond*' was worth Rs. 1565.3578 on a face value of Rs. 1000. Hence, it can be seen that the '*Inflation Indexed Bond*' was priced above as compared to the '*Nominal Fixed Coupon Bond*'. Lastly, we have compared both the bonds in the rising inflation scenario. We have analyzed that for an Inflation Indexed Bond, bond value increases with increase in the Inflation and vice-versa but for a Normal Bond, it remains unaffected by the rising Inflation levels (keeping interest/reinvestment rate as constant for both the bonds). Five year bond value becomes as high as Rs.1939.62 when the inflation rates went up till 12% and decreased to Rs. 1441.61 when inflation rates were as low as 5%.

After seeing the superiority of IIB's as compared to the Normal Bond, we can now make few recommendations based on our findings. Believing in our analysis, we will recommend IIB's not only to a particular class of investors (as investors and market participants understand these bonds only for the pensioners, retired people etc) in India but also to the mass as like the case of retail participation in Equity market. It can also help the government to deepen their under developed debt market and to safeguard the investors from the rising prices due to inflation. As we know the fact that unlike other developed debt markets of the world, financial literacy is not so common amongst the retail investors in India, hence the initial issue of IIB has to be simple on the issue dates, tenures and also for the matters regarding the auction process etc. It would be better if the central bank prior to issuing this kind of an instrument, holds a literacy program whereby the target audience can be tapped regarding the benefits and structure of this kind of a product.

Appendix: In Table 2, we took the following data and assumptions regarding the calculation

Issue Date: 1/1/2000

Issuance Price: Rs.1000

Maturity Period: 10 years

4% real coupon paid annually

6% year-on-year (annualized) WPI (Inflation)

We have take the base for the WPI as 100 on the issuance date and the WPI for a coupon date after one year is 106 (year-on-year of 6% until 179.08 ($100 \times (1.06)^{10}$)) in the year 10). The adjusted principal would be 1.06 times the face value/redemption value i.e. 1060 in the first year as compared to 1000 at the issue date. Hence, the

coupons are calculated on the indexed principals as one of the feature of the inflation indexed bonds i.e. 4% of 6% increased principal leads to the nominal cash-flow- annualized return of 10.24%.

This was a hypothetical and easily computable Inflation Indexed Bonds as in reality, IIB's cash flow patterns are bit complicated. It involves semi-annual coupons and the inflation-indexed principal is accrued daily, based on an interpolation of the two most recent WPI figures reported prior to the settlement month. "Thus it is proposed that final WPI with a lag of four months may be used as Ref WPI for the first day of the calendar month in which 'Issue Date' and 'Set Date' falls".

References

- A study by Indian Institute of Management, Calcutta (IIMC). (2011). The Development of Bond market in India. Retrieved from <http://www.docstoc.com/docs/19475216/The-Development-of-Bond-market-in-India>
- ADB report on development of securities market in India: Asia Bond Monitor. (March 2011). Retrieved from <http://www.adb.org/sites/default/files/pub/2011/abm-201103.pdf>.
- Afraid of inflation? Inflation-indexed bonds may bring respite. (2011, January 10). *The Economic Times*. Retrieved from http://articles.economictimes.indiatimes.com/2011-01-10/news/28425165_1_inflation-indexed-bonds-consumer-price-based-inflation-inflation-number.
- Collection of data for the Wholesale Price Index in India. (2011, April 10). *Office of the Ministry of Commerce and Industry*. Retrieved from http://eaindustry.nic.in/wpi_data_display/display_data.asp.
- Fabozzi, F. J. (1980). *The Handbook of Fixed Income Securities*. (7th Ed.). Tata McGraw Hill Edu Pvt Ltd.
- Fisher, L., & Weil R. L. (1971). Coping with the Risk of Interest-Rate Fluctuations: Returns to Bondholders from Naive and Optimal Strategies. *Journal of Business*, 408-431. <http://dx.doi.org/10.1086/295402>
- Go for inflation-indexed bonds. (2010, February 12). In *The Hindu Business Line*. Retrieved from <http://www.thehindubusinessline.in/2010/02/12/stories/2010021250310800.htm>.
- Haugen, R. A. (1986). *Modern Investment Theory*. Prentice-Hall, New York.
- India Inflation Up 8.98%. (2011, April 15). In *The Wall Street Journal*. Retrieved from <http://online.wsj.com/article/SB10001424052748704628404576264130788896912.html>.
- Inflation and how India calculates this rate. (2009, June 18). In *SME Times*. Retrieved from <http://smetimes.tradeindia.com/smetimes/in-depth/2009/Jun/18/inflation-and-how-india-calculates-this-rate-9064.html>.
- John Y. Campbell, & Robert J. Shiller. (1996). A scorecard for Indexed Government Debt. NBER Working Paper no. 5587, May. <http://dx.doi.org/10.2307/3585195>
- Kothari, S., & Shanken, J. (2004). Asset Allocation with Inflation-Protected Bonds. *Financial Analysts Journal*, 60, 54-70. <http://dx.doi.org/10.2469/faj.v60.n1.2592>
- Maloney, K. J., & Yavitz, J. B. (1986). Interest Rate Risk, Immunization and Duration. *The Journal of Portfolio Management*, Spring, pp. 41-48. <http://dx.doi.org/10.3905/jpm.1986.409062>
- Reddy, Y.V., Watanagase, T., Mor, N., & Joshi. (2002). Developing Bond Markets in Emerging Economies: Issues and Indian Experience. *Asian Bond Conference*, pp. 1-20.
- Reserve Bank of India. (2010, December 9). A technical paper on "Inflation Indexed Bonds (IIBs). Retrieved from <http://rbidocs.rbi.org.in/rdocs/PublicationReport/Pdfs/IIBT091210.pdf>.
- Reserve Bank of India. (2004, May 24). A technical Paper on "Capital Indexed Bonds. Retrieved from <http://rbidocs.rbi.org.in/rdocs/PublicationReport/Pdfs/53629.pdf>.

Notes

Note 1. See Appendix for calculation

Note 2. Data is collected in the month of April 2011

Foreign Private Capital, Economic Growth and Macroeconomic Indicators in Nigeria: An Empirical Framework

Ogujiuba Kanayo¹ & Obiechina Emeka²

¹Kanayo Ogujiuba, National Institute for Legislative Studies, National Assembly, Abuja, Nigeria

²Emeka Obiechina, Financial Markets Department, Central Bank of Nigeria, Abuja, Nigeria

Correspondence: Kanayo Ogujiuba, National Institute for Legislative Studies, 14/18 Danube St, Maitama Abuja, Nigeria

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Abstract

The understanding of the determinants of capital flows and the major challenges its sudden surge and flight might pose is central to assessing its macroeconomic impact in an economy. Most developing and transition countries are attracting large inflows of foreign capital that could spur economic growth or have destabilizing effect on their economies if not well managed and streamlined. This however, has aroused concern over their potential effects on macroeconomic stability, competitiveness of the export sector, and external viability. The study examines the relationship existing among foreign private capital components (Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI), economic growth (GDP) and some macroeconomic indicators; interest rate (INTR) and inflation rate (INF) as well as policy implications therefrom, using time series data from 1986-2008. A nonrestrictive Vector Autoregressive (VAR) model was developed, while restriction is imposed to identify the orthogonal (structural) components of the error terms - Structural Vector Autoregressive (SVAR). Analysis indicates that the response of the GDP to shocks from the NDI is not contemporaneous and this is applicable to the other variables. It is somewhat sluggish but returns faster to equilibrium compared to the response from the NNPI. Restricting the recursive Cholesky structural decomposition of the IRF, both in the short-run and long-run, the result indicates that the NNPI impacts on the GDP at the short-run, while the NDI does not. Also, the INTR was shown to impact on the NNPI in the short-run. Furthermore, in the long-run, the GDP responds more to the impact of the NNPI compared to the NDI, while the NDI responds to INTR, the NNPI does the same to INF. Policy frameworks on Foreign Private Investment should be encouraged for the promotion of economic development in Nigeria. Consequently, it is recommended that government should not discourage the flow of those foreign private capitals but be more vigilant about the nature and sources of the flows. This is very important in order to forestall their potential adverse impacts on key macroeconomic variables as well as economic growth in a situation of their sudden surge or flight.

Keywords: foreign private investment, Foreign Direct Investment, economic growth

JEL Classification: F21, F36, O47

1. Introduction

After political independence in the 1960s, African countries were very sceptical about the virtues of free trade and investment. Consequently, in the 1970s and 1980s several countries in the region imposed trade restrictions and capital controls as part of a policy of import-substitution industrialization aimed at protecting domestic industries and conserving scarce foreign exchange reserves. However, there is now a substantial evidence that this inward-looking development strategy discouraged trade as well as foreign direct investment (FDI) and had negative effects on economic growth and living conditions in the region (Rodrik, 1998). In most developing countries, the pursuit of economic growth has been always at the front burner of economic policy. This, however, is often hindered by the non availability of resources that would drive this process of achieving the required economic growth. The need for foreign capital flows arises when the desired investment exceeded the actual savings, and also due to investments with long gestation periods that generate non-monetary returns, growing government expenditure that are not tax-financed; and when actual savings are lower than potential savings due to repressed financial markets and even capital flight (Essien, & Onwioduokit, 1999). The emergence of integrated financial markets and high capital mobility made possible by the increasing globalization of world

economies have predisposed economies, especially emerging ones to the volatility of capital flows, sudden and spontaneous (Herd behavior), loss of market confidence, which often times result in severe financial crises.

Though foreign private capital is made up of Foreign Direct Investment and Foreign Portfolio Investment, Foreign Direct Investment is often preferred as a means of growing the economy. This is because FDI disseminates advanced technological and entrepreneur managerial practices through the host country and thereby exhibits greater positive externalities compared with Foreign Portfolio investment which may not involve positive transfers, just being a change in ownership. In addition, available data suggest that FDI flows tend to be more stable compared to Foreign Portfolio Investment (Lipsey, 1999). This is because of the liquidity of Foreign Portfolio Investment and the short time horizon associated with such investments. Also, FDI inflows can be less affected by change in national exchange rates as compared to Foreign Portfolio Investment. However, a balanced combination of the two, taking into consideration the unique characteristics of the recipient economy will bring about the required effects on the economy. Foreign Capital flows are of different kinds and what drives the motive behind them is different. It can be grouped into five categories: Foreign Direct Investment (FDI); Portfolio investment in stocks and bonds; international bank lending; and in some countries that still qualify for concessional loans and grants (Agosin, 2006). The benefit of FDI is aptly captured by Sadik & Bolbol (2001), its inflows are the least volatile of capital flows, and more importantly, can have direct and indirect effects on economic growth. The stability of FDI stems from the fact that direct investors have a longer-term view of the market, thus making them more resistant to herd behaviour, and from the sheer difficulty of liquidating assets at short notices. Conversely, Siegel (1998) was of the opinion that short-term investments, that are, easily liquidated and speculative threaten the stability of real economies, especially in the developing world, and force fiscal policy to be keeping financial markets happy rather than on raising standards of living.

In Nigeria, Foreign Direct Investment (FDI) and Portfolio investment in stocks, bonds and equities constitute the major bulk of foreign private capital flows. While portfolio investment has been a notable feature of developed economies, it is becoming a very important component of the Balance of Payments (BOP) of many emerging economies, such as China, Hong Kong, India, Singapore Taiwan, Brazil and South Africa etc. Recently, portfolio investment has gained prominence in Nigeria. Until the mid-1980s, Nigeria did not record any figure on portfolio investment (inflow or outflow) in her BOP accounts. This was attributable to the non-internationalization of the country's money and capital markets as well as the non-disclosure of information on the portfolio investments of Nigerian investors in foreign capital/money markets (CBN 1997:151). With the introduction of various structural reforms: internationalization of domestic money and capital markets; repealing of the Exchange Control Act of 1962; Nigerian Enterprise Promotion (Issue of Non-Voting Equity Shares) Act of 1987 and enactment of the Nigerian Investment Promotion Commission Decree No. 16 of 1995; Foreign Exchange (Monitoring and Miscellaneous Provisions) Decree 17 of 1995; Company and Allied Matters Act 1990; and financial sector reforms aimed at promoting private sector led-growth and ensuring macroeconomic stability, Nigeria has started attracting substantial volume of foreign capital flows. For example, the Net Portfolio Investment (NPI) and Net Direct Investment (NDI) were mere ₦151.6 million and ₦735.8 million in 1986 and these rose to ₦51,079.13 billion and ₦115,952.2 million in 2000, respectively. By 2006, the NPI and NDI have gone up to ₦117,218.85 million and ₦573,835.05 million, respectively, indicating growth rates of 77,221 and 77, 888 percent compared to 1986. Between 2007 and 2008, the NPI and NDI moved from ₦609,342.81 million and ₦759,380.40 to ₦350,919.40 million and ₦802,612.70, respectively. The sudden decline in the NPI from ₦609,342.81 million to ₦350,919.40 million between 2007 and 2008 could be attributed to capital flight, owing to the influence of the recent Global Financial and Economic Crises (GFEC).

Nigeria is one of the few countries that have benefited from the foreign inflow to Africa. Nigeria's share of inflow to Africa averaged around 10%, from 24.19% in 1990 to a low level of 5.88% in 2001 up to 11.65% in 2002 (CBN, 2004). The nominal FPI inflow ranged from N128.6 million in 1970 to N434.1 million in 1985 and N115.952 billion in 2000. This was an increase in real terms from the decline of the 1980s. Foreign inflows form a small percentage of the nation's gross domestic product (GDP), however, making up 2.47% in 1970, -0.81% in 1980, 6.24% in 1989 and 3.93% in 2002. (CBN, 2006).

There is no gaining saying that some developing and transition countries are attracting large inflows of foreign capital that could spur economic growth or have destabilizing effect on their economies, if not well managed. The destabilizing effect of foreign private capital flows has aroused concern over their potential effects on macroeconomic stability, the competitiveness of the export sector, and external viability. The most serious risks are that they fuel inflation and drive the real effective exchange rate to unsustainably high levels. The turmoil associated with massive foreign private capital movement has raised lots of issues on whether these flows are harmful or not. Consequently, the question, therefore, is whether foreign private capital flows affect economic

growth and some macroeconomic stability in Nigeria. The study examines the relationship among some components of the foreign private capital (Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI), economic growth, interest rate and inflation. Apart, from the introduction section, the rest of the paper is divided into five sections. Section 2 presents the theoretical framework and review of relevant literature, while section 3 reviews policy reforms, capital flows and macroeconomic development in Nigeria. Section 4 presents method of analysis and model specification, while section 5, focuses on the empirical result and analysis. Finally, section 6 is conclusion and policy recommendation.

2. Theoretical Framework and Literature Review

2.1 Theoretical Framework

In economics growth literature, the earliest model for determining the foreign capital-growth nexus was based on the pioneering works of the post-Keynesian growth models for closed economies as designed by Harrod (1939) and Domar (1946). The duo tried to identify the pre-conditions, which were needed in order to enable an industrialized economy, in this case of the U.S., to reach steady-state equilibrium of growth. In the early 1960s, the Harrod-Domar approaches, however, was adapted to open economies in the so-called Third World (Little, 1960; Chenery & Bruno, 1962; McKinnon, 1964; Chenery & Strout, 1966). The models assumed that there is an excess supply of labour, and growth is only constrained by the availability and productivity of capital. Three gaps were identified as constituting constraints to growth, and these gaps were needed to be filled by foreign capital to enable investment. The three gaps are: savings gap; trade balance gap (foreign exchange); and fiscal gap. Theoretically, the rationale for the relationship between capital flows and the savings–investment gap can be explained within the framework of a simple Keynesian macroeconomic model of an open economy or national income identities, where; $GDP(Y) = Consumption(C) + Investment(I) + Government(G)$ and Net Exports ($X-M$).

Therefore;

$$Y = C + I + G + (X-M) \quad (a)$$

Also,

$$GDP(Y) = C + S + T \quad (b)$$

Where;

C = Consumption

S = Saving

T = Tax

From (a) and (b)

$$C + I + G + (X-M) = C + S + T \quad (c)$$

$$(X-M) = C + S + T - C - I - G \quad (d)$$

$$(X-M) = S - I + T - G \quad (e) \text{ (Note 1)}$$

$$(X-M) = (S + T - G) - I \quad (f)$$

$$FCR = (X-M) = (S + T - G) - I \quad (g)$$

In (f), the gap between aggregate domestic saving (private and public) and domestic investment (private and public) is equal to the gap between exports and imports. Two-gap model postulates that if the foreign exchange gap ($X - M$) required in achieving a target rate of growth is greater than the domestic savings–investment gap, foreign aid is needed to fill the foreign exchange gap. Similarly, foreign aid is needed to fill the savings–investment gap if it is the larger of the two gaps (Note 2). The foreign capital requirement (FCR) in the economy could be expressed in terms of the gap between aggregate domestic saving (private and public) and domestic investment and the gap between exports and imports.

2.2 Literature Review

The most and strategic factor influencing economic growth in any country is investment. It is characterized as the main key to increased level of productivity. A strong correlation between investment and economic growth has been revealed by both theoretical and empirical studies by development economists in both developing and developed economics of the world. Capital flows has potential effects on macroeconomic stability, monetary and exchange rate management, competitiveness of the export sector and external viability. This is because no matter the nature of capital flows (flows over a medium-to-long-term), they are expected to influence the monetary

aggregates, especially the economy's net foreign assets (NFA), inflation, real effective exchange rate, aggregate output (GDP) and possibly the domestic interest rates. Fernandez-Arias and Montiel (2002) explained that surge in capital flows and its sustainability posed the possibility of macroeconomic distortions, arising from internal imbalances accentuated by distortions in the domestic financial sector, the real economy or from inadequate macroeconomic policy framework. Chakraborty (2001) explained the effects of inflows of private foreign capital on foreign currency assets, wholesale price index, money supply, real and nominal effective exchange rates and exports in India, using quarterly data for the period 1993-99. The Granger Causality test shows unidirectional causality from private capital flows to nominal effective exchange rates - both trade-based and export based, which raises concern about the RBI strategy in the foreign exchange market.

In a related study, Kohli (2003) empirically examined how capital flows affect a range of economic variables such as exchange rates, interest rates, foreign exchange reserves, domestic monetary condition and financial system in India during the period, 1986-2001, and concludes that the inflows of foreign capital have a significant impact on domestic money supply and stock market growth, liquidity and volatility. Froot and Ramadorai (2002) concluded that investor flows are important for understanding deviations of exchange rates from fundamentals, but not for understanding long-run currency values. Using daily, weekly and monthly data for 17 OECD countries, Hau and Rey (2002) noted that equity flows have become increasingly important over time and correlate strongly with exchange rates. Pavlova and Rigobon (2003) also estimated OLS regressions to show that demand shocks, associated with increased equity returns and capital inflows, correlate strongly with nominal exchange rates.

Also, the nature and source of capital flows helps in determining its impact on economic growth. Ironically, empirical evidence had established that they are not randomly available globally (Aremu, 2003). One of the fundamental issues of capital flows is the high risk of volatility, especially, Foreign Portfolio Investment (FPI) (short-term flows) that could be reversed at short notice, and probably leading to financial crisis (Obadan, 2004). The dangers of sudden capital flight are that they may create challenges for monetary policy and inflation management as well as foreign exchange rate stability and export competitiveness, especially, in countries with weak financial sectors and inappropriate macroeconomic policies. Conversely, Sadik and Bolbol (2001) argues that FDI is the least volatile of capital flows, and more important, can have direct and indirect effects on economic growth. The stability of FDI stems from the fact that direct investors have a longer-term view of the market, thus making them more resistant to herd behaviour, and from the sheer difficulty of liquidating assets at short notices.

3. Policy Reforms, Capital Flows and Macroeconomic Development in Nigeria

3.1 Policy Reforms

The federal government indigenization policy of the 1970s contributed in scuttling the growth of foreign capital flows in Nigeria. Prior to the promulgation of the Nigerian Enterprises Promotion (NEP) Act of 1972, there were some laws (e.g. Exchange Control Act of 1962, Section 7 of the Act, stipulates that "nobody within Nigeria could make any payment to anybody outside Nigeria or make such payment on behalf of anybody resident outside Nigeria without the permission of the Minister of Finance", Companies Act of 1968, Banking Act of 1969, Petroleum Act of 1969, Patents and Design Act of 1970 and Copy Rights Act of 1970) laid the relevant legal framework for the eventual take-off of the indigenization policy.

However, different policy reforms led to the change in the investment climate in Nigeria for both domestic and foreign investors. The abrogation of the Nigerian Enterprises Promotion Decree 1989 and the Exchange Control Act of 1962 as well as their subsequent replacements with Nigerian Investment Promotion Council Decree No 16 of 1995 and Foreign Exchange (Monitoring and Miscellaneous Provisions) Decree 17 of 1995, publication of Industrial Policy for Nigeria in January, 1989 provided foreign investors with enormous opportunity to participate in the economy. The Company and Allied Matters Act 1990 and Nigerian Investment Promotion Commission (NIPC) decree No. 16 of 1995 represented an institutional framework for the formation, management and winding-up of companies as well as registration of business names and incorporated trusteeship in Nigeria, while NIPC is to encourage, promote and co-ordinate investment in the country. The Foreign Exchange (Monitoring and Miscellaneous Provision Provisions) Decree 17 of 1995 was enacted to liberalize transactions involving foreign exchange, thereby; allowing for free flow of foreign capital. In addition, there was the establishment of Investment and Securities Act (ISA) of 1999 to further deregulate and enhance the development of the Nigerian capital market for greater inflow of foreign capitals. Apart from the law reforms, there are also the economic and financial sector policy reforms designed to reduce barriers, increase banking

capital base and attract investment as well as tax holidays, easing of import and customs controls, infrastructure investment, and labour law reform.

3.1.1 Capital Flows

Nigeria’s foreign private capital flows involve mostly the Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI). The Foreign Portfolio Investment is a recent development in Nigeria and this was initially attributed to the non-internationalization of the country’s money and capital markets as well as the non-disclosure of information on the portfolio investments of Nigerian investors in the foreign capital/money markets (CBN 1997:151).

Onosode, (1997) stated that between July 1995 and July 1996, about US\$6.0 million FPI was made in the Nigerian capital market through the Nigerian Stock Exchange (NSE) for the first time since 1962, while for the whole of 1996, foreign investment through the Nigerian Stock Exchange totaled US\$32.99 million; for 1995, it was US\$1.14 million (Obadan, 2004). In terms of net investment, the NPI in Nigeria was ₦151.6 million in 1986, and it rose to ₦51, 079.13 million in 2000. By 2005, there was a tremendous increase in the NPI in Nigeria. It increased from ₦23, 541.00 million in 2004 to ₦393,336.41 million in 2005, (indicating growth rate of 1,565 per cent). It, however, dropped to ₦294, 956.59 million in 2006. In 2007, the NPI increased to ₦609, 342.81 million before declining to ₦350, 919.40 in 2008. The sudden drop in the NPI level in 2008 could be attributed to the capital flight witnessed in the country at the heat of the GFC. Similarly, the NDI was ₦735.8 million in 1986 and rose to ₦115, 952.16 million in 2000. Furthermore, it increased from ₦654, 193.18 million in 2005 to ₦1, 779,594.79 million in 2006, indicating a growth rate of 172 per cent. In 2007, it dropped to ₦759,380.40 million but rose to ₦802,615.70 million in 2008 (Figure 1).

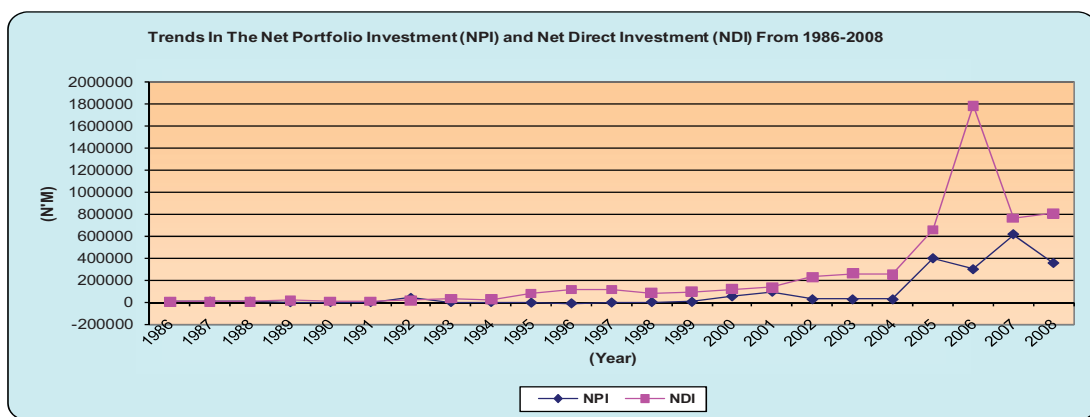


Figure 1.

Source: CBN Annual Reports and Statement of Account of Various Years

Within the same period, while the economy was experiencing huge inflows of FDI, it also witnessed some outflows. Between 1986-2008, the inflow of FDI was ₦4, 024.00 million in 1986, while the outflow was ₦1, 524.40 million, resulting in a net flow of ₦2, 499.60 million. In 2000, ₦16, 453.60 million was FDI inflow compared to ₦13, 106.60 million outflow. In 2007, the FDI inflow and outflow were ₦54, 254.20 million and ₦328.80 million, respectively, while the net flow was ₦53, 924.80 million. However, the inflow and outflow dropped to ₦37, 977.70 million and ₦4, 362.50 million in 2008, resulting in a net flow of ₦33, 615.20 million. Averagely, the annual FDI inflow and outflow in the economy for the period under review was ₦18, 755.49 million and ₦4, 090.89 million, respectively, thereby, resulting in a net flow of ₦14, 518.59 million. Achieving a positive net foreign investment is important in influencing the overall position of a country’s external sector (Figure 2).

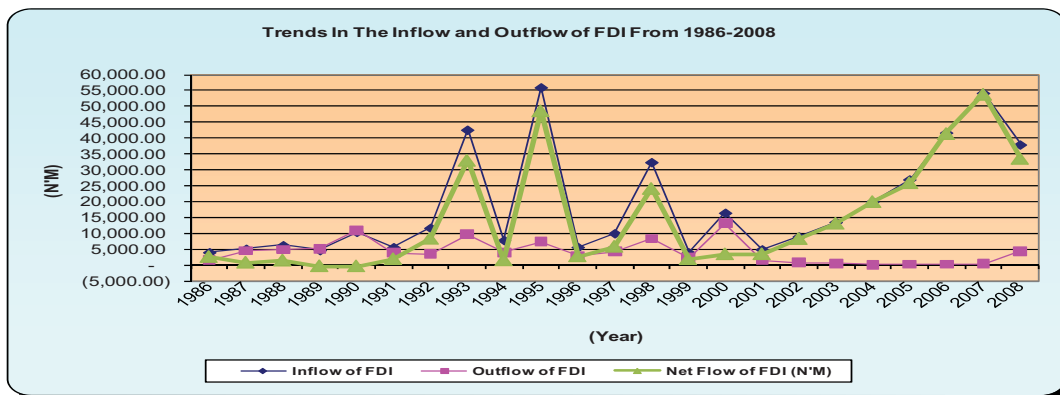


Figure 2.

Source: CBN Annual Reports and Statement of Account of Various Years

3.1.2 Macroeconomic Development

Review of the macroeconomic environment indicated that from the introduction of Structural Adjustment Programme (SAP) in 1986 through 1996, the average annual real GDP growth was 3.6 per cent. Between 1986 and 1996, the fiscal balance (FB)/GDP ratio improved from -11.9 to -0.45 per cent, while inflation rate worsened from 5.4 to 29.3 per cent. During the period, the current account balance (CAB)/GDP ratio declined from 11.6 to 8.9 per cent, while the stock of external reserves grew from US\$2.84 billion to US\$4.5 billion by end-December 1996. By 1995, the federal government abandoned the SAP and moved to a partial or guided deregulation of the economy. Comparatively, the average annual real GDP growth improved to 7.4 per cent from 3.6 per cent between 1997-2007 and 1986-1996, respectively, while it was 6.7 per cent in 2008. Meanwhile, the period 1999-2008, witnessed a stable democratic polity and this no doubt, would have influenced some of the improved developments in the macroeconomic aggregates. For example, the real GDP grew from mere 0.42 to 6.7 per cent between 1999 and 2008, while the fiscal balance (FB)/GDP ratio dropped from -8.93 to -0.20 per cent during the same period. Furthermore, the stock of external reserves grew from US\$5.42 billion to US\$53.0 billion between 1999 and 2008, while the current account balance (CAB)/GDP ratio increased from 1.5 to 17.4 per cent, respectively. Notwithstanding, the inflation rate soared from 6.6 to 15.1 per cent during the period.

4. Method of Analysis and Model Specification

4.1 Data

The series used in the analysis are annual observation expressed in natural logarithms and percentages with sample period, from 1986 to 2008. The reason for the choice of the period is apparently due to dearth of data as data on net portfolio investment started appearing on the Nigeria’s Balance of Payment (BOP) table from 1986. The data source is from the various issues of the Central Bank of Nigeria Annual Reports and Statement of Account as well as the Statistical Bulletin, which includes nominal Gross Domestic Product (GDP), Net Direct Investment (NDI), Net Portfolio Investment (NNPI), Domestic Interest Rate (proxied by Nigeria Treasury Bills rate for three months) and Inflation rate (Headline Year-on-Year).

4.2 Model Specification

Our reduced form model is an unrestricted VAR as this is a good approximation for the dynamic process of any vector of time series. For the VAR estimation, we assume a simple model for the Nigerian economy with at least five endogenous variables: nominal Gross Domestic Product (GDP), Net Direct Investment (NDI), Net Portfolio Investment (NNPI), Domestic Interest Rate and Inflation rate of the form;

$$U (VAR) = (GDP, NDI, NNPI, INTR, INF) \tag{1}$$

VAR allows for the interpretation of any variable as a possible endogen and explains the variation through previous personal values and those of the model. The goal of a VAR analysis is to determine the interrelationships among the variables, not the parameter estimates, as it is the case in this paper. The mathematical representation of a VAR is:

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + Bx_t + e_t \tag{2}(\text{Note 3}).$$

Adapting equ. (2) in the following VAR model form: $U(\text{VAR}) = (\text{GDP}, \text{NDI}, \text{NNPI}, \text{INTR}, \text{INF})$, let a constant be the only exogenous variable. With two lagged values of the endogenous variables in the VAR, it may be written as:

$$\text{gdp}_t = a_{11}\text{gdp}_{t-1} + a_{12}\text{ndi}_{t-1} + a_{13}\text{nnpi}_{t-1} + a_{14}\text{intr}_{t-1} + a_{15}\text{inf}_{t-1} + b_{11}\text{gdp}_{t-2} + b_{12}\text{ndi}_{t-2} + b_{13}\text{nnpi}_{t-2} + b_{14}\text{intr}_{t-2} + b_{15}\text{inf}_{t-2} + c_1 + \epsilon_{1t} \quad (3)$$

$$\text{ndi}_t = a_{21}\text{gdp}_{t-1} + a_{22}\text{ndi}_{t-1} + a_{23}\text{nnpi}_{t-1} + a_{24}\text{intr}_{t-1} + a_{25}\text{inf}_{t-1} + b_{21}\text{gdp}_{t-2} + b_{22}\text{ndi}_{t-2} + b_{23}\text{nnpi}_{t-2} + b_{24}\text{intr}_{t-2} + b_{25}\text{inf}_{t-2} + c_2 + \epsilon_{2t} \quad (4)$$

$$\text{nnpi}_t = a_{31}\text{gdp}_{t-1} + a_{32}\text{ndi}_{t-1} + a_{33}\text{nnpi}_{t-1} + a_{34}\text{intr}_{t-1} + a_{35}\text{inf}_{t-1} + b_{31}\text{gdp}_{t-2} + b_{32}\text{ndi}_{t-2} + b_{33}\text{nnpi}_{t-2} + b_{34}\text{intr}_{t-2} + b_{35}\text{inf}_{t-2} + c_3 + \epsilon_{3t} \quad (5)$$

$$\text{intr}_t = a_{41}\text{gdp}_{t-1} + a_{42}\text{ndi}_{t-1} + a_{43}\text{nnpi}_{t-1} + a_{44}\text{intr}_{t-1} + a_{45}\text{inf}_{t-1} + b_{41}\text{gdp}_{t-2} + b_{42}\text{ndi}_{t-2} + b_{43}\text{nnpi}_{t-2} + b_{44}\text{intr}_{t-2} + b_{45}\text{inf}_{t-2} + c_4 + \epsilon_{4t} \quad (6)$$

$$\text{inf}_t = a_{51}\text{gdp}_{t-1} + a_{52}\text{ndi}_{t-1} + a_{53}\text{nnpi}_{t-1} + a_{54}\text{intr}_{t-1} + a_{55}\text{inf}_{t-1} + b_{51}\text{gdp}_{t-2} + b_{52}\text{ndi}_{t-2} + b_{53}\text{nnpi}_{t-2} + b_{54}\text{intr}_{t-2} + b_{55}\text{inf}_{t-2} + c_5 + \epsilon_{5t} \quad (7)$$

4.3 Estimation Techniques

The study takes cognizance of the challenges (non-stationarity/unit root) that may arise with econometric modeling, using time-series data. Results from a regression exercise involving non-stationary data is observed to be spurious (Granger and Newbold, 1974 and Granger, 1981). Therefore, the empirical analysis is carried out in the light of the recent developments in the time series analysis and this would check for the order of integration of these variables. Unrestricted VAR model is applied, while restriction is placed on the VAR-SVAR, non-recursive orthogonalization of the error terms for impulse response analysis, using a pattern matrix.

4.3.1 Unit Root Test for Stationarity of Series

This involves testing whether a stochastic process is stationary or non-stationary and the order of integration of the individual series under consideration. Currently, the most accepted method for the testing for unit root are Augmented Dickey-Fuller (ADF) test due to Dickey and Fuller (1979, 1981), and the Phillip-Perron (PP) due to Phillips (1987) and Phillips and Perron (1988). One advantage of ADF is that it corrects for higher order serial correlation by adding lagged difference term on the right hand side. It relies on rejecting a null hypothesis of unit root (the series are non-stationary) in favor of the alternative hypotheses of stationarity. The tests are conducted with and without a deterministic trend (t) for each of the series.

The general form of ADF test is estimated by the following regression:

$$y_t = \alpha^0 + \alpha^1 y^{t-1} + \sum_{i=1}^n \alpha \Delta y_i + \epsilon^t \quad (8)$$

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{i=1}^n \alpha_i \Delta y_i + \delta_t + \epsilon^t \quad (9)$$

Where: y is a time series, t is a linear time trend, Δ is the first difference operator, α is a constant, n is the optimum number of lags in the dependent variable and ϵ is the random error term; and the Phillip-Perron (PP) is equation is thus:

$$\Delta y_t = \alpha_0 + \alpha_1 y_{t-1} + \sum_{i=1}^n \alpha_i \Delta y_i + \delta_t + \epsilon^t \quad (10)$$

4.3.2 VAR Impulse Response Function (IRF)

Since the individual coefficients in the estimated VAR are often difficult to interpret, the IRF would be used (Gujarati, 2003). The IRF traces out the response of the dependent variables in the VAR system to shocks in the error term (eqns. 4 – 7).

4.3.3 VAR Identification

An identified VAR is a structural VAR (SVAR). The main purpose of SVAR estimation is to obtain non-recursive orthogonalization of the error terms for impulse response analysis. This alternative to the recursive Cholesky orthogonalization requires that enough restriction is imposed to identify the orthogonal (structural) components of the error terms. Let y_t be a k -element vector of the endogenous variables and let $\Sigma = E[\ell_t \ell_t']$

be the residual covariance matrix. Following Amisano and Giannini (1997), the class of SVAR models that EViews estimates may be written as:

$$Ae_t = Bu_t \quad (11)$$

Where e_t and u_t are vectors of length k . e_t is the observed (or reduced form) residuals, while u_t is the unobserved structural innovations. A and B are $k \times k$ matrices to be estimated. The structural innovations u_t is assumed to be orthonormal, i.e. its covariance matrix is an identity matrix $E[u_t u_t'] = I$. Thus, the assumption of orthonormal innovations u_t imposes the following identifying restrictions on A and B :

$$A \Sigma A' = B B' \quad (12)$$

Where both expressions on either side of equ(11) are symmetric, this imposes $k(k+1)/2$ restrictions on $2k^2$ unknown elements in A and B . Therefore, in order to identify A and B , we need at least $2k^2 - k(k+1)/2 = k(3k-1)/2$ additional restrictions.

4.3.4 Specifying the Identifying Restrictions

Estimating the orthogonal factorization matrices A and B requires provision of additional identifying restrictions of the form; $2k^2 - k(k+1)/2 = k(3k-1)/2$. We, therefore, distinguished two types of identifying restrictions: short-run and long-run. For either type, we applied the pattern matrices.

4.3.5 Short-run Restrictions by Pattern Matrices

The identifying restriction on the A and B matrices is done, using simple zero exclusion restrictions. In our case, we specify the restrictions by creating a named "pattern" matrix for A and B . Any elements of the matrix that you want to be estimated should be assigned a missing value "NA". All non-missing values in the pattern matrix will be held fixed at the specified values. In our matrix A and B , we restricted A to be a lower triangular matrix with ones on the main diagonal and B to be a diagonal matrix.

$$A = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ \text{NA} & 1 & 0 & 0 & 0 \\ \text{NA} & \text{NA} & 1 & 0 & 0 \\ \text{NA} & \text{NA} & \text{NA} & 1 & 0 \\ \text{NA} & \text{NA} & \text{NA} & \text{NA} & 1 \end{pmatrix}$$

$$B = \begin{pmatrix} \text{NA} & 0 & 0 & 0 & 0 \\ 0 & \text{NA} & 0 & 0 & 0 \\ 0 & 0 & \text{NA} & 0 & 0 \\ 0 & 0 & 0 & \text{NA} & 0 \\ 0 & 0 & 0 & 0 & \text{NA} \end{pmatrix}$$

4.3.6 Long-run Restrictions by Pattern Matrices

Blanchard and Quah (1989) proposed an alternative identification method based on restrictions on the long-run properties of the impulse responses. The (accumulated) long-run response to structural innovations takes the form:

$$C = \delta_{\infty} A^{-1} B \quad (13)$$

Where $\delta_{\infty} = (I - A^{-1} \dots A^{-p})^{-1}$ is the estimated accumulated responses to the reduced form (observed) shocks. Long-run identifying restrictions are specified in terms of the elements of this C matrix, typically in the form of zero restrictions. The restriction $C_{ij} = 0$ means that the (accumulated) response of the i -th variable to the j -th structural shock is zero in the long-run. It is important to note that the expression for the long-run response in eqn(11) involves the inverse of A . Since EViews currently requires all restrictions to be linear in the elements of A and B , specifying a long-run restriction, the matrix must be the identity matrix. Unrestricted elements in the

matrix should be assigned a missing value “NA”. For example, in our VAR model, we are restricting the long-run response of the other endogenous variable to the first structural shock on the gdp to be zero,

$$\mathbf{BB} = \begin{pmatrix} \text{NA} & \text{NA} & \text{NA} & \text{NA} & \text{NA} \\ 0 & \text{NA} & \text{NA} & \text{NA} & \text{NA} \\ 0 & \text{NA} & \text{NA} & \text{NA} & \\ 0 & 0 & 0 & \text{NA} & \text{NA} \\ 0 & 0 & 0 & 0 & \text{NA} \end{pmatrix}$$

5. Empirical Result and Analysis

The result of the unit root test shows that all the series were not stationary at level, thereby, indicating the presence of unit root. However, following the differencing of all the variables once, both the ADF and PP test suggested the absence of unit root (Appendices 1 & 2). We, therefore, conclude that the variables are stationary at first difference. This implies that the variables are integrated of order one, i.e. I(1). Following the above results, a VAR was conducted. A useful output from VAR is the impulse response function (IRF), which uses the Cholesky structural decomposition to explain the response of the variables to certain structural shocks. The response of the GDP to shocks from the NDI is not spontaneous (Note 4) and this is applicable to the other variables. It is somewhat sluggish but returns faster to the equilibrium compared to the response from the NNPI. Furthermore, the impact of the shock on the GDP from the NNPI is most lasting compared to the NDI. For example, after roughly nine (9) periods, the impact on the GDP is almost zero, suggesting that the NNPI does not affect output GDP in the long-run. In terms of response of the NNPI from the INTR shock, it responds quickly after the second (2) periods and until the later periods. However, this was not the case with the INF. On the other hand, the NDI responds to shock from INTR throughout the periods, except as it approaches the nine (9) periods, while the impact of shock from the INF was throughout the period. In order that the recursive Cholesky structural decomposition (Note 5) of the IRF is restricted, a zero restriction is placed on the VAR in both short-run and long-run. The results indicate that the NNPI impacts on the GDP at the short-run, while the NDI does not. Also, the INTR is shown to impact on the NNPI in the short-run. Furthermore, in the long-run, the GDP responds more to the impact of the NNPI compared to the NDI. While the NDI responds to the INTR, the NNPI does the same to the INF.

6. Conclusion and Recommendations

6.1 Conclusion

We attempts to offer evidence on the relationship between some components of the foreign private capital flows and some macroeconomic variables in Nigeria, using nominal Gross Domestic Product (GDP), Net Direct Investment (NDI), Net Portfolio Investment (NNPI), Domestic Interest Rate (INTR) and Inflation rate (INF). The series used in the analysis is tested for stationarity, using the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP). The result indicts that the variables are not stationary at level, though stationary at first difference. Consequently, A VAR model is developed and the result of the Impulse Response Function is conducted, using the Cholesky structural decomposition. The response of the GDP to shocks from NDI is not spontaneous and this is applicable to other variables. The GDP returns faster to equilibrium from the NDI shock compared to the response from the NNPI. In terms of response of the NNPI from the INTR shock, it responds quickly after the second (2) periods and until the later periods than the NDI. With zero restriction placed on the VAR in order to make the model non-recursive, the result of the short-run and long-run indicates that the NNPI impacts on the GDP at the short-run, while the NDI does not. Also, the INTR is shown to impact on the NNPI in the short-run. Furthermore, on the long-run, the GDP responds more to the impact of the NNPI compared to the NDI. While the NDI responds to INTR and the NNPI does the same to INF.

From the forgoing, it is evident that the GDP responds differently to shocks from the NDI and NNPI both in the short-run and long-run, while the NDI and NNPI reacts differently to INTR and INF. The implication of the findings is that in periods of foreign private capital surge or flight, the NNPI would have more devastating impact on the GDP and INF compared to the NDI. Thus, there is no gainsaying that a sudden increase in the outflow of capital, especially, the NNPI exerts a destabilizing effect on the domestic interest rate, exchange rates and country's reserve position. Such flight could lead to reduction in growth potentials, as a result of reduction in available resources to finance domestic investment.

6.2 Policy Recommendation

Nonetheless, experience of other developing countries give contradicting reports on the effect of Foreign Private Investment, the Nigerian case is a bit different in that Foreign Private Capital has a significant effect on economic growth rate of Nigeria. Capital flows are very important because of their potential effects on the macroeconomic stability, monetary and exchange rate management as well as competitiveness of the export sector and external viability of a country. This is because no matter the nature of capital flows (flows over a medium-to-long-term), they are expected to influence the monetary aggregates, especially, the economy's net foreign assets (NFA), inflation, real effective exchange rate, aggregate output (GDP) and possibly the domestic interest rates. Consequently, any policy recommendation on this should understand, the nature, what drives the capital flows and the impact of its sudden surge or reversal on economy. It is, however, recommended that since the NNPI is more fluid, and the GDP responds more to its impacts than the NDI, the NNPI inflows could be sterilized within a period, before the beneficiaries could be allowed access to it. This is, very important in order to forestall their potential adverse impacts on macroeconomic variables as well as the economic growth in a situation of their sudden surge or flight. Achieving this, could also require the gradual and sequential opening-up of the capital account of the Balance of Payment account as well as sound macroeconomic management.

References

- Agosin, M. R. (2006). Capital Flows and Macroeconomic Policy in Emerging Economies. Inter-American Development Bank.
- Amisano, G., & Giannini, C. (1997). *Topics in Structural VAR Econometrics. (2nd Ed)*. Berlin: Springer-Verlag. <http://dx.doi.org/10.1007/978-3-642-60623-6>
- Aremu, J. A. (2003). An Overview of Foreign Private Investment in Nigeria. Paper presented at the CBN Twelfth Annual Conference of the Regional Research Units on "Foreign Private Investment in Nigeria" organized by Research Department, CBN. 1st-5th September.
- Blanchard, O., & Quah, D. (1989). The Dynamic Effects of Aggregate Demand and Aggregate Supply Disturbances. *American Economic Review*, 79, 655-673.
- Central Bank of Nigeria. (1997). Currency and Financial Crises in East Asian: Lessons for Nigeria. Abuja: Central Bank of Nigeria, 151.
- Central Bank of Nigeria. (2004). *Statistical Bulletin*. Abuja: Central Bank of Nigeria.
- Central Bank of Nigeria. (2006). *Statistical Bulletin*. Abuja: Central Bank of Nigeria.
- Chakraborty, I. (2003). Liberalization of Capital Flows and the Real Exchange Rate in India: A VAR Analysis. *CDS Working Paper No - 351*, September.
- Chenery, H. B., & Bruno, M. (1962). Development Alternatives in an Open Economy: The Case of Israel. *Economic Journal*, 72, 79-103. <http://dx.doi.org/10.2307/2228618>
- Chenery, H. B., & Strout, A. M. (1966). Foreign Assistance and Economic Development. *American Economic Review*, 56, 679-733.
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association*, 74, 427-431.
- Dicky, D. A., & Fuller, W. A. (1981). Like hood Ratio Statistics for Autoregressive Time Series with a Unit Root. *Econometrica*, 49, 1057-72, July. <http://dx.doi.org/10.2307/1912517>
- Domar, E. D. (1946). Capital Expansion, Rate of Growth and Employment. *Econometrica*, 14, 137-150. <http://dx.doi.org/10.2307/1905364>
- Enders, W. (1995). *Applied Econometric Time Series*, New York: John Wiley & Sons.
- Engle, R. F., & Granger, C. W. J. (1987). Cointegration and Error Correction Representation, Estimation and Testing. *Econometrica*, 55(2). <http://dx.doi.org/10.2307/1913236>
- Essien, E. A., & Onwioduokit, E. A. (1999). Capital Flows to Nigeria: Issues and Determinants. Proceedings of the Eight Annual Conference of the Zonal Research Units on the theme "Evaluating Investment Performance for Re-invigorating Growth and Development in Nigeria", Central Bank of Nigeria (CBN), pp 88.
- Fernandez-Arias, E., & Montiel, P. J. (1996). The Surge in Capital Inflows to Developing Countries: Prospects and Policy Response. *World Bank Policy Research Working Paper No. 1473*.

- Fuller, W.A. (1976). *Introduction to Statistical Time Series*. New York: John Wiley & Sons.
- Granger, C.W. J. (1981). Some Properties of Time-Series Data and Their Use in Econometric Model Specification. *Journal of Econometrics*, 16.
- Granger, C. W. J., & Newbold, P. (1974). Spurious Regressions in Econometrics. *Journal of Econometrics*, 2.
- Greene, J., & Villaneuva. (1991). Private Investment in Developing Countries: An Empirical Analysis. *IMF Staff Papers No 38*.
- Gujarati, D. N. (2003). *Basic Econometrics: International Edition* (4th Ed.). McGraw Hill.
- Harrod, R. F. (1939). An Essay in Dynamic Theory. *Economic Journal*, 49, 14-33. <http://dx.doi.org/10.2307/2225181>
- Hau, H., & Rey, H. (2002). Exchange Rates, Equity Prices and Capital Flows, Manuscript.
- Johansen, S., & Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, 52, 169-210. <http://dx.doi.org/10.1111/j.1468-0084.1990.mp52002003.x>
- Kang, J., & Stulz, R. (1997). Why is there a home bias? An analysis of foreign portfolio ownership in Japan. *Journal of Financial Economics*, 3-28. [http://dx.doi.org/10.1016/S0304-405X\(97\)00023-8](http://dx.doi.org/10.1016/S0304-405X(97)00023-8)
- Kohli, R. (2003, Feb. 22). Capital Flows and Domestic Financial Sector in India, *Economic Political Weekly*, p.761-68.
- Lipsey, R. E. (1999). The Role of Foreign Direct Investment in International Capital Flows. *NBER Working Paper No. 7094*.
- Little, I. M. D. (1960). The Strategy of Indian Development. *National Institute Economic Review*, May-Issue, p. 20-29.
- McKinnon, R. I. (1964). Foreign Exchange Constraints in Economic Development and Efficient Aid Allocation. *Economic Journal*, 74, 388-409. <http://dx.doi.org/10.2307/2228486>
- Obadan, M. I. (2004). *Foreign Capital Flows and External Debt: Perspectives on Nigeria and the LDCs Group*. Lagos-Nigeria: Broadway Press Limited.
- Onosode, B. (2000, 5 March). Foreign Investment Not a Panacea for Resource Mobilization. *Daily Times*.
- Rodrik, D. (1998). Trade Policy and Economic Performance in Sub-Saharan Africa. *National Bureau of Economic Research Working Paper 6562*.
- Sadiq, T., & Bolbol, A. (2001). Capital Flows, FDI, AND Technology Spillover: Evidence from Arab Countries. *World Development*, 29(12), 211-2125.
- Serven, A., & A. Solimano. (1992). Private Investment and Macroeconomic Adjustment: A Survey. *World Bank Research Observer*, 7(1). <http://dx.doi.org/10.1093/wbro/7.1.95>
- Siegel, M. (1998). Control of International Capital: A Survey of Policy Options. Discussion Paper for Working Group 1 at the Friend of the Earth's International Forum on Globalization.
- Solimano, A. (1989). How Private Investment Reacts To Changing Macroeconomic Conditions: The Case of Chile. *Pre Working Paper 212*, World Bank, Washington D.C.

Notes

Note 1. $X - M =$ Trade Balance Gap, $S - I =$ Savings – Investment Gap, $T - G =$ Fiscal Gap, explained within a set of economic growth rate.

Note 2. It simply means that foreign capital is needed to relax the limits to growth.

Note 3. Where y_t is a k vector of endogenous variables, x_t is a d vector of exogenous variables, A_1, \dots, A_p and B are matrices of coefficients to be estimated, and ϵ_t is a vector of innovations that may be contemporaneously correlated but are uncorrelated with their own lagged values and uncorrelated with all of the right-hand side variables.

Note 4. The spontaneity of the response of a particular variable to another could be affected by the nature of the time series data.

Note 5. The reason behind the placing of the restriction is to make it non-recursive.

Appendices

Appendix 1: Unit Root test for Stationarity at Levels

S/No	Variable	ADF (Intercept)	ADF (Trend and Intercept)	PP (Intercept)	PP (Trend and Intercept)
1	logngdp	-0.2336 (-3.6056)	-1.5824 (-4.2050)	-0.2479 (-3.6056)	-1.8238 (-4.2050)
2	logndi	-0.4016 (-3.6105)	-3.0232 (-4.2050)	-0.2003 (-3.6056)	-2.8405 (-4.2050)
3	lognmpi	-2.0290 (-3.7695)	-2.8073 (-4.4407)	-2.0290 (-3.7696)	-2.8073 (-4.4407)
4	intr	-2.7419 (-3.7696)	-3.2983 (-4.4407)	-2.7615 (-3.7696)	-3.2804 (-4.4407)
5	inf	-2.3604 (-3.7696)	-2.8830 (-4.5326)	-2.4081 (-3.7696)	-2.7987 (-4.4407)

Note: Significance at 1% level and * at 5% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.

Source: Author's Estimation using Eviews 7.2.

Appendix 2: Unit Root Test for Stationary at First Difference

S/No.	Variable	ADF (Intercept)	ADF (Intercept and Trend)	PP (Intercept)	PP (Intercept and Trend)
1	loggdgdp	-7.3667 (-4.7880)	-7.3391 (-4.4679)	-7.99349 (-3.7880)	-8.7933 (-4.4679)
2	logndi	-4.0307 (-3.8085)	-4.2202* (-3.6584)	-11.8245 (-3.7880)	-19.2745 (-4.4679)
3	lognmpi	-6.3045 (-3.7880)	-6.2722 (-4.4679)	-7.0388 (-3.7880)	-8.5596 (-4.4679)
4	intr	-5.5981 (-3.7880)	-5.5872 (-4.4679)	-7.3598 (-3.7880)	-9.6966 (-4.4679)
5	inf	-4.2857 (-3.7880)	-4.2132* (-3.6450)	-4.8698 (-3.7880)	-4.7529 (-4.4679)

Note: Significance at 1% level and * at 5% level. Figures within parenthesis indicate critical values. Mackinnon (1991) critical value for rejection of hypothesis of unit root applied.

Source: Author's Estimation using Eviews 7.2.

Appendix 3a: Short-Run Structural VAR**Short-Run Structural VAR Restriction Table**

Structural VAR Estimates

Date: 08/01/11 Time: 16:16

Sample (adjusted): 1989 2008

Included observations: 20 after adjustments

Estimation method: method of scoring (analytic derivatives)

Convergence achieved after 26 iterations

Structural VAR is just-identified

Model: $Ae = Bu$ where $E[uu'] = 1$

Restriction Type: short-run pattern matrix

A =	1	0	0	0	0
	C(1)	1	0	0	0
	C(2)	C(5)	1	0	0
	C(3)	C(6)	C(8)	1	0
	C(4)	C(7)	C(9)	C(10)	1
B =	C(11)	0	0	0	0
	0	C(12)	0	0	0
	0	0	C(13)	0	0
	0	0	0	C(14)	0
	0	0	0	0	C(15)

	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	-0.051641	0.265644	-0.194398	0.8459
C(2)	-0.804405	0.375268	-2.143549	0.0321
C(3)	4.717628	1.505853	3.132861	0.0017
C(4)	-18.73132	6.293048	-2.976509	0.0029
C(5)	0.066750	0.315585	0.211513	0.8325
C(6)	-0.804139	1.143237	-0.703388	0.4818
C(7)	-2.275301	3.961138	-0.574406	0.5657
C(8)	2.297082	0.809132	2.838945	0.0045
C(9)	4.444562	3.280368	1.354897	0.1755
C(10)	0.571389	0.765354	0.746568	0.4553
C(11)	0.561685	0.088810	6.324555	0.0000
C(12)	0.667279	0.105506	6.324555	0.0000
C(13)	0.941758	0.148905	6.324555	0.0000
C(14)	3.407797	0.538820	6.324555	0.0000
C(15)	11.66410	1.844255	6.324555	0.0000

Log likelihood -194.7181

Estimated A matrix:

1.000000	0.000000	0.000000	0.000000	0.000000
-0.051641	1.000000	0.000000	0.000000	0.000000
-0.804405	0.066750	1.000000	0.000000	0.000000
4.717628	-0.804139	2.297082	1.000000	0.000000
-18.73132	-2.275301	4.444562	0.571389	1.000000

Estimated B matrix

0.561685	0.000000	0.000000	0.000000	0.000000
0.000000	0.667279	0.000000	0.000000	0.000000
0.000000	0.000000	0.941758	0.000000	0.000000
0.000000	0.000000	0.000000	3.407797	0.000000
0.000000	0.000000	0.000000	0.000000	11.66410

Appendix 4b: Long-Run Structural VAR**Long-Run Structural VAR Restriction Table**

Structural VAR Estimates

Date: 08/01/11 Time: 16: 16

Sample3 (adjusted): 1989 2008

Included observations: 20 after adjustments

Estimation method: method of scoring (analytic derivatives)

Convergence achieved after 14 iterations

Structural VAR is just-identified

Model: $Ae = Bu$ where $E[uu'] = 1$

Restriction Type: long-run pattern matrix

Long-run response pattern:

C(1)	C(2)	C(4)	C(7)	C(11)
0	C(3)	C(5)	C(8)	C(12)
0	0	C(6)	C(9)	C(13)
0	0	0	C(10)	C(14)
0	0	0	0	C(15)

	Coefficient	Std. Error	z-Statistics	Prob.
C(1)	0.151902	0.024018	6.324555	0.0000
C(2)	0.043921	0.034669	1.266862	0.2052
C(3)	0.342377	0.054135	6.324555	0.0000
C(4)	-0.133132	0.041149	-3.235344	0.0012
C(5)	-0.280545	0.088480	-3.170711	0.0015
C(6)	0.948350	0.149947	6.324555	0.0000
C(7)	-0.084038	0.048093	-1.747416	0.0806
C(8)	-0.174524	0.102751	-1.698506	0.0894
C(9)	-0.192788	0.214237	-0.899884	0.3682
C(10)	3.062309	0.484194	6.324555	0.0000
C(11)	0.162643	0.056132	2.897513	0.0038
C(12)	0.086182	0.107261	0.803475	0.4217
C(13)	-0.584938	0.235331	-2.485600	0.0129
C(14)	0.194279	0.685442	0.283437	0.7768
C(15)	7.978983	1.261556	6.324555	0.0000

Log likelihood -194.7181

Estimated A matrix

1.000000	0.000000	0.000000	0.000000	0.000000
0.000000	1.000000	0.000000	0.000000	0.000000
0.000000	0.000000	1.000000	0.000000	0.000000
0.000000	0.000000	0.000000	1.000000	0.000000
0.000000	0.000000	0.000000	0.000000	1.000000

Estimated B matrix:

0.224783	-0.037172	-0.109086	-0.482095	0.138799
-0.019172	0.585936	-0.279818	-0.065178	-0.140954
0.371571	0.243448	0.740978	-0.573617	-0.125986
0.775070	0.605154	-1.498927	5.131527	0.741511
-2.700089	2.636308	-2.432885	-9.863231	12.12279

Investigating the Effect of Fundamental Accounting Variables on the Stock Prices Variations

Mahmood Moein Aldin¹, Hassan Dehghan Dehnavi², Mohammadreza Hajjighasemi¹ & Ali Hajjighasemi³

¹ Department of accounting, Yazd Branch, Islamic Azad University, Yazd, Iran

² Department of management, bafgh Branch, Islamic Azad University, bafgh, Iran

³ Department of management, Yazd Branch, Islamic Azad University, Yazd, Iran

Correspondence: Mohammadreza Hajjighasemi, Department of accounting, Yazd Branch, Islamic Azad University, Yazd, PO box 89195/155, Shohada-e-Ghomnam Road, Safaiieh, Yazd, Iran. Tel: 98-351-821-1391. E-mail: Hajjighasemi.m.r@gmail.com

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Abstract

Preparing financial statements mainly aims at providing users with the required information in order to help them make economic decisions. Current and potential investors are regarded as information users which are composed of diverse aspects. Investors seek to predict the future stock yields and this can be done through investigating the future stock prices. Hence, predicting future stock price is an essential aspect considered by potential investors. The present paper explores the relationship between changes in fundamental accounting variables with stock price variations of 70 firms listed on Tehran Stock Exchange in a period covering five years from 2006 to 2010 employing Correlation coefficient, adjusted R^2 and multiple regressions. The fundamental accounting variables include assets, liabilities, owner's equity, sale, operating income, net income, operating cash flow and investment cash flow. The empirical results reveal that there is a significant relationship between fundamental accounting variables and stock price variations of firms listed on Tehran Stock Exchange. That's why investors should have a special attention to fundamental accounting variables when predicting stock prices and making financial decisions.

Keywords: net income, operating income, operating cash flow, liabilities, stock price

1. Introduction

Developing capital market is a main composite of economic development and growth. In the last two decades, Iran capital market has also been experiencing a lot of variations such as fluctuations in stock exchanges and increased number of firms listed on the Stock Exchange. The significant role of capital market in economic development caused many researches to be done in Stock Exchanges.

Iran Accounting Standards statement no.1 which considers the financial statements documents that:

"Financial statements aim at providing summarized and classified information about financial position, performance and flexibility for different financial statements users to help them make useful economic decisions."

This statement reflects the comprehensiveness of published financial information which takes into consideration individual investors and creditors. As it can be realized, investors should consider extensive investigations when investing in common stocks. It means that they should have a lot of factors in their mind because they are changing their assets to stocks, otherwise they will make awful decisions which harm their credit. This subject is especially considered in those countries where there are no efficient stock exchanges. There is no need to investigate securities in countries with efficient markets, because market price of stocks is approximately the same as its intrinsic (real) value. It can be concluded that the market value of securities is a suitable proxy for the real value of securities.

Capital market is the place where two major groups interact; investors and investees, among which accounting plays the intermediate role. Investors aim at maximizing their yields and they are very eager to predict the returns of firm's stock in which they invest. A major part of the yields are clarified in stock price increased. The

present paper seeks to examine the relationship between variations in fundamental accounting variables and the changes in the stock price of firms listed on Tehran Stock Exchange.

2. Discussion

2.1 Literature Review

Hu et al. (2008) examined whether sale and income data changes are related to the stock price variations in Taiwan Listed firms. The findings are in consistent with the previous studies in America and Australia stock markets. They found that there is a statistical significant relationship between the variations in sale and income data with stock prices variations. They also revealed that the longer the time duration, the stronger the relation is. Keun et al. (2006) employed the panel data model to investigate the relationship between earnings per share (profit or loss) in Korea stock market. The findings indicate that average stock price variations are affected by earnings per share and other fundamental variables, but this does not verify the consistent level of variations. Chen et al. (2006) examined the accrual items (income and cash flows) and future stock yields and found that firms with high accruals in the period after financial reporting evidenced decreased stock returns.

Hosseini (2006) included automobile and cement industry firms listed on Tehran Stock Exchange and compared the affect of operational income and net cash flows on stock prices. The results showed that investors could not use operational income and net cash flow variables to make decisions about stock exchanges. They also found that this information cannot be used in predicting stock prices. Fouladi (2004) examined the relationship between income statement items variations and changes in stock prices of Tehran Listed firms. The results demonstrated that in more than 54 percent of firms there is a statistical significant relationship between income statement items variations and changes in stock prices. It means that the variations in income statement items might contain useful information for the stock price.

2.2 Hypothesis Development

H1- There is a significant relationship between changes in fundamental accounting variables and stock price variations.

H1-1- There is a significant relationship between changes in asset and stock price variations.

H1-2- There is a significant relationship between changes in liabilities and stock price variations.

H1-3- There is a significant relationship between changes in owner's equity and stock price variations.

H1-4- There is a significant relationship between changes in sales and stock price variations.

H1-5- There is a significant relationship between changes in the operating income and stock price variations.

H1-6- There is a significant relationship between changes in Net income and stock price variations.

H1-7- There is a significant relationship between changes in the operating cash flows and stock price variations.

H1-8- There is a significant relationship between changes in the investment cash flows and stock price variations.

2.3 Methodology

This paper is classified as an applied research and employs descriptive statistics along with correlation analysis and multi regressions. The amount of each independent variable in a given year is deducted from its amount in the year before, as the first step. Then the figure is divided by the amount of variable in the previous year to calculate the variation percentage of the independent variable. The dependent variable (stock price changes) is achieved through software delivered by Tehran Stock Exchange which shows the average annual stock prices of the firms listed. This amount is deducted from the same amount of the previous year and the result is divided by the average annual stocks prices of the firms. This figure shows the variations percentage in dependent variables. The required data are collected from financial statements publicly published and they were analyzed by employing SPSS software.

2.3.1 Statistical Population and Research Sample

We construct our sample starting with all of the companies listed on Tehran stock exchange and collect data for them from 2006 to 2010. Companies in our final sample meet the following criteria:

- The company has data about stock price, along with income statements, balance sheet and cash flow items for at least five years over our 2006-2010 time frames.
- They have been listed on Tehran Stock Exchange before the beginning of 2006 and their stocks should have been exchanged until the end of 2010.

Finally, there were 299 firms and 70 firms constituted our sample.

2.4 Hypotheses Testing

The research hypotheses were tested by employing Pearson correlation coefficient and adjusted R^2 ($\alpha=0.05$). The hypotheses are as follows:

H0: There is no significant relationship between fundamental accounting variations (assets, liabilities, owner's equity, sale, operating income, net income, operating cash flows and investing cash flows) and stock price variations of firms listed on Tehran Stock Exchange.

H1: There is a significant relationship between fundamental accounting variations (assets, liabilities, owner's equity, sale, operating income, net income, operating cash flows and investing cash flows) and stock price variations of firms listed on Tehran Stock Exchange.

Table 1 shows the results of correlation tests among independent research variables and stock prices.

According to the table 1, H0 is rejected and the significant relationship between variables considered is accepted. It can be concluded that there is a relationship between the variations in assets, liabilities, owner's equity, sales, operating income, net income, operating cash flow and the level of stock price variations. The other hypotheses relating to these independent variables are accepted at 99% level. The results reveal that the independent variables including assets, owner's equity, sales, operating income, net income and operating cash flows are directly correlated with stock prices. That is the inverse and significant relation for the liability. R^2 explains the effect of independent variables on the dependent variables. Hence it can be said that 5.9% of the variations in the stock price are related to the changes in the assets, while 94.1% are related to the other factors.

Table 1 indicates that the level of significance among the investment cash flows and stock prices changes is equal to 0.827. It means that investing cash flows variations and stock prices are not correlated.

Table 1. Correlation tests among independent research variables and stock prices

no.	ind .Variable	Pearson Correlation Coefficient	sig. level	R2	Hypothesis no.
137	assets	0.244	0.004	0.059536	1
132	debts	-0.441	0.000	0.194481	2
137	owner's equity	0.383	0.000	0.145924	3
136	sale	0.416	0.000	0.173056	4
135	operating income	0.526	0.000	0.276676	5
138	net income	0.567	0.000	0.321489	6
135	operating cash flows	0.585	0.000	0.342225	7
135	investment cash flows	-0.019	0.827	0.000361	8

2.5 Stock Price Prediction Model

The correlation coefficient and the level of significance between variables were shown in table 1. It is evident that in most cases, variables are significantly correlated and this causes no good fitness in the model in which these variables are applied. We have used the stepwise method and added the variables one by one to come into the best fitness. (Table 2)

Table 2. The entered and omitted variables in the model

Method	Entered Variables	Omitted Variables	Model
Stepwise	operating cash flow changes	-	1
Stepwise	operating income changes	-	2
Stepwise	Liability changes	-	3

The variables are characterized as table 3:

Table 3. variables coding

variable name	Name	variable name	name	variable name	name
stock price changes	Y	owner's equity changes	X ₃	net income changes	X ₆
asset changes	X ₁	sale changes	X ₄	operating cash flows changes	X ₇
liability changes	X ₂	operating income changes	X ₅	investment cash flows changes	X ₈

Operating cash flow changes are the most correlated with the stock price variations, so they are entered as the first variable, this is followed by entering the operating income changes in the second model and the liability changes in the third one. There is no omitted variable in the models.

The suggested models are represented as follows (table 4) :

$$\text{Model 1 } Y = \alpha + \beta_7 X_7 + \varepsilon$$

$$\text{Model 2 } Y = \alpha + \beta_7 X_7 + \beta_5 X_5 + \varepsilon$$

$$\text{Model 3 } Y = \alpha + \beta_7 X_7 + \beta_5 X_5 + \beta_2 X_2 + \varepsilon$$

Table 4. Summarize of the Models

Error	on Coefficient	R2	adjusted R2	Model
2955.6	0.569	0.324	0.319	1
2768.5	0.642	0.412	0.403	2
2641.2	0.684	0.468	0.456	3

Table 4 represents that the highest R² belongs to the third model and that is why this model have been chosen. Nearly 45.6% of the variations in the dependent variables (stock price changes) depend on the factors noted in the model 3 (operating cash flow variations, investing cash flow changes and liability changes). In the other words, those factors can predict less than 50% of the variations in the stock price, while the rest of changes are because of the other factors. Statistically, when the regression fitness model is significant, then the regression results are considered reliable. We employed analysis of variance to examine the significance of the multiple regressions. Finally, H₀ was defined and tested using ANOVA. (table 5)

H₀: regression model is not significant.

H₁: regression is significant.

The significance level of all the models are 0.00 and this causes H₀ to be rejected at 99 percent

Table 5. Summarized ANOVA

Model		Sum of Squares	Degree of Freedom	Mean of the Squares	F-statistics	Significant Level
1	regression	557483506.567	1	557483507	63.816	0.000
	residual	1161867527.600	133	8735846.07		
	total	1719351034.167	134			
2	regression	707605177.343	2	353802589	46.16	0.000
	residual	1011745856.800	132	7664741.34		
	total	1719351034.143	134			
3	regression	805509544.441	3	268503181	38.49	0.000
	residual	913841489.720	131	6975889.23		
	total	1719351034.161	134			

In the other words, all the regression models are significant.(table 6)

Table 6. Regression results

Model		non-standardized values		coefficient	T	significance level
		β	error	β		
1	constant value	752.639	259.617		2.899	0.004
	operating cash flows variations	0.033	0.004	0.569	7.988	0.000
2	constant value	652.662	244.228		2.672	0.008
	operating cash flows variations	0.024	0.004	0.418	5.57	0.000
	operational income changes	0.011	0.002	0.332	4.426	0.000
3	constant value	813.733	236.929		3.435	0.001
	operating cash flows variations	0.022	0.004	0.376	5.191	0.000
	operational income changes	0/010	0.002	0.313	4.362	0.000
	liability variations	-0.005	0.001	-0.245	-3.746	0.000

The table 6 represents the regression results in three models. As it is obvious, R^2 in the third model owned the highest value and caused this model to be chosen. The equation related to the model is explained as follows:

$$\varepsilon + X_2 - 0/005X_5 + 0/010X_7 = 813/733 + 0/022Y$$

The defined regression equation is illustrated:

- Constant value of the model is 813.733.
- 022/0X₇ reflects the 0.022 increase in stock price resulting from one unit increase in operating cash flows.
- 010/0X₅ reflects the 0.010 increase in stock price resulting from one unit increase in the operating income.
- 005/0X₂ reflects the 0.005 decrease in the stock price resulting from one unit increase in liabilities.

3. Conclusions

Based on the hypotheses tested through the study, we have found that there is a significant relationship among assets, liabilities, owner's equity, sales, net income, operating income and operating cash flows variations and stock price changes. But this does not hold true for the relationship between investing cash flows variations and stock price changes. Accordingly, it can be concluded that changes in the financial statements items are correlated with the stock price changes of the firms listed on Tehran Stock Exchange. The results document that investors ought to take into account the financial statements when predicting stock prices and economic decision makings.

4. Suggestions

The results of this study suggest that financial statements users including current and potential investors and creditors should pay special attention to the variations in the asset, liability and owner's equity from balance sheet; sale, operating income and net income from income statement; and operating cash flow from cash flow statements to achieve the highest yields. Investors are also suggested to employ the third regression model which can predict 45.6% of variations in the stock price. Since more than half of the variations in stock price variations are explained by the changes in the financial statement items, then users should consider external and non-financial factors in the field of economic decision making and stock price prediction.

References

- Chan, K.C., Chan, L., Jegadees, N. J., & Lakanishok. (2006). Earning Quality and Stock Return, *Journal of business, for the cominy*, 48, 321-340. <http://ideas.repec.org/a/ucp/jnlbus/v79y2006i3p1041-1082.html>
- Fouladi, M. (2004). The Analysis of the Relationship between the Changes in the Items of Income Statement and Stock Price Variations in Firms Listed on Tehran Stock Exchange. M.A Thesis, Tehran, NY: Tarbiat Modaras University.
- Hosseini, J. (2006). The comparative Investigation of Operating Income Impact and Net Cash Flow on Stock Prices of Firms Listed On Tehran Stock Exchange, M.A Thesis, Tehran, NY: Islamic Azad University. <http://ltuasr.blogfa.com/post-59.aspx>
- How, In-mu, Qi, Doqing, & Wu, Woody. (2001). The nature of information in accruals and cash flows in an earning capital market: The case of China. *The International Journal of Accounting*, 20(4), 391-406.

<http://ideas.repec.org/a/eee/accoun/v36y2001i4p391-406.html>

- Jahankhani, A., & Moradi, M. (1997). Investigating the Decision Making Behavior of Common Stock Buyers in Tehran Stock Exchange, the first conference on financial management in Iran, Administrating Sciences, Tehran, NY: Shahid Beheshti University. <http://www.ensani.ir/storage/Files/20101207190136-36778.pdf>
- Keun-Yeob Oh, Bonghan K., & Honkee. (2006). An Empirical Study of the Relation Between Stock Price and EPS in Panel Data: Korea Case, *Applied Economics*, 38, 2361-2369. <http://www.tandfonline.com/doi/abs/10.1080/00036840500427593#preview>
- Noferesti, M. (2001). *Statistics in Economics and Commerce* (2nd ed), Tehran, NY: Rasa Institute of cultural services.
- Oh Hu, Zhoadan Huang, & Bih-shuang Liao. (2009). Short sale and stock returns: Evidence from the Taiwan Stock Exchange. *The Quarterly Review of Economics and finance*, 49(3), 1146-1158. http://econpapers.repec.org/article/eeequaeco/v_3a49_3ay_3a2009_3ai_3a3_3ap_3a1146-1158.htm

Management Models of Municipal Solid Waste: A Review Focusing on Socio Economic Factors

Jacob Cherian¹ & Jolly Jacob²

¹ College of Business Administration, Abu Dhabi University, Abu Dhabi, UAE

² College of Arts and Sciences, Abu Dhabi University, Abu Dhabi, UAE

Correspondence: Jacob Poopada Cherian, Department of Management, College of Business Administration, Abu Dhabi University, Abu Dhabi, UAE. Tel: 971-5-015-646. E-mail: jacob.cherian@adu.ac.ae

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Abstract

Waste management is a complex process that requires a lot of information from various sources such as factors on waste generation and waste quantity forecasts. When operations related to promotion of waste management systems are considered it is observed that generation of waste and planning is found to be influenced by different factor of which are impacted by socio demographics. The main aim of this paper is to review previously tested models related to municipal solid waste generation and identify possible factors which will help in identifying the crucial design options within the framework of statistical modelling.

Keywords: solid waste management, empirical models, socio economic factors

1. Introduction

Waste management is a complex process that requires a lot of information from various sources such as factors on waste generation and waste quantity forecasts (Bovea et al., 2010; Zurbrügg et al., 2012). Data on the various factors that play a role in waste generation is important as it aids in estimating the consequences of changes in general conditions like economic system (Sjöström and Östblom 2010; Wang et al., 2011) demography (Bandara et al. 2007), domestic heating systems or waste management measures (e.g. increasing the rate of home composting) ((Lebersorger and Beigl 2011) and policy measures (Mazzanti and Zoboli, 2008). A number of studies have focused on the influence of socio economic factors in a bid to understand, define and forecast the unit rate of waste generation and composition of solid waste (Mazzanti, M., & Zoboli, R. 2009; Bandara et al., 2007; Emery et al., 2003). Some of the most common variables that are analyzed are number of individuals in a dwelling, age, sex, land usage, communications, ethnicity of the populations and productive activities (Emery et al., 2003).

When operations related to promotion of waste management systems are considered it is observed that generation of waste and planning is found to be influenced by different factor of which are impacted by socio demographics including

Amount of waste generated and personnel required: This is directly dependent on the population density and other factors (Henry et al., 2006).

Cost of operations: Greater the amount of waste generated, greater is the cost of operations (Christensen, 2011).

A significant issue that every nation faces is the need for a proper disposal system of the huge solid wastes that are generated every year. According to (Alhumoud, 2005; Christensen 2011), developed countries have always had to face significant difficulties in trying to devise a manageable way to dispose the waste that they generate. When it comes to non industrialized countries, (Koushki and Alhumoud, 2002; Al-Khatib et al., 2007; Henry et al., 2006), state that a lack of awareness and knowledge coupled with the increasing amount of lands being cleared for waste disposal and storage purposes are one of the major concerns.

Therefore although a specific waste disposal protocol or solution cannot be implemented or set due to the ever changing demographics and needs of the population, there is a need to identify the influence of socio demographic factors on municipal solid waste management systems which are currently planned and operated and arrive at different models which will help forecast better models of solid waste management.

The main aim of this paper is to review previously arrived at and tested models related to municipal solid waste generation and identify possible identifiers related to socio economic factors. From the review and discussion of models the research aims at arriving at limitations of previous models which will help in identifying the crucial design options within the framework of statistical modelling.

1.1 Defining Urban Solid Waste

Any and all solid waste that is created in an urban environment is classified as Urban Solid Waste (USW). USW is further divided into two different categories – RSW and NRSW. RSW refers to waste that is generated by households and NSRW is the waste that is produced by the commercial sector (industries, organizations). Both these sources create different kinds of waste that are classified as follows as identified by different authors (Buenrostro et al., 2001; Singh et al., 2011; Gomez et al., 2008):

- (1) RSW: The solid waste that is generated by a single family or in a multiple family dwelling like an apartment.
- (2) CSW: The solid waste generated by commercial institutions such as temporal ambulatory markets, supermarkets, markets, department stores and hotels.
- (3) Industrial solid waste: the solid waste generated in all processes of extraction, transformation, and production.
- (4) Institutional and services solid waste: the solid waste generated in recreational centres, like cinema theatres and stadiums, educational centres, libraries, private and governmental offices, museums, and archaeological zones.
- (5) Special solid waste: This refers to the wastes that require special precautions and methods when it comes to their removal, management and disposal due to their hazardous nature or due to the requirements of the prevailing legal regulations. Usually such wastes are generated by automotive or industrial maintenance workshops, research laboratories, terrestrial transportation terminals, airports, medical institutions or facilities, drug stores and veterinary facilities.

When it comes to making appropriate decision in relation to the waste management of urban solid waste (USW), two factors are important – the total volume and composition. Both these factors change with time and socio economic conditions (Singh et al., 2011). Socio economic variables are among the most important factors when it comes to planning management programs of USW in developing countries mainly because the socio economic variables are not yet fully understood (Maldonado, 2006). According to (Agamuthu et al., 2007; Hockett et al., 1995), the effects of socioeconomic variables such as income, level of consumption, and cultural and educational environment on the generation of USW are specific and vary from place to place

1.2 Impact of Social Demographics on Solid Waste Generation

In the residential sector, socio-economic status and housing characteristics affect not only the amount of municipal waste that individuals generate, but also how they manage it (Emery et al., 2003). When the level of participation as well as the overall waste segregation individuals in a community make at the source was considered there has been determination of a positive correlation (Noehammer and Byer, 1997). Apart from this positive relationship has also been identified when the frequency of collection (Singh et al., 2011), Apart from this a link has been identification between consumer participation as well as economic incentives (Thanh et al., 2010; Maldonado 2006; Noehammer and Byer, 1997) provided and the time of collection of garbage (Folz, 1991). The degree of waste management has also been identified to have a direct link with the level of social pressure which is presented in the community (Barr et al., 2003). The design and management of any waste management program should be promoted in a manner that the needs of the different community members in terms of the actual requirements of their household is met (Lansana, 1993). The degree of variation of these needs among different housing types and areas thus will be a predictor of how effective the waste management system is making identification of the variation of waste generation across the socio demography an important aspect. The generation of solid waste is found to be different as there is a difference in the level of consumption pattern in different locations (Singh et al., 2011; Sjöström and Östblom 2010). When different consumption patterns are considered they are found to vary with a wide range of factors including environment, demography and socio economic factors. These factors need to be examined in order to identify and develop a solid waste management system which can handle as well as minimize the overall rate of waste generation (Wang et al., 2011).

A number of studies have examined the impact of socio economic and demographic factors on the generation of waste (Buenrostro et al., 2001; Banar and Ozkan, 2008; Afon, 2007; Hockett et al., 1995; Dyson and Chang 2006; Daskapoulos et al., 1998; Beigl et al., 2004).

From all these studies the most common factors which impact the generation of waste include the level of income, the overall size of the household, the level of education, the attitude towards the environment (Afon, 2007). However these effects are found to be different across different locations and may vary across countries, cities and even zones in one particular city. It becomes very difficult to predict the level of association between each of these factors on a larger level as what is a predictor in one level need not necessarily be a predictor in another (Banar and Ozkan, 2008).

From the review of literature on types of solid waste generation and importance of understanding impact of socio economic factors on managing solid waste it is identified that there is growing demand for availability of reliable information on amount and composition of waste generation which is characterized areawise. Measurement of waste generation according to different models needs to take into account the different socio demographic factors which will enable further evaluation of disposable habits, the current trends and changes which may occur. In order to the same it is vital to arrive at an effective model. The following section describes the methodology followed in arriving at these models.

2. Research Methodology

The researcher systematically searched the Science Direct, Sage and Emerald databases through March 2012 using the following key words: solid waste generation, solid waste management, household waste, municipal solid waste. References from published prospective studies, relevant reviews, and previous Meta analyses were hand searched for additional studies not identified in the database search. Five characteristic classification criteria were focused by a systematic review of 10 waste generation models and these include: modeling method, type of modeled waste streams, location, regional scale and independent variables.

2.1 Eligible Studies

- 1) Were focused on solid waste management.
- 2) Included models that were used in solid waste management.
- 3) That incorporated independent variables like Removal and utilization of solid waste.
- 4) Were published in the English language.

Studies not meeting these criteria were excluded. In addition to the above criteria's, studies that carried out a review of SWM and included a Meta analyses in relation to solid waste management were also excluded.

2.2 Data Extraction

The researcher independently extracted data using standardized data extraction forms. Disagreements were resolved by consensus or, when necessary, by a third reviewer. Reviewers extracted information on study design, including the duration of follow-up, the setting.

2.3 Classification of Criteria Used in the Study

2.3.1 Type of Place

Constituency (C): One of the main reasons for the smallest regional unit being a district is due to the readily available data and competence of regional planning according to (Hockett et al., 1995). In the current study, the term 'Constituency' refers to an administrative unit that includes cities as well as municipalities. This particular research design allows a proper coverage of the federal states (ParWtt et al., 2001; Hockett et al., 1995; Salhofer and Graggaber, 1999). According to (Bach et al., 2004; Gay et al., 1993; Karavezyris et al., 2002), ensuring that modeling is not just restricted to a particular place will ensure that the samples cover a significant number of small to medium sized municipalities.

Households (H): In the case of household related studies, relationship between a wide range of individual habits or characteristics of the representatives of the household itself are analysed. Generally the sample size is setermined to be anywhere between 40 and 800 depending on whether the study is considering a survey on a single household dwelling or an entire community. Typical manner of attaining the required information is through personal interviews and surveys. Due to data protection issues census information is usually not available on an individual level. According to Lebersorger et al., (2003), household community generally refers to the smallest administrative unit.

2.3.2 Type of Waste Stream

2.3.2.1 Material Streams

Material streams refer to all the waste that is generated by the final consumer and material streams can only be

determined through input output analysis. This method is not aimed at taking into account the collection procedure that is applied mainly because of its nature. The records pertaining to the amount of waste generated is not necessary and may be required only for the purpose of validation. Other studies have used dependant variables that are based on other input – output analysis (Daskalopoulos et al., 1998; Christiansen and Fischer, 1999; Skovgaard et al., 2005).

2.3.2.2 Collection Streams

The waste statistics are derived from the official statistics when modeling of the total Municipal Solid Wastes is required (e.g., Beigl et al., 2004; ParWtt et al., 2001; Hockett et al., 1995; Chen and Chang, 2000) or the sum of all recyclables (ParWtt et al., 2001) or single recyclable materials, like glass, plastics or metals or paper and cardboard (Bach et al., 2003 Lebersorger et al., 2003 1) or single collection streams, like residual waste (Mertins et al., 1999; Grossman et al., Dyson and Chang, 2005; Jenkins, 1993;). Some of the models also address other ways of disposal of wastes, like private wiring, illegal disposal and informal collection, other than the officially reported waste streams.

2.3.2.3 Independent Variables

According to Salhofer (2001), there are two different ways to classify models when it comes to analysis of waste generation and they are:

- Factor models that use factors describing the processes of waste generation (Consumption or Utilization).
- Input–output models based on the flow of material to or from waste generators (Removal).

There are a number of independent variables that have been used to explain the overall quantity of partial or entire MSW streams. Some of these variables are mentioned in studies by Salhofer (2001), Beigl et al. (2003), Hockett et al. (1995) and Jenkins (1993). As per the above depicted classifications, grouping is done based on the various stages of product life cycle which are: disposal-related variables, consumption related and production and trade related.

Forecasting of future solid waste is important and this is where solid waste management models are extensively used. There have been a number of studies that have dealt with various solid waste management models and their uses. These models are discussed below

Karavezyris et al., (2002) in their study looked into the application of system dynamics and fuzzy logic to forecasting of municipal solid waste. The study delved into the impact of demographical factors as well as costs of materials recovery and facilities, environmental behavior, treatment and disposal schemes on solid waste management. The study concluded that systems dynamics can be used to forecast and manage municipal solid wastes in a efficient manner. Fuzzy logic modeling was used in this study and it was evident from the study that it could be used for modeling exogenous elements like influences and thresholds. This model discussed constituency based features by identifying different collection streams. It focused on solid waste removal only. The limitation in this study was that the parameters examined were curtailed to amount of waste generated.

The importance of planning and proper design of a solid waste management was again reiterated in a study by Dyson & Chang (2005). The authors clearly identified a limitation when it comes to research or system planning in relation to solid waste management and the limitation was the lack of official historical records of solid waste quality and quantity. These limitations mainly occurred due to lack of sufficient financial resources and lack of proper management

3. Results and Discussion

Table 1. Summary of reviewed references

Reference	Type of Place	Waste Streams	Type of Independent variables	Modelling method	Parameters examined related to socio demographics
Karavezyris et al., (2002)	Constituency	Collection streams	Solid waste Removal	Systems dynamics	Amount of waste generated
Dyson & Chang (2005)	Constituency	Collection Streams	Utilization	Systems Dynamics	Waste generated in relation to income and population
Chen & Chang (2000)	Constituency	Collection Streams	Utilization and Removal	TSA	Amount of waste generated in relation to yearly time periods
Chang & Lin (1997)	Constituency	Collection Streams	Removal	TSA	Waste generation in relation to seasons and density
Zhang et al., (2011)	Multiple cities	Collection Streams	Removal	Reverse Logistics Waste management	Amount of waste generated
Dalemo et al., (1997)	Urban Areas	Material Streams	Removal	ORWARE	-
Bandara et al., (2007)	Constituency	Household Waste	Removal	Univariate Regression	Amount of waste and type of waste generated in relation to income
Skovgaard et al., (2005)	Country	Material Streams	Utilization	Time Series Analysis	Waste generation in relation to household size, expenditure and population
Navarro Esbri et al., (2002)	Constituency	Collection Stream	Utilization	Time Series Analysis	Amount and time of waste collected and seasonal waste generation

Dyson and Chang (2005), in their study again used system dynamics modelling to predict solid waste generation which would greatly aid in the management of the municipal solid waste. A case study based research was undertaken by the authors and five planning models were considered based on the various kinds of system dynamics models. This study also concentrated on presenting a model which was constituency based and identified different models of collection. The study identified consumption and utilization patterns by including data on income and population density. The modeling results are directly useful for associated system planning with regard to site selection and capacity planning of Material Recovery Facility in the near future.

Chen & Chang (2000) in their research also stated that solid waste management system requires accuracy in terms of knowing exact amount of solid waste being generated. However, the authors also contend that the manner in which the amount of solid waste generated is predicted is different in both developed and developing countries. This study focused on the city of Tainan in Taiwan. The study discovered that grey fuzzy dynamic modeling helps in reducing the inconsistency between the predicted values and the observed values. This is also a constituency based study focusing on different collection streams. There is presentation of both utilization and removal related factors. The one disadvantage in this type of modeling is that there is only seasonal data available for waste generation without taking into account any other parameters. Once again lack of proper and sufficient financial resources and unavailability of a good management task force is stated as the main reason for the above stated differences. The authors therefore contend that a special analytical technique must be developed and applied before the subsequent system planning for urban solid waste management is carried out. With this aim in mind, the authors presented a grey fuzzy dynamic modeling model to forecast the amount of waste generated in an urban environment. Zhang et al., (2011) proposed an inexact reverse logistics model for municipal solid waste management systems (IRWM). The study developed an inexact reverse logistics model in order to better facilitate the interactions between production and transport planning and inventory features in the system. Some of the limitations of the study include the non inclusion of parameters such as resource conditions and differences in the legislation, economic and social conditions. This study though being constituency based also identifies a number of specific areas across different cities which is a strength. This study classifies waste collected based on the type of material and focuses only on removal of waste. Despite these specifics the lack of any parameters related to socio economic factors is a limitation to be acknowledged in this study. This model can greatly benefit managers to develop a good solid waste management program. The study concluded that this

model could be further advanced through incorporating methods of stochastic or fuzzy parameters into its framework.

Dalemo et al., (1997) conducted a study into handling of the waste from urban areas. The study made use of an ORWARE model to simulate various scenarios in urban waste management. The study provides a detailed view on the energy turn over, environmental effects and plant nutrient consumption in relation to solid waste management. This study focuses on specific urban areas but does not classify specific constituencies in these areas. The study is focused on different material streams identifying removal of waste. The limitation of this study is that none of the parameters related to any socio economic features are identified. The study concluded that the model affects the input data to the model, i.e., amount and composition of waste, and transport distances and therefore information has to be gathered separately for each area that is under review.

Bandara et al., (2007) also carried out a study to develop an effective waste management strategy for a specific place. The study focused on determining the relation of waste generation and composition to socio-economic factors. Some of the socio economic variables that the study used were the population density and average income of the individuals. In addition to these variables, level of education, climate, religious and cultural beliefs, living habits and social and public attitudes were involved. The study focused on a suburban municipal area in Sri Lanka. The study identified that there is a reduction in per capita generation of waste when there is an increase in number of occupants of one house. The study focused on a single constituency and identified only one type of waste which is a limitation. The socio economic factors identified include only amount of waste generated related to income

Chang & Lin (1997) conducted a study into solid waste generation and delved into the impact that time series intervention modelling has on it. The study concluded that recycling impacts is important when it comes to forecasting the amount of solid waste generation. This study is constituency based focusing on a variety of collection streams. This study is unique in that it does not focus on consumption factors and focuses solely on removal of waste. The only factor examined is generation of waste without identifying population density. Furthermore the authors also determined that time series model will be a very useful tool when it comes to prediction of solid waste generation.

Navarro Esbri et al., (2002) proposed some tools for time series analysis and forecasting MSW generation. This study made use of a prediction based technique which focused on non linear dynamics which presented different performance measures by making use of a seasonal Autoregressive and Moving Average (SARIMA) methodology. The model presented a forecast model which clearly identified a possible practical implementation for an effective MSW management. In this study a community based waste collection approach waste classified across different waste streams and identifying consumption patterns was observed. However only amount and time of waste generation are identified.

Skovgaard et al. (2005) proposed a model for overcoming the issue by means of providing a forecast for all required predictors and MSW forecasts for potential users. By means of implementing comparable and predictable variable like socio-economic variables, the model can be promoted to greater extent. The independent variables are hypothesized, collected and analyzed. It is vital and complex to ensure for the quality of such data. Due to the issues related to data availability and comparability, there are restrictions with respect to the implementation of data intensive approaches. The model on the same context is determined to have major objective of developing prediction tool. The reader is determined to be enabled for making inter-temporal forecasts or inter-regional predictions. Due to the inadequate data with respect to model parameters, the most of the models are unfeasible. In this study a country level analysis was carried out by focusing on different types of material used. This identified consumption types and size of household and income in relation to population were identified thereby overcoming the limitations of previously cited studies.

4. Conclusions

The process of waste management planning considers the evaluation of impacts on existing and future waste streams are vital and essential aspects. It is evident from the literature review considering for the previous implemented approaches that there is variation to greater extent among the adapted models in the concept. The variations are determined regardless of solving the issues in similar manner. There are five aspects that describe the models:

- Focused regional scale that ranges from perspective of household to county
- Type of modeled waste streams
- Hypothesized independent variables

- Socio economic factors
- Modeling method

In order to determine critical design options that have impacts on information gathered and cost efficiency of waste generation models, procedural and systematic guideline needs to be developed

From the discussions on the concept in previous studies and paper the following aspects can be proposed

- Beneficial choices considering for regional sampling that includes number and size of observed areas
- Waste stream definition and investigation
- Select appropriate independent variables
- Model validation procedures

The findings of the study are derived from the practical analysis and consideration of two case studies having varying settings:

- Survey-based analysis of household waste generation at multi-family dwellings and
- A census-data-based development of a forecasting tool for cities

The hypotheses derived by means of comparing the two case studies make the suggestion that implementation of single optimum procedure is not adequate for varying research objectives and circumstances as there exists various issues related to planning process. Balancing of information gain and implementation costs are essential in order to establish or determine the minimum requirements and standards for modeling procedures.

From the review a series of general check list like aspects with respect to current models can be identified. It is identified that there is a need for an overall forecast model which identifies both planning, location, type of waste generated and future growth in waste generated per capita. The discussion in this review also reviews certain shortcomings. The study has focused on a small number of models while there are a many more models which may have better insights to share. The study has also adopted a purely qualitative approach without involving statistical tools. Future research which presents statistical analyses may enable better insight into current models.

References

- Afon, A. O. (2007). An analysis of solid waste generation in a traditional African city: the example of Ogbomoso, Nigeria. *Environment and Urbanization*, 19(2), 527-53. <http://dx.doi.org/10.1177/0956247807082834>
- Agamuthu, P., Fauziah, S. H., Khidzir, K. M., & Noorazamimah, A. A. (2007). Sustainable waste management - Asian perspectives. *Proceedings of the International Conference on Sustainable Solid Waste Management*. 5-7, 15-26. Chennai, India. <http://dx.doi.org/10.1007/s10163-012-0055-z>
- Alhumoud, J. M. (2005). Municipal solid waste recycling in the Gulf Cooperation Council states. *Resources, Conservation and Recycling*, 45, 148-152. <http://dx.doi.org/10.1108/14777830810894210>
- Al-Khatib, I. A., Arafat, H. A., Basheer, T., Shawahneh, H., Salahat, A., Eid, J., & Ali, W. (2007). Trends and Problems of Solid Waste Management in Developing Countries: A Case Study in Seven Palestinian District. *Waste Management*, 27, 1910-1919. <http://dx.doi.org/10.1177/0734242X08094124>
- Bach, H., Weber, A., Mild, A., Natter, M., & Hausberger, S. (2003). Optimierungspotentiale in der Entsorgungslogistik (optimisation potentials in waste logistics). *Schriftenreihe Umweltschutz und Ressourcenökonomie*, 40. Published by Department of Technology and Commodity Science, Vienna, Austria.
- Bandara, N. J., Hettiaratchi, J. P., Wirasinghe, S. C., & Pilapiiya, S. (2007). Relation of waste generation and composition to socio-economic factors: a case study. *Environmental Monitoring and Assessment*, 135(1-3), 31-39. <http://dx.doi.org/10.3923/rjasci.2010.183.190>
- Barr, S., Ford, N. J., & Gilg, A. W. (2003). Attitudes towards recycling household waste in Exeter, Devon: quantitative and qualitative approaches. *Local Environment*, 8(4), 407-421. <http://dx.doi.org/10.1080/13549830306667>
- Beigl, P., Wassermann, G., Schneider, F., & Salhofer, S. (2004). Forecasting municipal solid waste generation in major European cities. IEMSS International Conference: "Complexity and Integrated Resources Management. pp. 14-17. [Online] Available: <http://www.iemss.org/iemss2004/pdf/regional/beigfore.pdf>.

- Buenrostro Otoniel, Bocco Gerardo, & Cram Silke. (May 2001). Classification of sources of municipal solid wastes in developing countries. *Resources, Conservation and Recycling*, 32(1), 29-41. <http://dx.doi.org/10.5772/16438>
- Buenrostro, D. O., Bocco, G., & Bernache, G. (2001). Urban solid waste generation and disposal in Mexico: a case study. *Waste Management & Research*, 19(2), 169-176. <http://dx.doi.org/10.1177/0734242X0101900208>
- Chang, N. B., & Lin, Y. T. (1997). An analysis of recycling impacts on solid waste generation by time series intervention modeling. *Resources, Conservation and Recycling*, 35(3), 201-214. <http://dx.doi.org/10.1108/17506180810891582>
- Chen, H. W., & Chang, N. B. (2000). Prediction analysis of solid waste generation based on grey fuzzy dynamic modeling. *Resources, Conservation and Recycling*, 29(1-2), 1-18. [http://dx.doi.org/10.1016/S0921-3449\(99\)00052-X](http://dx.doi.org/10.1016/S0921-3449(99)00052-X)
- Christensen, T. H. (2011). *Solid Waste Technology & Management*. West Sussex (UK): A. John Wiley and Sons. <http://dx.doi.org/10.1002/9780470666883>
- Christiansen, K. M., & Fischer, C. (1999). Baseline projections of selected waste streams: developments of a methodology', European Environmental Agency, Technical Report No. 28, Copenhagen.
- Dalemo, M., Frostell, B., Jönsson, H., Mingarini, K., Nybrant, T., & Sonesson, U. (1997). ORWARE – a simulation model for organic waste handling systems, Part 1: Model description. *Resources, Conservation and Recycling*, 21(1), 17-37. <http://dx.doi.org/10.1177/0734242X06062485>
- Daskapoulos, E., Badr, O., & Probert, S. D. (1998). Municipal solid waste: A prediction methodology for the generation rate and composition in the European Union countries and the United States of America. *Resources, Conservation and Recycling*, 24(2), 155-166. [http://dx.doi.org/10.1016/S0921-3449\(98\)00032-9](http://dx.doi.org/10.1016/S0921-3449(98)00032-9)
- Dyson, B., & Chang, N. B. (2005) 'Forecasting municipal solid waste generation in a fast-growing urban region with system dynamics modeling. *Waste Management*, 25(7), 669-679. <http://dx.doi.org/10.4236/jep.2012.31015>
- Emery, A. D., Griffiths, A. J., & Williams, K. P. (2003). An in-depth study of the effects of socio-economic conditions on household waste recycling practices. *Waste Manage Res*, 21(3), 180-90. <http://dx.doi.org/10.1016/j.resconrec.2006.03.016>
- Folz, D. H. (1991). Recycling program design, management, and participation: a national survey of municipal experience. *Public Administration Review*, 51(3), 222-231. <http://dx.doi.org/10.1016/j.resconrec.2008.09.004>
- Gay, A. E., Beam, T. G., & Mar, B.W. (1993). cost-e Vective solid-waste characterization Methodology. *Journal of Environmental Engineering*, 119(4), 631-644. [http://dx.doi.org/10.1061/\(ASCE\)0733-9372\(1993\)119:4\(631\)](http://dx.doi.org/10.1061/(ASCE)0733-9372(1993)119:4(631))
- Gomez Guadalupe, Meneses Montserrat, Ballinas Lourdes, Castells Francesc. (2008). Characterization of urban solid waste in Chihuahua. *Mexico Waste Management*, 28(12), 2465-2471.
- Henry, R. K., Yongsheng, Z., & Jun, D. (2006). Municipal solid waste management challenges in developing countries—Kenyan case study. *Waste Management*, 26, 92-100. <http://dx.doi.org/10.1016/j.wasman.2005.03.007>
- Hockett, D., Lober, D. J., & K. (1995). Pilgrim: Determinants of per capita municipal solid waste generation in the Southeastern United States. *J. Environ. Manage*, 45, 205-217. <http://dx.doi.org/10.1006/jema.1995.0069>
- Jenkins, R. R. (1993). *The Economics of Solid Waste Reduction: The Impact of User Fees*. Edward Elgar Publishing Limited, Aldershot, United Kingdom.
- Karavezyris, V., Timpe, K., & Marzi, R. (2002). Application of system dynamics and fuzzy logic to forecasting of municipal solid waste. *Mathematics and Computers in Simulation*, 60(3-5), 149-158. <http://dx.doi.org/10.1016/j.resconrec.2006.06.002>
- Koushki, P. A., & Al-Humoud, J. M. (2002). Evaluation of Reported and Measured Compositions of Household Solid Waste in Kuwait. *Practice Periodical of Hazardous, Toxic, and Radioactive Waste Management*, 6, 204-208. [http://dx.doi.org/10.1061/\(ASCE\)1090-025X\(2002\)6:3\(204\)](http://dx.doi.org/10.1061/(ASCE)1090-025X(2002)6:3(204))
- Lansana, F. M. (1993). A comparative analysis of curbside recycling behaviour in urban and suburban communities. *Professional Geographer*, 45, 169-79. <http://dx.doi.org/10.1080/1463137042000223895>

- Lebersorger, S., & Beigl P. (2011). Municipal solid waste generation in municipalities: Quantifying impacts of household structure. *Commercial waste and domestic fuel Waste Management*, 31(9-10), 1907-1915.
- Lebersorger, S., Schneider, F., & Hauer, W. (2003). Waste generation in households – models in theory and practical experience from a case study of multifamily dwellings in Vienna. In: Proceedings in Sardinia 2003 (ed.) Ninth International Waste Management and LandWll Symposium. Pula, Cagliari, Sardinia, Italy. S. Margherita di.
- M.D. Bovea, V. Ibáñez-Forés, A. Gallardo, & F.J. Colomer-Mendoza. (2010). Environmental assessment of alternative municipal solid waste management strategies. *A Spanish case study Waste Management*, 30(11), 2383-2395.
- Maldonado, L. (2006). The economics of urban solid waste reduction in educational institutions in Mexico: A 3-year experience Resources. *Conservation and Recycling*, 48(1), 41-55. <http://dx.doi.org/10.1177/1077727X99281001>
- Mazzanti, M., & Zoboli, R. (2009). Municipal waste Kuznets curves: Evidence on socioeconomic drivers and policy effectiveness from the EU. *Environmental and Resource Economics*, 44(2), 203-230. <http://dx.doi.org/10.1007/s10640-009-9280-x>
- Mazzanti, M., Montini, A., & Zoboli, R. (2008). Municipal waste generation and socioeconomic drivers. *Journal of Environment and Development*, 17(1), 51-69. <http://dx.doi.org/10.1177/1070496507312575>
- Mertins, L., Vinolas, C., Bargallo, A., Sommer, G., & Renau, J. (1999). Development and application of waste factors – An overview. Technical Report 37. European Environmental Agency, Copenhagen. Cited in: Bogner J. and E. Matthews, 2003. Global Methane Emissions from Land Wlls: New Methodology and Annual Estimates 1980–1996. *Global Biogeochemical Cycles*, 17(2), 34-1.
- Navarro-Esbrí, J., Diamadopoulos, E., & Ginestar, D. (2002). Time series analysis and forecasting techniques for municipal solid waste management. *Resources, Conservation and Recycling*, 35(3), 201-214. <http://dx.doi.org/10.1177/0734242X10396754>
- Nguyen Phuc Thanh, Matsui Yasuhiro, & Fujiwara Takeshi. (2010). Household solid waste generation and characteristic in a Mekong Delta city. *Vietnam Journal of Environmental Management*, 91(11), 2307-2321.
- Noehammer H.C., & Byer P.H. (1997). Effect of design variables on participation in curbside recycling programs. *Waste Management and Research*, 15, 407-427. <http://dx.doi.org/10.1177/0734242X9701500408>
- ParWtt, J. P., Lovett, A. A., & Sünnerberg, G. (2001). A classification of local authority waste collection and recycling strategies in England and Wales. *Resources, Conservation and Recycling*, 32(3-4), 239-257. [http://dx.doi.org/10.1016/S0921-3449\(01\)00064-7](http://dx.doi.org/10.1016/S0921-3449(01)00064-7)
- Salhofer, S. (2001). *Kommunale Entsorgungslogistik: Planung, Gestaltung und Bewertung entsorgungslogistischer Systeme für kommunale Abfälle*. Berlin. Erich Schmidt. <http://dx.doi.org/10.1016/j.wasman.2006.12.011>
- Singh Pratap Rajeev, Singh Pooja, Araujo Ademir, S. F., Hakimi Ibrahim, M., & Sulaiman Othman. (2011). Management of urban solid waste: Vermi-composting a sustainable option Resources. *Conservation and Recycling*, 55(7), 719-729. <http://dx.doi.org/10.1016/j.resconrec.2011.02.005>
- Sjöström Magnus, & Östblom Göran. (2010). Decoupling waste generation from economic growth. A CGE analysis of the Swedish case. *Ecological Economics*, 69(7), 1545-1552. <http://dx.doi.org/10.1016/j.ecolecon.2010.02.014>
- Skovgaard, M., Moll, S., Andersen, F. M., & Larsen, H. (2005). Outlook for waste and material flows: baseline and alternative scenarios. Working Paper 1. *European Topic Centre on Resource and Waste Management*, Copenhagen, Denmark.
- Wang, J., Li, Y., Huang, K., & Chen, H. (2011). Treatment Situation and Determinants of Rural Domestic Waste., *China Population, Resources and Environment*, 21(06), 71-78.
- Zhang, Qinglin, Dor Liran, Fenigshtein dikla, Yang, Weihong, & Wlodzmierz. (2011). Gasification of municipal solid waste in the Plasma Gasification Melting process. *Applied Energy*.
- Zurbrügg Christian, Gfrerer Margareth, Ashadi Henki, Brenner Werner, & Küper David. (2011). Determinants of sustainability in solid waste management. The Gianyar Waste Recovery Project in Indonesia. *Waste Management*, 11.

The Relationship between Economic Freedom, State Growth and Foreign Direct Investment in US States

Dennis Pearson¹, Dong Nyonna¹ & Kil-Joong Kim¹

¹ School of Business, Austin Peay State University, Clarksville, TN 37044, USA

Correspondence: Dennis Pearson, College of Business, Austin Peay State University, Clarksville, TN 37044, USA. Tel: 931-221-7851. E-mail: pearsond@apsu.edu

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Abstract

“There is one and only one social responsibility of business – to use its resources and engage in activities designed to improve its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition, without deception and fraud.”

Milton Friedman

Researchers have identified economic freedom, growth rate of the economy, per capita income, unemployment rate, etc as determinants of foreign direct investment (FDI) inflows into the United States as a country. Whether or not these economic variables also determine FDI at the states' level is often excluded from the literature.

This paper attempts to fill that gap by using a panel data from 1984 through 2007 for all 50 states. We employ the random effects regression model and find that both economic freedom and growth rate in each state are significant positive determinants of FDI inflows. This result is consistent with that of Ray (1989) who shows that high economic growth in the U. S. leads to more FDI inflows. Bengoa and Sanchez-Robles (2003), and Kapuria-Foreman (2007) document similar results for Latin American countries.

In addition, we show that both per capita income and unemployment rate exhibit significant negative relations with FDI. These results are consistent with that of Edwards (1992) and Jaspersen, Aylward, and Knox (2000), but inconsistent with that of Tsai (1994) and Lipsey (1999). We attribute the negative relation between FDI and per capita income to the fact that states with higher per capita income tend to discourage FDI inflows since higher per capita income translates into higher wages. The observed inverse relation between FDI and unemployment rate is due to the fact that states with high unemployment rates are more prone to crime, and therefore deters risk-averse foreign investors from assuming a lasting interest in those states.

Keywords: economic freedom, Foreign Direct Investment, growth

JEL Classification: C33, H7, H30, F21

1. Introduction

The Economics and Statistics Administration of the U.S. Department of Commerce documents that foreign direct investment (FDI) (Note 1) into the U.S. over the past decade has supported more than 5 million U.S. jobs and that on average, those jobs pay 30 percent more than other jobs (Note 2). These findings point the way toward policies that could expand the number of foreign partners investing in the United States and, in so doing, create more high-paying U.S. jobs.

Policymakers at the state and local government levels obviously expect FDI inflows to help improve income and employment aspects of their residents. Consequently, all 50 states in the U.S. compete aggressively for FDI (Graham and Krugman 1995; Casey 1998; Head et al. 1999; Torau and Goss 2004). More evidence of aggressive competition among U. S. states for FDI inflows is found in the Nov. 24th, 1993 edition of the Wall Street Journal, where the state of Alabama is reported to have promised Mercedes-Benz well over \$300 million if it located its first U.S auto manufacturing plant in that state.

Considering the crucial role FDI plays in the economic development of a nation, tremendous amount of research on its determinants exists. Many economists identify economic freedom, growth rate of the economy, per capita

income, unemployment rate, etc as determinants of FDI. Whether or not these determinants of FDI at the national level also impact FDI inflows at the state level is often excluded from the literature.

This paper attempts to fill that gap by using a panel data from 1984 through 2007 for all 50 states. We employ the random effects regression model and find that both economic freedom and growth rate in each state are significantly positively related to FDI. In addition, we show that both unemployment rate and per capita income are negatively related to FDI inflows into the states. We attribute this negative relation between FDI inflows and unemployment to the fact that high unemployment may lead to crime, and so discourages risk-averse foreign investor. Since high per capita income translates into high wages, we attribute the inverse relation between per capita income and inflows of FDI to entrepreneurs trying to avoid states with high wages.

Our paper contributes to the literature in the following manner. Since the 50 states in the U. S. are not homogeneous in terms of policy and regulations, our study seeks to find out whether the determinants of FDI at the national level also determine FDI at the state level. We find that both economic freedom and growth rate of the economy are direct contributory factors to FDI inflows. On the other hand, both the state's unemployment rate and per capita income negatively impact FDI inflows into that state.

From a policy perspective, state and local government authorities should promote a business environment consistent with economic freedom that fosters economic growth in order to attract inflows of FDI. In addition, since high unemployment discourages foreign entrepreneurs from investing, state governments should institute measures aimed at mitigating the unemployment menace.

The rest of the paper is organized as follows. Section 2 discusses the economic variables used in the study and testable hypotheses. Section 3 reports the data and methodology. The results are reported in section 4, and section 5 concludes the paper.

2. Economic Variables and Hypotheses

Researchers in foreign direct investment argue that inflow of FDI plays an important role in the socioeconomic and technological developments of the host nation. In particular, FDI inflows provide capital for domestic investment. In addition, the host country benefits from tax revenues through increased economic activities resulting from FDI capital inflow. Considering the significant role FDI plays in the economic development of developing countries (in particular) a number of studies have evolved on the determinants of FDI. Most of these studies identify the degree of economic freedom, the growth rate of the economy, the per capita income (or the size of the market), the unemployment rate for the host economy, etc, as determinants of FDI. Next, we discuss each of these variables and their relationships with inflows of FDI.

2.1 Economic Freedom

“Modern economic growth is mainly about brain power and sound policy. Investment capital and entrepreneurial talent will flow toward economies with low taxes, secure property rights, sound money and sensible regulatory policies. In contrast, when these factors are absent, people will find more attractive environments somewhere. Nations prosper when they provide a climate that encourages their citizens, often in cooperation with foreigners, to discover and adopt better ways of doing things,” Gwartney and Lawson (2001).

The above quote implies that inflows of FDI do not necessarily flow to where it is needed the most; it flows to economies with the most conducive business environments. The degree of economic freedom, which measures the conduciveness of a business environment, is defined by Caetano and Caleiro (2009) as “the degree to which a market economy is in place, where the central components are voluntary exchange, free competition, and protection of persons and property.” Two indexes measure the degree of economic freedom. One is the Fraser's Institute Economic Freedom World (EFW) Index and the other is the Heritage Foundation Economic Freedom Index of the World. Our analysis utilizes the Fraser's Institute degree of economic freedom index. The index quantifies forty-two data points in five broad areas (size of government; legal structure and security of property rights; access to sound money; freedom to trade internationally; and regulation of credit, labor, and business) into a composite score on a scale of 0 to 10, with 10 representing the highest degree of economic freedom (see Gwartney, Lawson, and Hall, 2011).

Kapuria-Foreman (2007) examines the determinants of FDI using data from 1990-1998 for a number of developing countries and document that FDI varies positively with higher levels of certain components of the economic freedom index. In another study of 18 countries, Quazi (2007) use the economic freedom index published by the Heritage Foundation as a proxy for “domestic investment climate” and show that economic freedom is a significant positive determinant of FDI. In a related study, Bengoa and Sanchez-Robles (2003)

analyze a sample of 18 Latin American countries from 1970-1999 and report that economic freedom is a positive determinant of FDI inflows.

Utilizing a pooled time-series and cross sectional data from 1979-85, Ray (1989) show that an increase in nontariff trade barrier protection, which is a component of economic freedom, in the United States leads to an increase in foreign direct investment in U. S. manufacturing activities. Another component of economic freedom that is shown to have a positive effect on FDI inflows is the tax rate of the host nation. Both Cassou (1997) and Billington (1999) show that low corporate tax rates in host countries attract FDI inflows. In addition, Kemsley (1998) provides evidence that tax serves as an incentive for U.S. multinational corporations to export to foreign markets rather than undertaking green field investment. The degree of openness to international trade, measured by the ratio of the sum of exports and imports to GDP, is another component of economic freedom. This component is shown to exhibit a strong positive relation with FDI inflows (Edwards, 1992).

In view of these documentations on the relationship between economic freedom and inflows of FDI in developing countries, we have no reason to believe the relationship would be different in the 50 U. S. states. Hence our hypothesis on the relationship between FDI and economic freedom in the 50 U. S. states follows.

Hypothesis 1: States with higher degree of economic freedom (as provided by the Fraser Institute) should have higher inflow of FDI.

2.2 Growth Rate of the Economy

Advanced by Lim (1983), the growth hypothesis postulates that a rapidly growing economy has better opportunities (from the perspective of the foreign investor) for profit maximization than those that are stagnant. In support of this hypothesis, Tsai (1994) acknowledged that most studies on the determinants of FDI consider economic growth rate of the recipient country as a crucial factor attracting inflows of FDI. According to Hansen and Rand (2006), the consensus seems to be that of a positive relationship between FDI inflows and economic growth in host countries provided the receiving countries have achieved a minimum level of educational, technological, and/or infrastructural development.

Using a 40-year period of annual data, Asheghian (2004) analyzes the role of FDI on U.S. economic growth and document that FDI has a significant positive impact on the U.S. economic growth. However, Chowdhury and Mavrotas (2006) test the direction of causality between FDI and economic growth for three major FDI recipient countries and report mixed results. They fail to confirm the conventional view that the direction of causality runs from FDI to economic growth for one host country, and document a bi-directional relationship between FDI and growth rate for the other two recipient countries. In another study, Ray (1989) show that high economic growth in the United States tends to influence the decision by foreign firms to invest in the United States.

In summary, we consider growth as a crucial determinant of FDI. Risk-averse foreign investors will be attracted to a high-growth economy where the possibility exists for an expanding domestic market. As a result, we argue that states experiencing rapid growth will be more attractive to foreign investors than states with declining growth. Consequently, the second hypothesis becomes:

Hypothesis 2: States with high economic growth should experience more FDI inflow than states with low economic growth.

2.3 Per Capita Income

Many studies have analyzed the relationship between inflows of FDI to the host nation and per capita income and found mixed results. Using a pooled aggregate data for 62 countries over the period 1975-1978 and for 51 countries from 1983-1986, Tsai (1994) and Lipsey (1999) document a positive relationship between FDI and per capita income. On the contrary, Edwards (1992) and Jaspersen, Aylward, and Knox (2000) find a significant negative relation. In our view, high per capita income, which is a consequence of high wages, tends to discourage FDI inflows. The reason is that rational entrepreneurs realizing the benefits of lower labor cost will most likely locate their businesses in economies where wages are lower (*ceteris paribus*). Furthermore, Leibrecht and Scharler (2009) study the importance of labor market conditions in Central and Eastern European countries and find that countries with lower labor costs have high FDI inflows. Even though these studies were conducted on developing nations, we believe to some extent, the U.S. states behave in a similar fashion. Therefore the hypothesis on per capita income and FDI follows.

Hypothesis 3: States with lower per capita income will attract more FDI than states with higher per capita income.

2.4 Rate of Unemployment

The relationship between unemployment rate and FDI inflows is mixed. Billington (1999) notes that high unemployment, which is a proxy for the availability of labor in the host country encourages FDI inflows. On the contrary, using a simple partial equilibrium model of foreign direct investment in the U. S., Ray (1989) provides evidence regarding the degree to which FDI might lower the unemployment rate. We believe high unemployment rate should lead to socio-economic problems like high crime rate and high rate of school dropout (*ceteris paribus*). The consequence of high rate school dropout is scarcity of skilled labor force in the long-run. As a result no rational enterprise will want to have lasting interest in such an environment. Therefore, our hypothesis on the relationship between unemployment rate and FDI inflows is the following.

Hypothesis 4: States with higher unemployment rates attract less FDI inflows than states with lower unemployment rates.

3. Data and Methodology

3.1 Sources of Data

We utilize a panel data of 1,150 observations from 1984 through 2007. All data points are reported in two versions: All-Government Index, and Sub-national Index. We obtain inward foreign direct investment (FDI) data for each of the 50 U.S. states from the Bureau of Economic Analysis (BEA). Data on economic freedom (ER) for each 50 U.S. states is obtained from the Frasier Institute (Note 3). Next, data on growth rate (Growth) for each state is obtained from the BEA, while data on states' unemployment rates (Unemp) is obtained from the Bureau of Labor Statistics (BLS). Finally, data on per capita income (Pcap) by state is obtained from the BEA.

3.2 Methodology

Consistent with the literature on panel data estimation, we employ the random effects model to estimate the following regression model.

$$FDI_{it} = \beta_0 + \beta_1 EF_{it} + \beta_2 Growth_{it} + \beta_3 Pcap_{it} + \beta_4 Unemp_{it} + \varepsilon_{it}, \quad (1)$$

where:

FDI_{it} is the inward foreign direct investment for state i at time t . It is computed as

$$\ln(FDI_t/FDI_{t-1}) * 100.$$

EF_{it} is the economic freedom for state i at time t . This variable is hypothesized to have a direct relation with FDI for each state.

$Growth_{it}$ represents the growth rate of state i at time t . It is computed as $\ln(GSP_t/GSP_{t-1}) * 100$, where GSP_t is the Gross State Product at time t . Like the economic freedom variable, growth rate in each state is expected to have a positive relation with FDI.

$Pcap_{it}$ is the per capita income for state i at time t . Per capita income on the other hand is expected to have a negative relation with FDI.

$Unemp_{it}$ depicts the unemployment rate for state i at time t . A state's unemployment rate is hypothesized to have a negative relation with FDI.

ε_{it} is the error term

4. Empirical Results

Our regression results using the all-government index version of the data is depicted on the table below:

Table 1. Regression of FDI on ER, Growth Rate, Pcap, and Unemp:

$$\text{Model: } FDI_{it} = \beta_0 + \beta_1 EF_{it} + \beta_2 Growth_{it} + \beta_3 Pcap_{it} + \beta_4 Unemp_{it} + \varepsilon_{it},$$

Variable	Coefficient	Standard Error	t-Statistic
EF	6.2032	1.5099	4.1083***
Growth	0.2727	0.1334	2.0434**
Pcap	-0.0004	0.0001	-7.9028***
Unemp	-2.0474	0.3725	-5.4966***
Total (Pooled) Observations	1,150		
R-Squared	12.15%		
Adj R-Squared	7.9%		

***Significant at 1% level, **Significant at 5% level

All the variables have their expected signs and are highly significant at the 1% level except for the *Growth* rate variable, which is significant at the 5% level. The coefficient on the economic freedom variable (EF) is positive and highly significant at the one percent level, supporting hypothesis 1, which states that a high degree of economic freedom in a particular state will lead to an increase in FDI inflows into that state. This is consistent with Gwartney and Lawson (2001) who purport that investment capital and entrepreneurial talent will flow toward economies with low taxes, secure property rights, sound money, and sensible regulatory policies. Similarly, the coefficient on the growth variable (Growth) is positive and significant. This supports our second hypothesis, which implies higher growth rates attract more FDI inflows. These results are consistent with that of Ray (1989) who show that high economic growth in the U. S. leads to more FDI inflows. Bengoa and Sanchez-Robles (2003), and Kapuria-Foreman (2007) document similar results for Latin American countries.

The coefficients on both per capita income (Pcap) and unemployment (Unemp) variables are both negative and highly significant indicating the negative relationship between these variables and FDI inflows. Higher per capita income, which translates into higher wages, discourages FDI inflows. Similarly, high unemployment with its concomitant social vices tends to scare away risk-averse foreign entrepreneurs. These results are consistent with that of Jaspersen, Aylward, and Knox (2000); and Edwards (1992), but inconsistent with that of Tsai (1994) and Lipsey (1999).

We attribute the negative relation between FDI and per capita income to the fact that states with higher per capita income tend to discourage FDI inflows since higher per capita income translates into higher wages. The observed inverse relation between FDI and unemployment rate is due to the fact that states with high unemployment rates are more prone to crime, and therefore deters risk-averse foreign investors from assuming a lasting interest in those states.

For robustness, we estimate the same model above using the sub-national index version of the data. However, we do not report the results since they are very similar to those of the all-government index.

5. Conclusion

Using a panel data from 1984 through 2007, the study looks at the relationship between foreign direct investment (FDI) and a number of economic variables hypothesized to explain FDI in each of the 50 U. S. states. We find that both the degree of economic freedom (for each state) as measured by the Fraser's Institute Economic Freedom World Index and the state's growth rate exhibit a direct relationship with FDI. This is expected since all things being equal a "frictionless" economic environment should attract more business investment. This finding is consistent with Edwards (1992) and Ray (1989). Second, we document that, high levels of both unemployment rate and per capita income in a state lead to low levels of FDI in that state. We attribute this result to the fact that high per capita income translates into high wages, which tends to discourage the inflow of FDI. In addition, the negative relation between unemployment rate and FDI inflows can be attributed to the fact that high unemployment rate can lead to a high crime rate, which discourages risk-averse foreign entrepreneurs from taking a lasting interest in that economy.

From a policy perspective, state and local government authorities should promote a business environment consistent with economic freedom that fosters economic growth in order to attract inflows of FDI. Pro-FDI policies should be implemented at the state level. In addition, since high unemployment discourages foreign

entrepreneurs from investing, state governments should institute measures aimed at mitigating the unemployment menace.

References

- Asheghian, Parviz. (2004). Determinants of Economic Growth in the United States: The Role of Foreign Direct Investment. *The International Trade Journal*, 18(1), 63-83. <http://dx.doi.org/10.1080/08853900490277350>
- Bengoa, Marta, & Sanchez-Robles. (2003). Foreign Direct Investment, Economic Freedom and Growth: New Evidence from Latin America. *European Journal of Political Economy*, 19, 529-545. [http://dx.doi.org/10.1016/S0176-2680\(03\)00011-9](http://dx.doi.org/10.1016/S0176-2680(03)00011-9)
- Billington, Nicholas. (1999). The Location of Foreign Direct Investment: An Empirical Analysis. *Applied Economics*, 31(1), 65-76. <http://dx.doi.org/10.1080/000368499324561>
- Caetano, Jose, & Caleiro, Antonio. (2009). Economic Freedom and Foreign Direct Investment: How Different are the MENA Countries from the EU. *iBusiness*, 1, 65-74. <http://dx.doi.org/10.4236/ib.2009.12010>
- Cassou, Steven, P. (1997). The Link Between Tax Rates and Foreign Direct Investment. *Applied Economics*, 29(10), 1295-1301. <http://dx.doi.org/10.1080/00036849700000019>
- Chowdhury, Abdur, & Mavrotas, George. (2006). FDI and Growth: What Causes What? *The World Economy*, 29(1), 9-19. <http://dx.doi.org/10.1111/j.1467-9701.2006.00755.x>
- Edwards, Sebastian. (1992). Capital Flows, Foreign Direct Investment, and Debt-Equity Swaps in Developing Countries. *NBER Working Paper No. 3497*.
- Goldsmith, Arthur. (1995). Democracy, Property Rights and Economic Growth. *The Journal of Development Studies*, 32(2), 157-174. <http://dx.doi.org/10.1080/00220389508422409>
- Gwartney, James, Lawson, Robert, & Hall, Joshua. (2011). *Economic Freedom of the World*. Fraser Institute.
- Hansen, Henrik, & Rand, John. (2006). On the Causal Links Between FDI and Growth in Developing Countries. *The World Economy*, 29(1), 21-41. Wiley Blackwell. <http://dx.doi.org/10.1111%2Fj.1467-9701.2006.00756.x>
- Jaspersen, S., Aylward, A., & Knox, A. (2000). The Effects of Risks on Private Investment: Africa Compared with Other Developing Areas. In P. Collier and C. Pattillo (Eds.), *Investments and Risks in Africa*, pp 71-95. New York. St. Martin's Press.
- Kapuria-Foreman, Vibha. (2007). Economic Freedom and Foreign Direct Investment in Developing Countries. *The Journal of Developing Areas*, 41(1), 143-145. <http://dx.doi.org/10.1353/jda.2008.0024>
- Kemsley, Deen. (1998). The Effect of Taxes on Production Location. *Journal of Accounting Research*, 36(2), 321-341. <http://dx.doi.org/10.2307/2491480>
- Klein, Michael, & Rosengren, Eric. (1994). The Real Exchange Rate and Foreign Direct Investment in the United States: Relative Wealth vs. Relative Wage Effects. *Journal of International Economics*, 36(3-4), 373-389.
- Leibrecht, Markus, & Scharler, Johann. (2009). *How Important is Employment Protection Legislation for Foreign Direct Investment Flows in Central and Eastern European Countries?* <http://dx.doi.org/10.1111/j.1468-0351.2009.00353.x>
- Lim, David. (1983). Fiscal Incentive and Direct Foreign Investment in Less Developed Countries. *The journal of Development Studies*, 19(2), 207-212.
- Lipsey, Robert. (1999). The Location and Characteristics of U. S. Affiliates in Asia. *NBER Working Paper No. 6876*.
- Quazi, M. Rahim. (2007). Foreign Direct Investment in Latin America: A Panel Regression Study. *The International Journal of Business and Finance Research*, 1(1), 59-67.
- Ray, Edward John. (1989). The Determinants of Foreign Direct Investment in the United States, 1979-85, in Robert C. Feenstra, ed., *Trade Policies for International Competitiveness*, p.53-84. University of Chicago Press.
- Tsai, Pan-Long. (1994). Determinants of Foreign Direct Investments and its Impact on Economic Growth. *Journal of Economic Development*, 19, p.137-163.

Notes

Note 1. The International Monetary Fund (IFM) defines Foreign Direct Investment (FDI) as “an investment that is made to acquire a lasting interest in an enterprise operating in an economy other than that of the investor with the purpose being to have an effective voice in the management of the enterprise.”

Note 2. www.esa.doc.gov/Reports/foreign-direct-investment-united-states

Note 3. This Economic Freedom of the World Index for the Fraser Institute is a composite score based on quantitative data.

East African Regional Integration: Challenges in Meeting the Convergence Criteria for Monetary Union: A Survey

Annette Kuteesa

Correspondence: Annette Kuteesa, Economic Policy Research Centre, P.O. Box 7841, Kampala, Uganda. Tel: 256-4-145-4103. E-mail: akuteesa@eprc.or.ug

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Abstract

The realization of a successful monetary union among EAC partner states depends upon a sufficient degree of convergence of partners economies to established criteria. Gathering but scattered research has begun assessing the various benchmarks for this characteristic. This work integrates and synthesizes the various findings of literature with the view of providing a general perspective on how far the partner states have reached in meeting the macroeconomic convergence criteria and whether they have met the precondition for ascending the union. The review is done with anticipation of uncovering the challenges countries are encountering in aligning the economies to set criteria and what possible policy strategies exist to overcome these problems. Findings reveal that there has been very limited convergence. Generally countries remain behind the staged indicators. Progress to the monetary union is challenged by the highly demanding criteria, lack of exchange rate mechanism, obstacles to the common market, multiple memberships and many more. While countries might have the option of revising the benchmarks, efforts to strengthen national economic growth, build regional capacities, harmonize policies related to the monetary union, and correct constraints in the common market will enhance deeper integration and contribute greatly to macro-economic convergence.

Keywords: EAC partner states, macroeconomic convergence, challenges, policies

1. Introduction

The East African Community (EAC) re-emerged in 2000 after the ratification of the EAC treaty signed earlier in 1999 by member states of Kenya Uganda and Tanzania. Rwanda and Burundi joined the union in 2007. As by the treaty, the objectives of the EAC are to develop policies and programs aimed at widening and deepening co-operation among the Partner States in economic, social, cultural and political fields their mutual benefit. Within this framework partner countries also resolved to establish amongst themselves a customs union, a common market, subsequently a monetary union and ultimately a political federation to strengthen, regulate, and enhance an accelerated harmonious, equitable and sustained economic development (EAC, 2007). This collaboration of efforts has so far yielded a customs union launched in 2005 and the common market established in 2010.

At a glance the EAC common market covers a geographical area 1.82 million square kilo meters (Note 1) and a growing population of 133.1 million persons. The economic community displays some improvements in economic growth despite country level differences in economic performance. Market price GDP which stood at 74.5 billion USD accordingly in 2005 registered 79.2 billion USD in 2010. Individual country contributions are shown in figure 1.

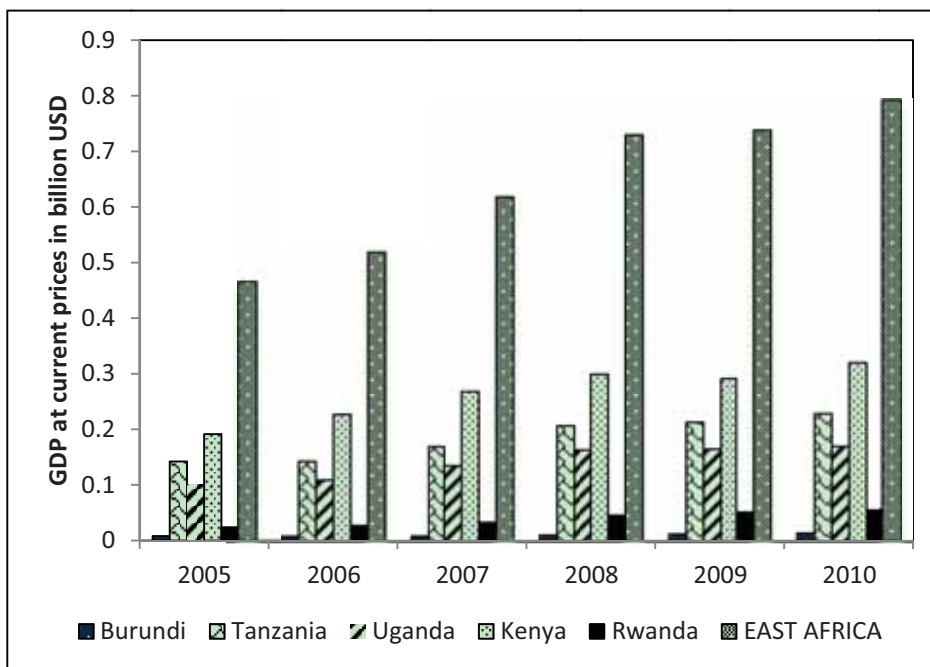


Figure 1. Regional trends in GDP at current prices

Source EAC secretariat, 2011

Kenya and Tanzania that have always had stronger economies compared to other countries in the REC accounted for most these gains. There are also signs of recovery in growth of Real GDP whose rate fell tremendously 4.4% in 2009 after global economic crisis of 2008. In 2010 the rate registered 5.9%. Further improvements have occurred in standard of wellbeing across the region with overall per capita GDP at current price rising from \$632 in 2009 to \$685 in 2010 respectively. How individual nations have fared in the past six years in wellbeing is illustrated in figure 2. The integration has also boosted the volume of intra trade among member countries. Kenya remains the main source of imports for all other countries in the block although its self receives a small amount of imports from them. But like all other countries it's overall trade position remains weak with a widening trade balance reflecting that imports continue to surpass exports.

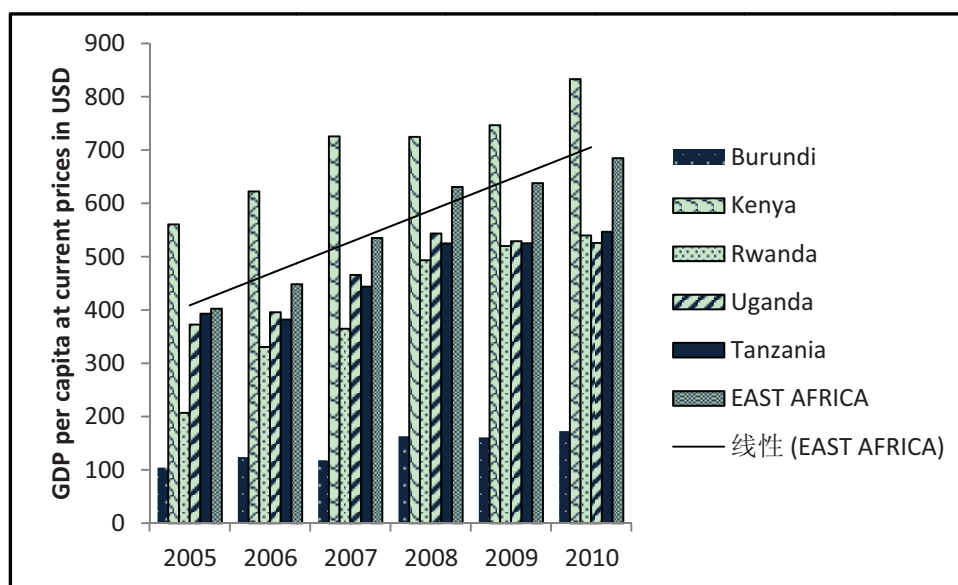


Figure 2. Level of GDP per capita for EAC from 2005-2010

Source: EAC secretariat, 2011

Recent developments in negotiations have sought to elevate the REC to a monetary union (MU) with the introduction of the single currency by 2015 (EAC, 2009). Granted, the benefits of a single currency area several including reductions in transaction costs associated with cross border trade and volatility of exchange rates across the union thus facilitating trade and investment in the region. The union can also aid in the strengthening of the common market due to the unrestricted movement of goods and services, human resource and capital thus enhance efficiency in production leading to increased GDP. Further benefits can be derived in terms of price stability and convergence which could reduce on market discrimination, foster competition and increase economic efficiency (Alessina and Barro, 2002; Mundell, 1961; Mckinnon, 1963; Flemming, 1971). For the case of EAC, the MU is sought to facilitate the formation of stable political state. However, there are also costs linked to the unification, the major being loss of national autonomy in monetary policy. Other costs are tied to the possibility of increased inflation and unemployment, loss of exchange policy and fiscal independence (Schuberth and Wehinger, 1998; Bean, 1992; Calmfors, 2001). The magnitude of this loss depends on how well individual countries were conducting monetary policy prior to joining the currency union. But in order to reap the maximum benefits and minimize costs there ought to be a sufficient degree of macro-economic convergence, and financial integration among aspiring economies preceding the fusion. Without this compatibility, partner countries risk of high adjustment costs at the start of the EAMU and an unstable union.

Consistent with a number of RECs elsewhere, EAC countries have put in place macro convergence criteria to guide and hasten the merger. But how far the nations have progressed in aligning their economies to the set bench marks still troubles many given the discrepancies in institutional mechanisms, social and economic structures. Well as the community has made substantial gains in the process ahead of the union by establishing relevant committees overseeing coordination and harmonization of policies; standardizing the value added tax rates; maintain ace of currency convertibility by all partner states; modernizing and integrating the payment systems and settlements; and synchronizing the trading practices and rules in stock market exchange (EAC, 2009), partner commitment has remained low with some policies registering 3 out of 5 participating countries. In addition, policy coordination has stayed largely in the hands of the state forcing macro-economic convergence to proceed in an environment that is prone to economic disruptions.

A small but growing amount of empirical research has begun to examine the subject. Works have investigated the degree of economic integration and the suitability to which EAC region constitutes a single currency. While most of these have applied laborious econometric techniques, others have been more consultative in nature rooted in ongoing regional tendencies. Rather than break new grounds through fresh research, this paper aims at integrating and synthesizing key findings of this scattered literature with the view of highlighting the major issues as the region moves towards the East African monetary union (EAMU). The intension is to provide a general perspective on how far the partner states have reached in meeting the macroeconomic convergence bench marks, the challenges they are encountering in aligning the economies to set criteria and the possible policy strategies to overcome them. While importance of various empirical techniques utilized by the scholars is recognized, discussion of methodological issues is reserved for a later time. A total of 12 studies are examined. The rest of this paper proceeds by first examining the status of member countries in fulfilling the criteria set by the EAC. This is followed by a discussion of perceived challenges and approaches through which they can be countered. The paper ends by presenting the conclusions and policy implications.

2. Status of the Partner Economies in Fulfilling Macro Convergence Criteria

2.1 The EAC Macro-economic Convergence Criteria

As mentioned earlier transiting to the EAMU is pegged on the achieving the macroeconomic convergence criteria established by the EAC monetary committee affairs (MAC, 2009). Generally the framework is rather comprehensive constituting of traditional criteria and their derivatives grouped into primary and secondary criteria that must be met and maintained at two separate stages before the introduction of the single currency in the third stage. Details of these key indicators and associated timings are provided in table 1.

Table 1. EAC Macroeconomic Convergence Criteria

Criteria	Stage I 2007-2010	Stage II 2011 – 2014	Stage III 2015
Primary Criteria			
– Budget deficit/GDP (excluding grants)	<6%	<5%	
– Budget deficit/GDP (including grants)	<3%	<2%	
– External Reserves (months of imports of goods and non-factor services)	>4	>6	
– Annual Inflation rate	<5%	< 5%	
Secondary Criteria			
– Exchange rates	Stable		
– Interest rates (Market based)	Achieve and Maintain	●	Introduction and circulation of a single East African Currency
– Real GDP growth rate	>7%	>7%	
– National savings/GDP	>20%	>20%	
– Sustained pursuit of debt sustainability	●	●	
– Reduction of current account deficit (excluding grants) as a percentage of GDP to sustainable level consistent with debt sustainability	●	●	
– Implementation of 25 core principles of bank supervision and regulation based on the agreed action plan for harmonization of bank supervision	●		
– Adherence to core principles of systematically important payment systems by modernizing payment and settlement systems	●		

Note: Source of Information is the EAC Monetary Affairs Committee (MAC) report, 2009; ● implies that the criterion is considered for that stage.

The context under which EAC's macroeconomic convergence criteria are established compares well with those followed by other regional economic communities e.g. the EU, SADC, COMESA, and UEMOA in that they all center on areas of price stability, exchange rate stability, strengthening the level external reserves, fiscal restraint (by limiting government debt and deficits) and encouraging policy coordination among partner states. Variations are in the broadness of criteria and flexibility of set targets. For example EAC benchmarks hardly allow for adjustments for economic shocks within set criteria. While other initiatives such as SADC allows for member countries' budget deficits to fluctuate between 3 or – 1 of the prevailing regional average for over a 6 year period. In controlling fiscal debt, EAC's criteria remains open while other initiatives have set limits to debt borrowing and accumulation of about 60 to 70 percent (Note 2). In extensiveness of the criteria, EAC is most similar to COMESA.

All studies encountered under in this work have relied on one or more of these criteria when determining regional integration. Emphasis has been placed on both the changing patterns and equalization of criteria to set targets but also on their distribution, linkage and merger to a common point of movement or convergence; correspondingly findings are presented as per se.

2.2 Emerging Macro-economic Trends and Criteria

At the moment, all countries have gone through the first stage of convergence and are underway the second stage. While works have assessed trends as early as 2000, this discussion is limited of findings to only the stage I for purposes of giving a more meaningful interpretation to the criteria and also there is not much data for stage II. Generally the findings show that country performances have remained behind Stage I bench marks compromising on the future prospects of attaining the goals set in Stage II (IMF, 2011a, 2011b; ECB, 2010). In regards to the primary criteria, tendencies of budget deficits excluding grants indicate that Rwanda, Tanzania and Burundi have consistently have found it difficult to stay below the 6% target registering double digits as late as 2010. Kenya and Uganda have performed relatively well with former meeting the criteria until 2009 and thereafter defaulted on the benchmark possibly due to the economic downturn.

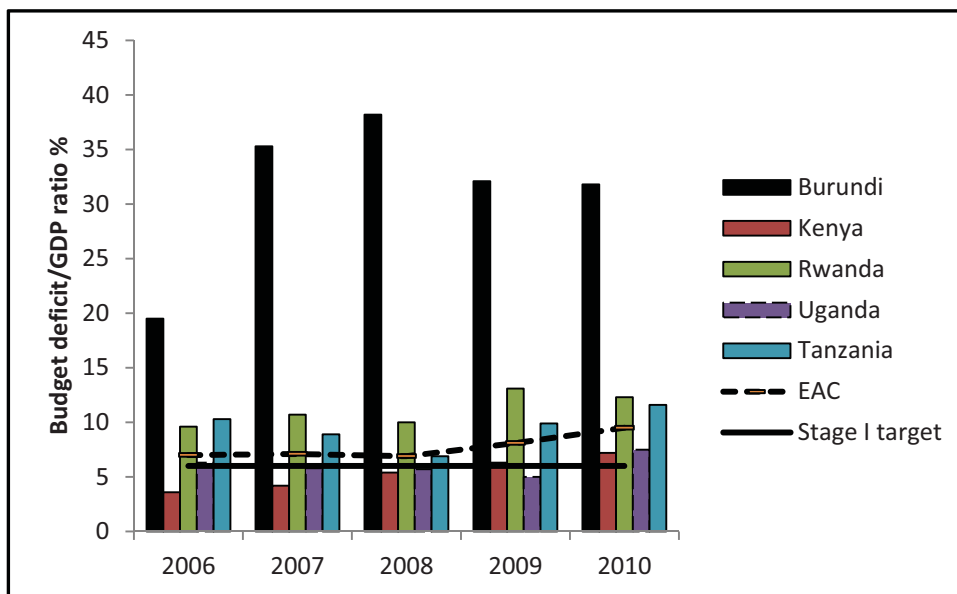


Figure 3. Trends in budget deficit to GDP ratio excluding grants for EAC countries for 2006-2010

Source: IMF African Department database and World Economic Outlook, 2011

As far as budget deficits including grants are concerned, most countries have progressed relatively well by remaining below the 3% target. On combining the two findings, it becomes clear that the countries' capacity to generate their own revenue remains low compared to their financial demands. The high dependency on grants or aid for economic development is risky for any economy even more dangerous as nations ascend the union given that such donor support is seasonal. This is so most worrying for especially Burundi, Rwanda and Tanzania.

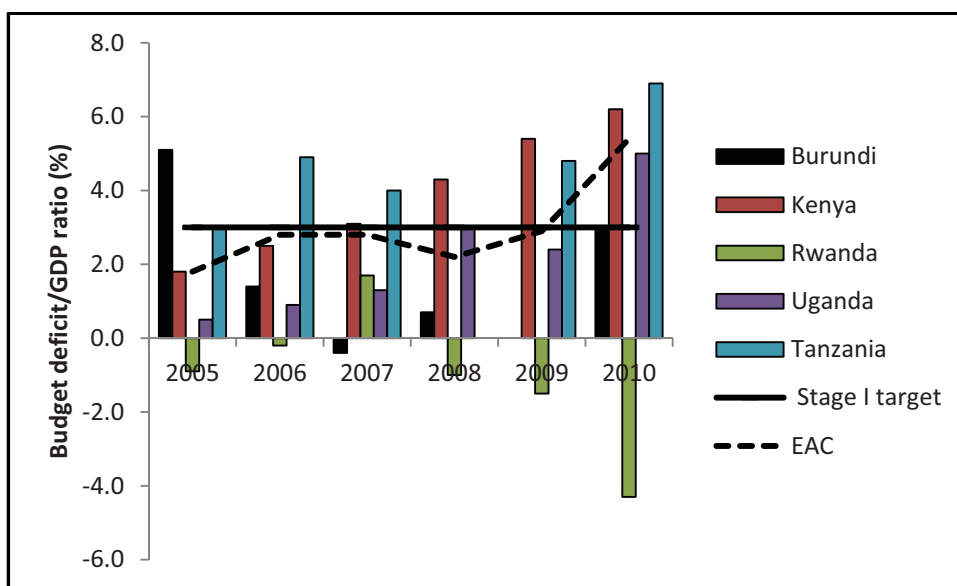


Figure 4. Trends in budget deficit to GDP ratio including grants for EAC countries for 2005-2010

Source: IMF African Department database and World Economic Outlook, 2011

Generally countries have fulfilled the requirement of 4 months of import cover for goods and services for external reserves except for Kenya which has underperformed in this regards. Burundi which also trailed behind in 2007 appears to have caught up to Rwanda, Uganda, and Tanzania. Overall Uganda has the strongest position as seen in figure 5. Generally countries did well until the economic downturn 2008-2009 at which point the

deficits increased and reserves fell for the region. However the progress in controlling inflation at 5% target has been very slow. Countries continue to be above the 5% target mark as shown in figure 6. The high levels are blamed on high rise in food prices across the region especially from 2007 to 2009. Elevated and divergent rates don't favor exchange rate stability in that they create expectation about incompatibility of exchange rate in the region could further destabilize the union.

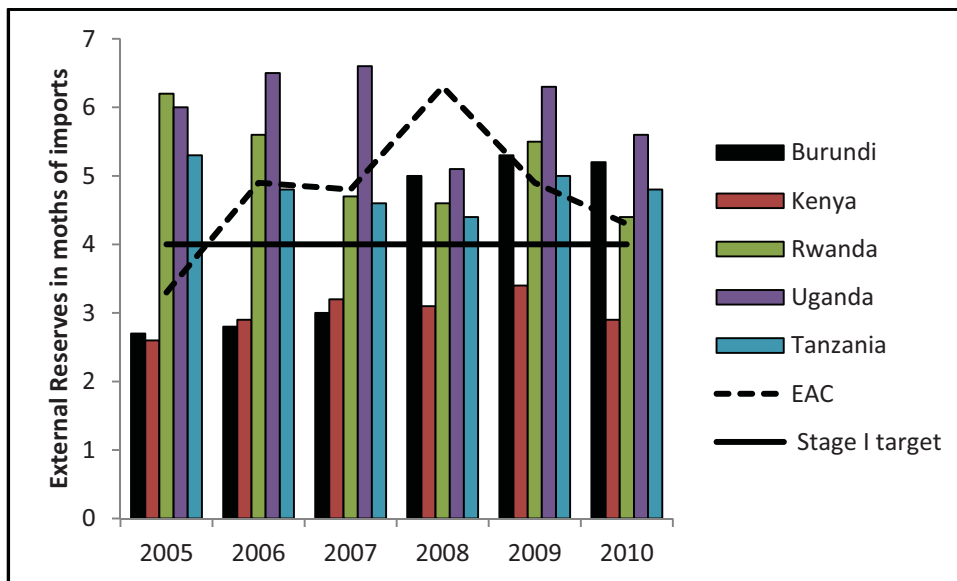


Figure 5. External Reserves in months of imports of goods and services for EAC countries 2005-2010

Source: IMF African Department database and World Economic Outlook, 2011

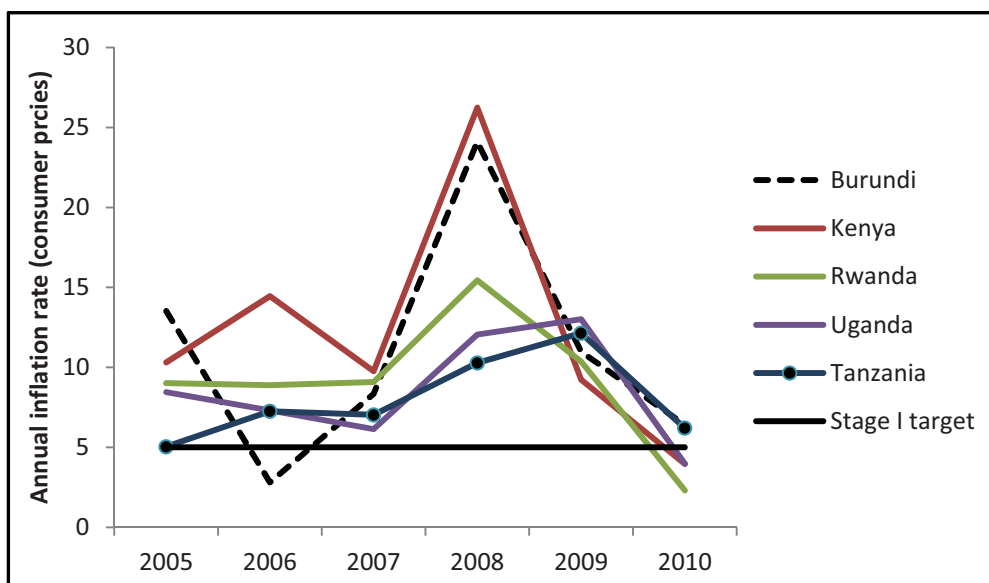


Figure 6. Annual Inflation rate at consumer prices (%) of EAC states 2005-2010

Source: World Bank WDI, 2012

On meeting the secondary criteria, tendencies of bilateral exchange rates (ER) and interest rates in the region would offer the best indication of economic integration. A significant achievement by EAC economies has been the maintenance of market based interest and exchange rates. Another achievement has been the currency convertibility where by local currencies are changed to a foreign currency such as dollar, Euro, pound sterling and as wells other regional currencies. In assessing stability and convergence of bilateral exchange rates studies

have expressed concerns due to a lack of exchange rate mechanism between countries. The investigation by ECB (2010) determining ER stability revealed a depreciation of the all other currencies against the Kenyan shilling. However the Ugandan currency was found to be more stable against the Kenyan currency compared to other currencies. Countries have also exhibited differing interest in last decade as depicted in figure in figure 7.

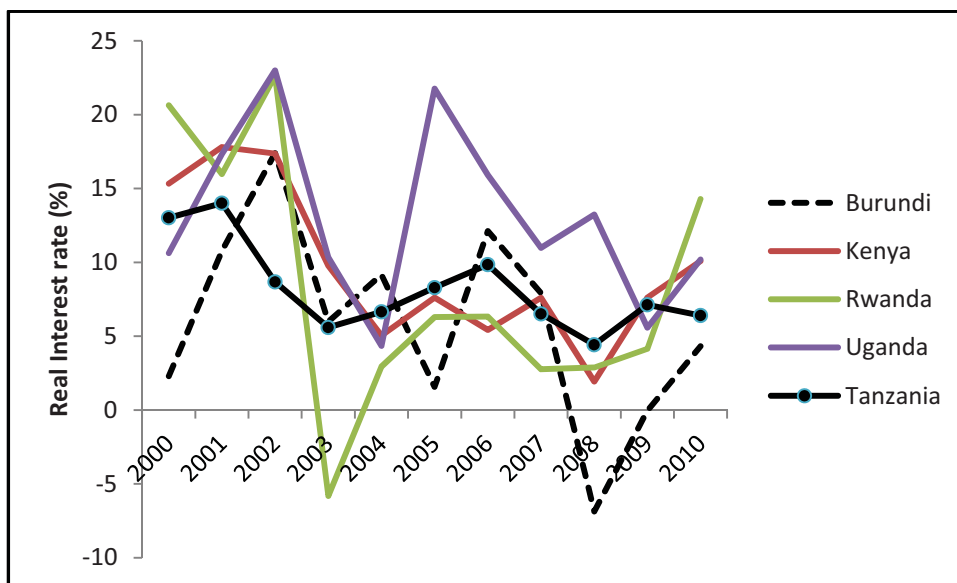


Figure 7. Trends in Real interest rate for EAC countries 2000-2010

Source: WDI database, 2012

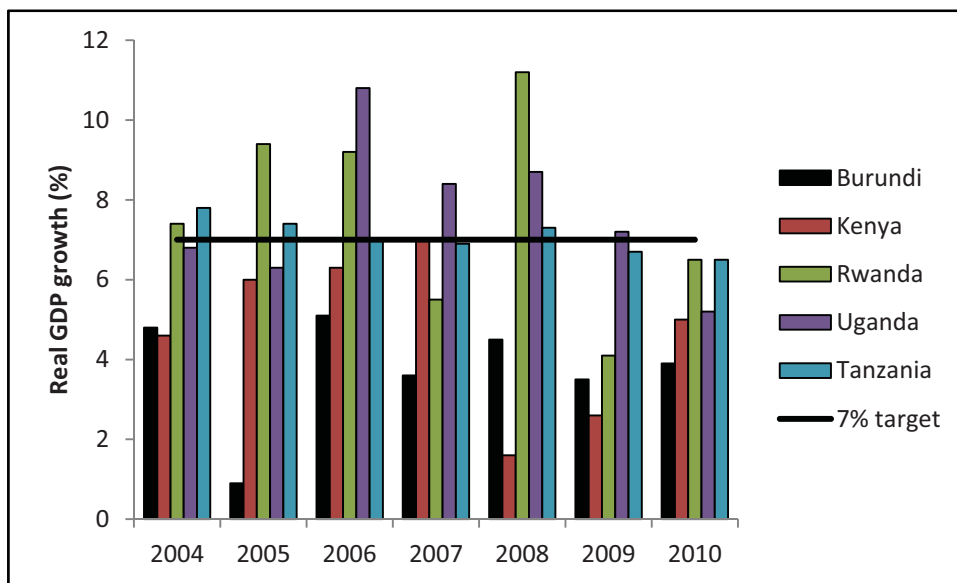


Figure 8. Trends in real GDP growth for EAC states 2004-2010

Source: IMF African Department database and World Economic Outlook, 2011

GDP growth within and between most of the EAC countries has widely varied over the years except in Tanzania which has had a relatively stable growth of close to 7% per year. From the 2007 to 2009 Uganda performed best while Kenya and Burundi least considering the criteria of not less than 7% growth in GDP. Countries have experienced low growth in GDP between in the last two years due to global economic meltdown. A wide range of underlying growth rates points to the straining of shared monetary and exchange rate policy and may cause difficulties for a common fiscal policy in the MU.

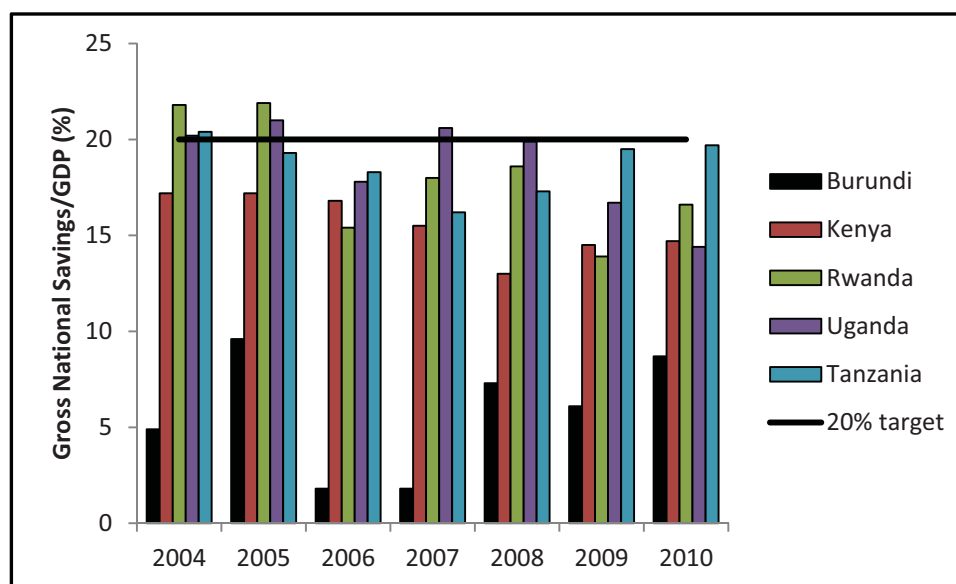


Figure 9. Gross National Savings /GDP for EAC countries

Source: IMF African Department database and World Economic Outlook, 2011

EAC partner states have also found it difficult to achieve 20% target proportion of national savings to GDP as seen figure 9. Findings reveal that Uganda which did well in 2007 and 2008 fell short in 2009 and 2010 possibly due to the global melt down. The circumstances are the reverse for Tanzania. Burundi remains far below half of this requirement. National savings to GDP ratio is meant encourage fiscal discipline and reduce risk of in the EAMU where by member countries with lower savings take funds from other countries with higher savings. The wide disparities in the rates of savings between countries, presents a highly dangerous situation.

The pursuit of debt sustainability amongst the EAC countries is not well assessed amongst studies the reason being that the criterion is not well defined. There are questions as to what measure to use, possibly the use of gross public debt or the total national debt to GDP ratio could prove most appropriate in these regards. IMF (2011a) considered the use the former and established that countries had made significant progress since 2006 by keeping the gross public debt below 50% of GDP with Uganda and Rwanda out performing others by having just half of that proportion. The challenge is thrust towards Kenya and Burundi not to take higher debts that would exceed the 50%. However there are also concerns of managing the current gains against debt in all other countries given that they are rapidly taking on more debt after the recent debt relief.

Progress towards currents accounts deficit reduction remains very slow and mixed. While some partner countries shown declining trends others have had increasing trends. For most members current accounts deficits represent a very small part of GDP not greater than 15%. For others like Burundi current account deficits are a big part of GDP in the proportion of over one third of GDP. This work was unable to find any information relating to the progress of the 25 core principles of bank supervision or an agreed action plan for harmonization of bank supervisions. Nonetheless, there is some evidence tied to the pursuit of regional financial integration has seen the full liberalization of capital transactions in the region for Uganda, Kenya and Burundi. There has gradual removal of restrictions on intra-regional capital transactions and the harmonization of market infrastructure resulting the formulation of the cross-border listing. A range of other programs that could transform the regional financial market including the fields of tax, financial reporting and education, and trading systems are in the pipeline (EAC, 2009). Yet these are only enablers that create an appropriate environment for financial transactions, tangible evidence concerning the EAC financial market integration ought to be established.

2.3 Macro-economic Convergence

While the above tendencies illuminate on the economic progress countries have made towards the MU, they are unable to validate with confidence the possibilities of forming same. Knowledge of such potentialities of an MU or single currency area is best revealed by rigorous analysis of linkages, dispersion and convergence of the economies of the key macroeconomic indicators. Correspondingly EAC member countries must be able to demonstrate this characteristic prior to the union.

The viability of monetary unions is best assessed using the optimal currency area (OCA) theories (Mundell, 1961). Proponents of these theories argue that potential MUs should exhibit similarity in economic structure characterized by high degree of wage flexibility to allow for the adjustment of asymmetric shocks; a high degree of labor mobility; and a high degree of goods and market integration across States. The size and openness of the economy, degree of commodity diversification and fiscal integration are also important to the formation of a successful MU (McKinnon, 1963; Kenen, 1969; Flemming, 1971). Furthermore, the similarity in policies and desire for a political union are additional key factors (Haberler, 1970; Cohen, 1993).

The theories have been used to determine probable monetary unions by focusing on real and nominal convergence (Opolot and Lavunda, 2009; Marelli and Signorelli, 2010; Smaghi, 2007). Real convergence relates to the equalization of economic welfare and social structure. In this case, similarities in the level of competitiveness, labor and macroeconomic performance as measured by real economic outcomes of per capita incomes, productivity, industrial indicators, trade links, business cycle synchronization etc. reveal the extent real convergence. On the other hand nominal convergence relates more to the movement of nominal variables including budget deficits, inflation, exchange rates etc.) directed to the achievement of macroeconomic stability and greater uniformity. Under this, is also the realization of institutional convergence whose focus is on the harmonization of institutional policies and legislation.

A variety of econometric techniques have been used to determine the presence of these economic behaviors across regional economies. Those encountered within the context of EAC have included the use of sigma convergence, unit root tests, generalized purchasing power parity and vector auto regression whose basis is cointegration analysis. Often these methods demand high frequency data sets which are not always available especially since the EAC is a recent occurrence. Nonetheless studies have mainly made use of time series data extending from 1981 to 2010. Both real and nominal convergences have been investigated using variables defined by the macro-convergence criteria.

In assessing real convergence research has paid more attention to real GDP growth. In a bid to establish if the EAC is a viable MU, Buigut and Valev (2005) investigated to symmetric nature of demand and supply shocks belying real GDP growth in partner states from 1980-2001. Theory asserts that partner countries within a monetary union should have monetary policies similar to that of the monetary union as whole and thus cannot apply monetary and exchange rate policies to respond to country specific shocks (Mundell, 1961; McKinnon, 1963). Results from this study showed that short run shocks were not symmetric, but lagged supply shocks associated with trade patterns were. In addition the speed of adjustment to shocks and the effect of variability on real output (real GDP) also appeared to be symmetric with the exception of Uganda. In particular Uganda experienced large shocks and adjustments were very slow which could prove costly in a monetary union. Although the findings could not confirm a viable monetary union at the time, they pointed towards a potential MU if there is deeper trade integration emphasizing the importance of well-functioning common market. This study utilized data ending just the time of EAC, but outcomes involving use of recent data sets have not been that different. In particular Opolot and Osoro (2009) who examine the synchronization of business cycles of real GDP from 1981 to 2007 across the region find peculiar differences. While business cycle co movements across the region have improved since the 1990's, they are still very low. Only Tanzania and Uganda have optimistic synchronizations within the region casting more doubt on assuming the monetary union at the moment. Opolot and Lavunda, (2009) take a different approach. Using panel unit tests on the same data, the researchers established that there was convergence of real GDP growth in region but this consistently being generated by Rwanda and Burundi. The 3 original countries showed divergence with Tanzania consistently showing a drift from the region. Further assessments of catch-up growth have conducted based on per capita real GDP (Note 3) Sigma tests carried out by IMF (2011) indicate that with the exception of Burundi, incomes across the region have grown closer over the last 15 years (1996-2010). All other countries' per capita incomes appear to be catching up Kenya. Findings by Opolot and Lavunda, (2009) further confirm this, but add Burundi to the group of 4. This dissimilarity in result could be explained by differences in data sample and might imply that in the recent years all other economies have grown much faster and there institutional structures and policies have become more similar compared to Burundi.

In regards to the nominal variables, investigations have mostly turned to exchange rate behavior. Mkenda (2001) examined the convergence of real exchange rates of Tanzania, Uganda and Kenya, generalized purchasing power parity. Findings revealed some co-integration, but remained short of confirming a single currency area. Most recently Falagiada, (2011) studied the behavior of nominal exchange rates all five countries and uncovered some degree of economic integration. However the findings were unsatisfactory about convergence in all 5 counties. Buigut (2011) adds to these efforts by looking at both nominal and real exchange rates regions using data from

1991 to 2009. He finds partial convergence due to that fact that some countries exhibited show convergence in the short run. He is unable to find a common trend in long run for these EAC countries urging caution for taking on an MU.

Largely studies have found no evidence of budget deficits (including and excluding grants) convergence in the region in the region (IMF, 2011; Opolot and Lavunda, (2009). Analyses of the evolution of the criteria have instead shown increasing patterns of dispersion and divergence across states. Findings concerning inflation rates convergence appear to be mixed. While some found divergence across states (IMF, 2011), others discovered convergence (Kishor and Ssozi, 2010; Opolot and Lavunda 2009). Even so in later case, the effect attributed more to the three original countries Tanzania, Uganda and Kenya. Upon isolation from trio, Rwanda and Burundi appear to exhibit inflation divergence. Yet others Buguit (2011) have found partial convergence. In general, there is very little research on the convergence of current account deficits and national savings. At this moment we rely only on results by Opolot and Lavunda (2009) who appear to have picked interest in the variables. Their panel unit root tests show convergence of the current accounts and national savings of the group of 5. However a more detailed examination reveals that affects appear to be attributed to Kenya, Burundi and Rwanda in the case of current accounts deficits. While for the case of national savings convergence is mostly attributed to Kenya and Rwanda. These findings are quite surprising given that Rwanda and Burundi have just recently emerged out of civil strife compared to Uganda or Tanzania. In addition it should not be forgotten that data range used is for earliest period of the EAC as a five block.

The above results provide us with empirical evidence on the state of macro-economic convergence in the five EAC partner countries. Findings indicate partial convergence of some countries to some criteria, but generally the economies remain unaligned to these benchmarks pausing risk for the establishment of an MU. These dissimilarities further suggest that countries largely follow independent policies and ought to make significant adjustments in of support the monetary policies to make union more credible.

3. Challenges in Meeting the Convergence Criteria and Possible Strategies

The above findings indicate that macroeconomic convergence for EAC partner states has been very slow. Fast tracking the MU to the 2015 deadline faces great risk since countries are still struggling with fulfilling current criteria which tighten over time. Based on the experiences of other countries and monetary unions, IMF (2011a) and ECB (2010) have put forth several proposals embedded in foreseen challenges. According to IMF (2011a), the indicators were considered to be too many. The presence of secondary criteria were deemed unnecessary given that they were derived from the primary criteria and do related more to economic performance that advancement towards the MU. Aspects such as the 7% real GDP growth, 20% national savings/GDP ratio exchange rate stability and debt sustainability relate more to national economic growth goals. The 25 banking principles pertain more to institutional reforms that could be placed in a separate program. Placing these in a separate program would increase focus on attaining the much needed benchmarks which are the primary criteria.

In regards to budget deficits, the difference between that deficit including grants and that excluding grants was considered too constrictive at 3% of GDP restraining the use fiscal policy especially in use of donor funding for any country. For countries not exceed the higher limit on deficit, budget spending including donor grants must be set within lower limit which would allow for excess spending of donor money over 3%. However, most countries receive over 3% of GDP in donor funds will always choose within the narrow criteria thus reducing on the relevancy of cap of budget deficits excluding grants. There were also concerns of achieving deficit target of 2% since most countries have never achieved the mark other than Rwanda. A level of 2½ % was suggested given that its consistency with the debt to GDP ratios and GDP growth of 7%. Yet framework should allow for lifting of the ceiling that in periods of large economic shocks to facilitate counter cyclical fiscal response during economic downturn as experienced in 2009. Partner states were urged that adopt measures exclude temporary incomes and incomes from natural resources from deficits to facilitate scaling fiscal sustainability. Temporary income funds can be misleading about the underlying fiscal performance given that increase volatility and strengthen deficits including grants.

A foreseeable difficulty is that of partner countries being unable to meet the 2011-2014 reserve targets of 6months of imports. Except for Uganda, all other countries came short of the mark throughout the stage I period. While higher reserves lower risks at onset of the single currency, attaining the 6 month requirement would necessitate countries tighten fiscal and monetary policy against economic growth. That is countries would have to reduce on fiscal spending to direct the related resources to savings. Also the central bank could purchase foreign currency to neutralizing the creation from bonds constraining credit growth. Assuming that the requirement may be lower upon acceding the MU then a more achievable level of 4.5 may be appropriate.

The current Inflation rate benchmark is also considered too taxing given that none of nations have achieved it in the past even when the effects from food and fuels prices are dealt with. Revising target to a reasonable level that can be adhered to by nations is perhaps more favorable to the process as long as it does not compromise on achieving and maintaining price stability by countries. A level of 8% was proposed since it bring most countries closer to fulfilling inflation convergence. Yet this does not have to be uniform. For countries that have succeeded in the past in meeting the 5% maintaining the present level for successful at lower level would reduce on possible risks of inflation indiscipline and distortions of regional competitiveness due to large differences in inflation. Another alternative is to adopt a variable ceiling of 3 points above average of the best performing countries which means that this must be 7% to be consistent with evidence of not more than 10%. There is a need to for all countries to report the core inflation and harmonize the mechanisms used to arrive at the measure.

As mentioned earlier studies emphasized lack of ERM for all countries that is paramount to the tracking of bilateral exchange rate stability. It is important that an appropriate ERM be adopted and be considerate of the EAC's choice of exchange rate regime for a single currency. Furthermore it should specify the extent of currency flexibility with a reflection of transition from constricted to wide-range fluctuations.

Progress towards the MU was also constrained by lack of quality information of specific indicators which in-turn limited their monitoring and assessment macro-economic performance. In some cases data is collected, other cases not. Possibly the most outstanding issue is that countries use different variables say when determining particular criteria such as the budget deficit. The lack of a harmonized way and transparency in collecting relevant data has serious consequences when evaluating convergence.

It was noted that convergence efforts were further hampered by the lack of a surveillance system or institution to enforce fiscal discipline and ensure adherence to the criteria. Setting up a mechanism would make it possible to identify destabilizing trends, contribute to broad-based macro-economic stability through checks on fiscal imbalances, debt managements and formulation of appropriate policy responses.

Furthermore, the issue multiple member ship of EAC partner states still lingers and could derail the convergence process. In this regards, Tanzania is a member of SADC while Uganda and Kenya are part of the COMESA both of which considering monetary unions and have put forward convergence criteria with bench marks that are in some instances conflicting. For example and as mentioned earlier while EAC criteria demand fixed budget deficits SADC offers flexible routines. In addition SADC has limits on debt accumulation of up to 60% a trend that is not associated with the EAC. Furthermore COMESA demands adherence to additional criteria linked to the central bank financing, liberalization of capital accounts, and limits to generation of domestic revenue not considered by the EAC. While all RECs are simultaneously undergoing convergence, there are differences in scheduling of targets. EAC has proposed to attain full convergence by 2015. But the COMESA and SADC assume to get there by 2018. Harmonizing the criteria of the three blocks in a manner whereby the outcome pauses no risk to any partner was considered important in enhancing convergence efforts.

Lastly, the current state of the common market on whose basis the monetary union is hinged upon begs for a more cautious process and by itself is a challenge to achieving convergence. As theory and empirical evidence have suggested, deeper trade integration will be great enabler to the convergence process in the region. On one hand the removal of trade barriers may bring about correlated business cycles due to common demand shocks and intra trade, on the other hand integration will promote industrial specialization and inter-trade causing more synchronized output fluctuations. This could be rather slow in the case of EAC. This is because countries are not fully dedicated to implementing the customs union and common market protocol were signed to benefit trade across the region. This lack of commitment is linked to the fear of loss of revenue. Even if countries were to fully able to take on these procedures, the wide spread nature of non-tariff barriers (NTBs), poor road infrastructure and other problems cause substantial disparities in the conduct of business between countries and trounces the idea of free trade (Note 4).

4. Conclusions and Policy Implications

Clearly the path to the EAMU is a difficult one. Both emerging trends and detailed empirical analysis generally indicate that EAC economies are far from achieving macro-economic convergence based on the staged indicators. Findings show that criteria appear to be set high above country economic performances making them trying to attain but also point to a lack of commitment to the process on the side of the countries. Revising the proposed bench marks to reflect this trend and possible economic shocks might be one way to go. However the process could be long, and is unlikely to yield quick results given that it requires all countries to come to a common agreement. The uneven convergence where by some countries are progressing faster than others and to some but not all criteria, may suggest that nations adopt a path similar to that EU states or west

African member states where by states concentrated on fulfilling certain criteria and countries whose economies are aligned to such criteria could form monetary union to which the members can later join upon meeting convergence.

Regardless of the situation and nature of outcome, EAC economies must aggressively pursue policies that promote economic growth that line up with those of the monetary union. Programs that lower and enhance the management of the budget deficits in sustainable way will be vital to enhancing convergence. Reductions in deficits would entail locating and strengthening revenue generating mechanisms to counter fiscal spending. This does not imply that nations reduce spending, but rather generate sufficient amounts of revenues to exceed expenditure. This means that countries must identify and capitalize on the key economic drivers and formulate appropriate plans to stimulate their economic activity and related sectors for sustained economic growth. On a general side the main drivers of growth in the EAC countries are listed as private consumption, exports and gross fixed capital, tourism revenues, foreign investment, services and aid. The common key enabling sectors include agriculture, manufacturing, trade, tourism, and infrastructure. The factors and sectors act interdependently such that enhancing one sector could induce growth in another. The contribution of private consumption to growth is associated with the increasing demand for services in the region. The Kenyan economy has benefited immensely from the sale of consumption goods such as ICT, Uganda and Rwanda have fallen suit and show no signs of slowing down. The potential to earn export revenues from intra-regional agriculture trade and external trade with countries outside the block as well as tourism remains unexhausted. While EAC economies have prioritized improvement agriculture and related trade, quality investment in terms production and trade infrastructure remains low and the export base is still narrow for most countries. It is important that countries formulate policies that encourage economic upgrading in these sectors and increase export diversification which in turn will result in a boost in revenues.

EAC countries are still developing and thus good grounds for foreign direct investment especially in industry and manufacturing and transportation. However region's ability to attract sufficient levels FDI is remains weak. The incapability to draw in FDIs has denied the region the much the needed capitals for investment especially that partner countries are characterized by low incomes and savings. Furthermore extra advantages of employment, managerial skills and technology that add to growth and development are lost. Within the EAC, FDI inflows have been linked to the local size of market and natural resource development in areas of mining and oil extraction, some agriculture and most recently to services. However, such invests are thin provide little strength to the fiscal balance. Thus economies must ascertain other FDI opportunities related to additional factors such as geographical location, infrastructure and the stock of human capital. Along with this is the relevant policy to create and maintain good environment and investment climate to draw in FDI. While countries have improved in political and macroeconomic stability and reduced tariffs to trade, a lot remains to be achieved on the side of supporting institutions and physical and social infrastructure in terms of quantity and quality of roads and communication systems, skilled labor to allow the efficient delivery public services imperative for thriving of FDI.

Countries and the region must also be able deal the constraints surrounding the common market. In addition to rectifying problems in various individual country economic sectors and institute will improve on the functioning of the market, combining efforts to harmonize policies and completely eliminate NTBs will have far greater impacts on enhancing profound regional integration and strengthen the chances of achieving a successful MU.

Further attention must be paid to building capacities in data collection, harmonization and sharing of all relevant statistics to facilitate the monitoring process. At the moment the MAC committee involved in undertaking various activities associated with the monetary union acknowledges the strengthening of knowledge, skills, attitudes and competencies of central bank officials as critical to monetary convergence. There also the lack of capacity in information technology, absence of knowledge sharing infrastructure and staff retention that must be addressed. In addition it also necessary to engage in awareness campaigns for all stakeholders regularly to improve legitimacy of the union.

References

- Alesina, A., & Barro R. (2002). Currency unions. *Quarterly Journal of Economics* 117(2), 409-436. <http://dx.doi.org/10.1162/003355302753650283>
- Bean, C. (1992). Economic and monetary union in Europe. *Journal of Economic Perspectives*, 6(4), 31-52. <http://dx.doi.org/10.1257/jep.6.4.31>
- Buigut, S. (2011). A fast-track East African Community monetary union? Convergence evidence from a cointegration analysis. *International Journal of Economics and Finance*, 3(1), 255-265.

- Buigut, S.K., & Valev N.T. (2005). Is the proposed East African monetary union an optimal currency area? A structural Vector Autoregression Analysis. *World Development* 33(12), 2119-2133. <http://dx.doi.org/10.1016/j.worlddev.2005.06.006>
- Calmfors, L. (2001). Unemployment, labor market reform, and monetary union. *Journal of Labor Economics*, 19(2), 265-289. <http://dx.doi.org/10.1086/319561>
- East African Community (EAC). (2007). Treaty for the establishment of the East African Community. (As amended on 14th December, 2006 and 20th August, 2007). http://www.eac.int/index.php/advisory-opinions/doc_details/158-amended-treaty-for-the-establishment-of-east-african-community.html
- _____. (2009). EAC Monetary Affairs Committee: Achievements, challenges and way forward-(1998-2008). http://www.eac.int/index.php/advisory-opinions/cat_view/42-about-eac.html.
- _____. (2011). EAC Development Strategy (2011/12 – 2015/16): Deepening and accelerating integration. http://www.eac.int/index.php/advisory-opinions/doc_details/650-4th-eac-development-strategy.html
- European Central Bank (ECB). (2010). Study on the establishment of a monetary union among the partner states of the East African Community. ECB Staff Study.
- Falagiarda, M. (2010). Are the East African countries ready for a monetary union? Traditional Indicators and Cointegration Analysis. *JEL Classification*, E42, F33.
- International Monetary Fund (IMF). (2011a). Managing the macroeconomic convergence process ahead of the monetary union. A consultancy Report
- _____. (2011b). *World Economic and Financial Surveys. Regional Economic Outlook. Sub-Saharan Africa recovery and new risks*. Washington DC.
- Kenen, P. B. (1969). The Theory of Optimum Currency Areas: An Eclectic View. In Mundell R. and Swoboda A. *Monetary Problems in the International Economy*.
- Kishor, N. K. & Ssozi, J. (2009). Is the East African Community an optimum currency area? *JEL classifications*: F33; E32; F15; N17. Retrieved from http://mpira.ub.uni-muenchen.de/17645/1/MPRA_paper_17645.pdf
- McKinnon, R. I. (1963). Optimum Currency Areas. *American Economic Review*, 53(4), 717-725. Retrieved from <http://www.jstor.org/stable/1811021>
- Mkenda, B.K. (2001). Is East Africa an optimum currency area? Working papers in economics Goteborg University, (41), JEL-Codes: C32; F15; O55. Retrieved from <https://gupea.ub.gu.se/handle/2077/2675>
- Mundell, R. A. (1961). A theory of optimum currency areas. *American Economic Review*, 51(4), 657-665. Retrieved from <http://www.jstor.org/stable/1812792>
- Opolot, J., & Osoro, N. (2009). Is the East African Community suitable for a monetary union? An enquiry of Idiosyncrasies and Synchronization of Business Cycles, Bank of Uganda Staff papers, 1(3),118-140, http://www.bou.or.ug/export/sites/default/bou/bou-downloads/research/Staff_Papers/Vols/All/Bank_of_Uganda_Staff_Papers_Vol_3_Num_1_2009.pdf
- Opolot, J., & Luvanda, E. (2009). Macroeconomic Convergence in the East African Community: Progress and Implications for the Proposed Union, Bank of Uganda Staff papers, 1(3),53-79. Retrieved from http://www.bou.or.ug/export/sites/default/bou/bou-downloads/research/Staff_Papers/Vols/All/Bank_of_Uganda_Staff_Papers_Vol_3_Num_1_2009.pdf
- Schuberth, H., & Wehinger, G.D. (1998). Costs of European Monetary Union: Evidence of Monetary and Fiscal Policy Effectiveness. European Regional Science Association Conference papers No ersa98p459. Retrieved from <http://www-sre.wu-wien.ac.at/ersa/ersaconf/s/ersa98/papers/459.pdf>

Notes

Note 1. This includes water bodies. The surface area excluding water bodies is approximately 1.72 million square kilo meters.

Note 2. SADC and the EU have set the limit of fiscal debt up 60% of GDP, while the UEMOA has a limit of to 70% of GDP for member countries.

Note 3. While convergence of per capita real GDP is not characterized as the macro-economic convergence, it is linked to institutional and policy alignment in the countries which is important for economic convergence and successful monetary unions.

Note 4. The EAC development strategy outlines several challenges that obstruct the realization of gains from the common market including inadequate institutional, national and regional level capacities to domesticate regional policies and information access; low levels of awareness across Partner States; inappropriate legal and regulatory frameworks, continued nationalistic tendencies, weak private sector, differences in education systems, cultural diversities, language barriers, differences in level of economic development including limited participation of the various stakeholders; weak capacities of implementing agencies; inadequate safeguard measures and dispute settlement mechanisms; incomplete harmonization of examination and certification; inappropriate labor policies and legislation; weak urban planning policies and disparities in intra-regional trade (EAC, 2011).

What Do Managers Mean When They Say ‘Firms Like Theirs’ Pay Bribes?

George R. G. Clarke

Correspondence: George Clarke, Division of International Banking and Finance Studies, A.R. Sanchez, Jr. School of Business, Texas A&M International University, 5201 University Boulevard, Laredo, Texas 78041, USA. Tel: 1-956-326-255. E-mail: George.Clarke@tamui.edu

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Abstract

It is difficult to get firm managers to answer questions on corruption honestly. Because of this, most surveys ask about corruption indirectly—asking whether corruption is a problem or whether ‘firms like this one’ pay bribes. Most studies interpret managers’ responses to indirect questions as if they were answering about their own behavior. This might not be the case, however. This paper uses data from a survey of construction contractors in Afghanistan to look at how managers respond to indirect questions. We show that firms that are averse to paying bribes to win government contracts, and so do not bid for them, are more likely to say that firms like theirs pay bribes at other times. If managers answer the general indirect questions on corruption thinking about their own actions, we would expect that firms that are averse to paying bribes to win contracts would also be averse to paying bribes at other times. One explanation for the counterintuitive result is that firms answer the indirect questions as asked—about what they believe other firms are doing. This has important implications for studies that use indirect questions to assess what types of firms pay bribes.

Keywords: corruption, indirect questions, firm surveys, lying

1. Introduction

People often lie when asked sensitive questions during surveys. Men consistently report that they have had more partners of the opposite sex than women do. This is difficult to explain even with explanations such as prostitutes skewing the female average (Wiederman, 1997). Meters that record what music people listen to show men spend more time listening to soft rock and less time listening to classical music than they report during surveys (Clausen, Kraay, & Murrell, 2010). Over half of people with high-interest rate consumer loans in South Africa denied having them during a survey (Karlan & Zinman, 2008). Other studies have found that people often do not admit that they use alcohol and illegal drugs, use birth control, have had an abortion or have gastrointestinal problems during surveys (Tourangeau and Smith, 1996).

Lying is also a problem for firm surveys that ask about sensitive topics such as corruption (Azfar & Murrell, 2009; Clausen et al., 2010). To decrease underreporting most surveys ask questions indirectly. For example, rather than asking about the firm’s own experience with corruption, most surveys ask whether corruption is a serious problem or how much the manager thinks other firms pay in bribes. It is hoped that indirect phrasing will decrease underreporting by allowing managers to admit to paying bribes without incriminating themselves (Note 1).

Even if indirect questions lessen underreporting, it is difficult to interpret the answers. That is, managers might answer with their own actions in mind or might answer based on what they think others do. Managers who believe their competitors win government contracts unfairly, avoid paying taxes, or get licenses more quickly by paying bribes might say that corruption is a problem or that firms like theirs pay bribes even if they do not themselves. If managers answer indirect questions as they are asked, it will be difficult to relate bribes with firm and manager characteristics.

Some evidence suggests that firms do not always answer indirect questions with their own actions in mind. Managers of firms that do not bid for government contracts are more likely to say that corruption is a problem when bidding for government contracts than managers of firms that do bid (Clarke, 2011b). This suggests that managers are not implicitly admitting to paying bribes when they say corruption in government contracting is a

problem. One explanation for why firms that do not bid might say corruption is a problem is that firms that are averse to paying bribes might refuse to bid for government contracts. By stopping them from getting contracts, corruption therefore affects them even though they do not pay bribes.

This paper shows the same firms were also more likely to say that corruption is a serious problem and that firms like theirs paid bribes in situations unrelated to bidding. It seems unlikely that firms that are averse to paying bribes when bidding for contracts will pay bribes more often at other times. A more likely explanation is that firms answer indirect questions thinking about what other firms do. This implies researchers should interpret indirect questions about corruption with care—managers might answer the questions thinking about other firms not their own firm.

2. Asking Firms about Corruption

Most firm-level surveys ask questions about corruption indirectly. Rather than asking whether the firm has paid bribes, the interviewer ask managers whether corruption is a problem, whether other firms like the managers' firm pay bribes, or whether bribes are needed or sought (rather than paid). This allows managers to answer the questions without admitting to paying bribes. For example, the two main questions on corruption in the World Bank's *Enterprise Surveys* are:

(J7) "We've heard that establishments are sometimes required to make gifts or informal payments to public officials to get things done with regard to customs, taxes, licenses, regulations, services etc. On average, what percentage of total annual sales, or estimated annual value, do establishments like this one pay in informal payments/gifts to public officials for this purpose?"

And

(J30f) "As I list some of many factors that can affect the current operations of a business, please look at this card and tell me if you think that [Corruption] is No Obstacle, a Minor Obstacle, a Major Obstacle, or a Very Severe Obstacle to the current operations of this establishment."

Other cross-country and one-off surveys have used similar indirect questions (Note 2). This paper focuses on questions similar to question J7 and J30f above—on whether 'firms like this one' sometimes pay bribes and whether corruption is a serious obstacle.

The problem with indirect questions is that it is not clear what firm managers mean when they answer. This is clear for questions like J30f that ask whether corruption is a problem. A manager that pays a bribe to avoid paying taxes or complying with regulations might see corruption as useful rather than harmful. Similarly, managers who refuse to pay bribes might see corruption as a problem if they lose contracts or cannot get permits or licenses because they refuse. Indirect questions that ask about 'firms like this one' have similar problems. Firm managers that don't pay bribes but believe that their competitors do might say that 'firms like theirs' pay bribes even if they do not.

Although the questions are ambiguous, most studies using indirect questions assume that firms answer these questions thinking about their own behavior (Note 3). If a firm managers says that 'firms like theirs' pay bribes equal to 2 percent of sales, most studies assume the firm pays that amount. In a recent paper on cross-country determinants of corruption, Treisman (2007, p. 214) notes "[w]ording is often chosen to reduce respondents' fear of self-incrimination—e.g., questions concern 'firms like yours'—but it is hoped and assumed that respondents reply based on their own experiences." Similarly, if a manager says corruption is a problem, studies often assume that is because that firm pays bribes more frequently. Safavian, Graham and Gonzalez-Vega (2001, p. 1220), for example, note:

"All questions in the survey asked the respondent to rate the level of corruption, on a one to four scale, in terms of problems of irregular payments or unprofessional behavior of local government officials. For the empirical work, we make the assumption that an individual firm's rating is correlated with its individual experience in bribery payments."

Anecdotal evidence on whether managers answer this way is mixed. Johnson, McMillan, and Woodruff (2002, p. 1337-1338) report one respondent told an interviewer that he understood that the question was really asking about his own firm. During field interviews in Zambia, however, when asked whether bribes were sometimes needed (i.e., question J7) several managers explicitly noted that although they do not pay bribes—often giving reasons why they do not—they know other firms do (Note 4). It is unclear, whether the managers did this maintain the illusion that they do not pay bribes or because they were truthfully answering questions based on what they believe other firms do.

In summary, indirect questions are difficult to interpret. That is, firms that say corruption is a problem or that firms like theirs pay bribes might not answer questions with their own actions in mind. If this is the case, firm-level analysis of firms' answers will tell you what types of firms and managers believe others pay bribes not what types of firms or managers pay bribes. The goal of this paper is to provide additional evidence on whether firms answer indirect questions with their own experiences in mind.

3. Data

This paper uses data from survey of 144 construction firms in Kabul (Afghanistan) that was conducted between May and June 2009. The survey was a general business environment survey—only six of the 114 questions concerned corruption. The questionnaire was based on the World Bank's *Enterprise Survey*. Firms were randomly selected from the database of 1165 construction firms held by the Peace Dividend Trust (PDT). PDT uses the database to help construction firms access information and bid for contracts. Because construction contractors need to keep their information current to receive information, it is probably the most comprehensive database of construction contractors available in the country.

4. Corruption in Public Contracting

Afghanistan has serious problems with corruption, including in government contracting. As well as asking general questions about corruption (e.g., J30f and J6), the survey included questions about corruption in government contracting. Managers were asked whether corruption was a serious problem when bidding for government contracts. About 69 percent of managers said that it was. Corruption was seen as the most serious problem related to bidding for government contracts (see Table 1).

Table 1. Barriers to bidding on government contracts

	All Firms
Corruption	69%
Unfair selection methods	32%
Provisions for price escalation	30%
High bid bonds	23%
Procurement procedures	20%
Size of contracts	18%
Dispute resolution procedures	15%
Insurance	10%
Technical/experience requirements	10%

Source: Author's calculations based upon data from survey.

Construction firms that are averse to paying bribes have another option in Afghanistan. International donors and foreign militaries finance much of the construction in the country (Note 5). Since corruption is a less serious problem for these contracts, firms that are averse to paying bribes can focus on bids with these organizations (Note 6). Many firms do this, bidding for international, but not government, contracts (see Table 2).

Table 2. Number of firms bidding on government and non-government contracts

No of Firms	Bids on International Contracts			
	No	Yes	Total	
	No	17	44	61
Bids on Government Contracts	Yes	9	74	83
	Total	26	128	144

Source: Authors' calculations based upon data from survey. Note: Counts are unweighted

Managers who do not bid for government contracts are more likely to say corruption is a problem than managers that do bid for government contracts (Clarke, 2011b). About 77 percent of managers that had not bid said that corruption was a serious problem compared with 63 percent of managers that had bid (Note 7). This suggests that firms that say corruption is a problem are not implying that they pay bribes. That is, firms that do not bid do not pay bribes to win government contracts.

So why are firms that only bid for contracts with international organizations more concerned about corruption than firms that bid for government contracts? It might be because managers who are averse to paying bribes avoid bidding for government contracts because they believe that they have to pay bribes to compete (Clarke, 2011b). These managers, who feel that they lose potential contracts because of corruption, might therefore see corruption as an especially serious problem.

For this explanation to explain the pattern of responses, some people would have to be more averse to paying bribes than others. There are several reasons why this might be the case. Some people might be more apprehensive about breaking the law, more worried about being caught, or more concerned about how corruption affects society. Another possibility is that non-bidders are less well connected. They therefore might find it harder to know who to bribe and how much to pay (Note 8). Moreover, in the absence of a legally enforceable agreement, they might worry that they will not win the contract after paying the bribe.

In summary, the results suggest that firms that say corruption is a problem during the bidding process are not implicitly admitting to paying bribes. Firms that do not bid do not pay bribes. They do, however, report being more concerned about corruption during bidding than firms that do bid. This makes it difficult to interpret responses to this indirect question as if firms are talking about their own behavior. In the next section, we explore this issue further looking at general questions about corruption.

5. Econometric Estimation

The question of how firms answer general questions about corruption in areas unrelated to government contracting is explored by estimating two models. The first looks at whether different types of firms have different perceptions about corruption by estimating the following equation:

$$\text{Perceptions}_i = \alpha + \beta \text{Aversion}_i + \gamma \text{Firm Characteristics}_i + \varepsilon_i \quad (1)$$

Perceptions_i are how large an obstacle the manager of firm *i* sees corruption. Unlike the question summarized in the previous section, this is a general question about corruption (identical to question J30f). That is, it is not specifically about corruption related to government contracts. The dependent variable takes five possible values (0 to 4) corresponding to “no obstacle”, “minor obstacle”, “moderate obstacle”, “major obstacle” and “very severe obstacle”.

$$\text{Reported Obstacle} = \begin{cases} 0 & -\infty & \mu_1 \\ 1 & \mu_1 & \mu_2 \\ 2 & \text{if } \mu_2 < \text{Perceptions} \leq \mu_3 & \mu_3 \\ 3 & \mu_3 & \mu_4 \\ 4 & \mu_4 & \infty \end{cases} \quad (2)$$

Since the dependent variable is ordered and categorical, the model is estimated as an ordered probit model.

The main variable of interest is the measure of aversion to paying bribes (aversion_i). The proxies that we use are a set of dummy variables indicating what types of contracts the firms bid on. The results in the previous section suggest that firms that are averse to paying bribes avoid bidding on government contracts. We therefore divide the firms into three groups: (i) firms that bid for government contracts; (ii) firms that bid for contracts from international organizations but not from the government; and (iii) firms that have not bid for any contracts. Firms in the second, and possibly, third groups are likely to be more averse to paying bribes than firms in the first group. It is, however, difficult to know whether firms that did not bid on any contracts are averse to bidding on government contracts specifically. That is, firms that did not bid for any contracts might have had no capacity to take any additional contracts that year. As a robustness check, we drop firms that did not bid on any contracts.

Although we could divide firms that bid for government contracts into firms that only bid for government contracts and those bid for both government and international contracts, there were only 9 firms in the second category (see Table 2). We therefore separate the two groups only as a robustness check.

Firms that do not bid on government contracts worried more about corruption when bidding for contracts. As argued above, the most reasonable explanation for this is that firms that are averse to corruption choose not to bid for government contracts. If this interpretation is correct, all else equal, we would expect these firms to be less likely to pay bribes in other situations. If managers answer the indirect questions as if they are answering about their own firm, we would therefore expect firms that only bid on government contracts to be less likely to say that firms like theirs pay bribes and that corruption is a problem.

The regression includes several control variables. The first two indicate the size and age of firms. If large firms and old firms are better connected this might affect how they deal with government officials and, therefore, their experience with corruption (Campos & Giovannoni, 2006). The model also includes a dummy variable indicating the gender of the owner. Managers of female-owned firms might behave differently from other managers (Swamy, Knack, Lee, & Azfar, 2001). Because corruption might affect domestic firms differently than foreign firms, the regressions include a variable indicating domestic ownership. The final variable measures time spent dealing with government regulations. This is included because the burden of regulation might affect corruption (Djankov, La Porta Lopez-de-Silanes, & Shleifer, 2002; Safavian et al., 2001).

The second model looks at whether firms report that ‘establishments like this one’ make ‘informal payments or gifts’ to ‘get things done with regard to customs, taxes, licenses, regulations, services, etc.’ (i.e., J7 above). Once again, this is a general question about corruption and is not specifically about corruption when bidding for government contracts. The model is the following:

$$\text{Firms like this one pay bribes}_i = \alpha + \beta \text{Aversion}_i + \gamma \text{Firm Characteristics}_i + \varepsilon_i \quad (3)$$

The dependent variable is a dummy variable indicating that the manager says that ‘firms like this one’ pay bribes to get things done (Note 9). The models are estimated as a probit model containing the control variables above.

5.1 Empirical Results

5.1.1 Firms That Bid on International Contracts

Managers of firms that bid only for international contracts were more likely to say that corruption in general is a problem (i.e., J30f) than firms that bid on government contracts (see column 1 in Table 3). The coefficient indicates that firms that bid only on international contracts were about 17 percentage points more likely to say that corruption was a severe problem in other situations (see Table 4). If firms that are averse paying bribes bid only on international contracts, it is not clear why these firms would be more likely to pay bribes in other situations. A more likely explanation for the statistically significant coefficient is therefore that firms that are averse to paying bribes are more concerned about corruption because they are less willing to pay them and therefore have problems with corrupt officials in other situations as well.

Table 3. Effect of firm characteristics on views about corruption

	Corruption is serious problem	Firms like this one pay bribes (missing is N/A)	Firms like this one pay bribes (missing is yes)
Number of Observations	141	112	141
Bidding a			
Firm bids only on contracts with int. organizations	0.489** (2.10)	0.623** (2.13)	0.524** (2.04)
Firms does not bid on any contracts	0.260 (0.79)	-0.074 (-0.17)	0.013 (0.04)
Firm-level controls			
Number of workers (log)	-0.014 (-0.19)	-0.053 (-0.57)	-0.011 (-0.14)
Age of firm (in years, log)	-0.179 (-1.02)	0.542** (2.13)	0.528** (2.52)
Firm has female owner	0.371 (0.99)	0.182 (0.43)	0.025 (0.06)
Firm has domestic owner	0.147 (0.70)	0.571** (2.04)	0.831*** (3.35)
% of time management spends with regulators	0.022*** (3.76)	0.022*** (3.06)	0.018*** (3.03)
Constant		-1.507** (-2.56)	-1.433*** (-2.84)
Pseudo R-Squared	0.07	0.16	0.17

Source: Authors' calculations based upon data from survey.

Note: t-statistics are in parentheses. ***, **, * Statistically significant at 1, 5, and 10 percent significance levels.

^a Omitted category is firms that bid on government contracts.

Firms that do not bid on government contracts were also more likely to say that firms like theirs need to pay bribes to get things done (see column 2). If firms that do not bid for government contracts are more averse to paying bribes to win contracts, it seems unlikely that they would be more likely to pay bribes in other situations. This suggests that their responses indicate that they believe that ‘firms like theirs’ pay bribes rather than that they pay bribes (note 10). In summary, it is difficult to interpret the answers to these general indirect questions as if the managers are talking about the firms’ own experiences.

Table 4. Estimated outcomes that firms will answer questions about corruption positively

	% saying corruption is severe problem	% saying firms like their pay bribes (missing is N/A)	% saying firms like their pay bribes (missing is yes)
Firm bids on government contracts	50%	29%	43%
Firm bids only on international contracts	67%	49%	60%
Firm does not bid on any contracts	59%	27%	43%

Source: Authors’ calculations based upon data from survey.

Note: Estimated outcomes are calculated by predicting the outcome for each observation assuming that it falls into that group (i.e., replacing the appropriate dummies with the dummy for that group)

5.1.2 Firms That Do Not Bid on Any Contracts

The coefficients on the dummy variable indicating that the firm did not bid on either type of contract were statistically insignificant. However, there are few firms in this category (see Table 2) and, as a result, the coefficients are estimated imprecisely. In fact, we are also unable to reject the null hypothesis that the coefficients on this dummy variable are the same as the coefficients on the dummy variable indicating that the firm bids only on international contracts at conventional 10 percent significance levels. In this respect, we are unable to say much about the responses of firms that bid on neither type of contract.

Table 5. Robustness Checks

	Corruption is serious problem	Firms like this one pay bribes (missing is N/A)	Corruption is serious problem	Firms like this one pay bribes (missing is N/A)
Number of Observations	141	112	125	100
Bidding a				
Firm bids only on contracts with int. organizations	0.494** (2.08)	0.669** (2.23)	0.524** (2.25)	0.619** (2.12)
Firms does not bid on any contracts	0.267 (0.80)	-0.015 (-0.03)		
Firms bids only on contracts with Government	0.045 (0.11)	0.373 (0.72)		
Firm-level controls				
Number of workers (log)	-0.013 (-0.17)	-0.048 (-0.51)	-0.080 (-1.05)	-0.047 (-0.48)
Age of firm (in years, log)	-0.179 (-1.02)	0.514** (1.99)	-0.257 (-1.38)	0.458* (1.73)
Firm has female owner	0.374 (1.00)	0.218 (0.51)	0.338 (0.89)	0.198 (0.47)
Firm has domestic owners	0.146 (0.70)	0.566** (2.01)	-0.002 (-0.01)	0.571* (1.95)
% of time management spends with regulators	0.022*** (3.76)	0.022*** (3.07)	0.025*** (4.03)	0.023*** (3.03)
Constant		-2.161*** (-3.74)		-2.047*** (-3.43)
Pseudo R-Squared	0.07	0.17		

Source: Authors’ calculations based upon data from survey.

Note: t-statistics are in parentheses. ***,**,* Statistically significant at 1,5, and 10 percent significance levels. Firms that bid on no contracts are excluded from regressions in last two columns

^a Omitted category is firms that bid on government and international contracts.

5.1.3 Control Variable

Most of the coefficients on the firm-level control variables are statistically insignificant. There were, however, some significant coefficients. Most notable, managers of domestically owned firms were more likely to say that corruption is a serious problem when bidding on government contracts and more likely to say that ‘firms like theirs’ paid bribes to get things done with respect to licenses, taxes, and other regulatory requirements. Managers of older firms were also more likely to say that firms like theirs paid bribes to get things done. Firm managers that reported spending more time with government officials were more likely to say that corruption was a serious problem and more likely to say that firms like theirs paid bribes.

5.1.4 Robustness Checks

Close to one-fifth of the surveyed contractors refused to answer the question on whether bribes are needed. It is possible that firm managers that believe that other firms like theirs pay bribes would be more likely to refuse to answer than managers that believe that firms like theirs do not pay bribes (Jensen, Li & Rahman, 2010). As a robustness check, we re-run these regressions treating non-respondents as if they replied yes – that is the dependent variable is one if the firm manager said that firms like their paid bribes or the firm manager refused to answer. The results are similar when we do this (see column 3)

As an additional robustness check, firms that bid only on government contracts are separated from firms that bid on contracts with government and with international organizations (see Table 5). As discussed above, only a few firms bid only on government contracts meaning that the coefficient will be estimated imprecisely. The coefficient on this variable is statistically insignificant, meaning that the difference between these firms and firms that bid on both government and international contracts is not statistically significant. Including the additional dummy does not appear to affect any of the main results discussed above. Finally, the results are also similar when we omit firms that did not bid on any contracts. As discussed above, it is possible that these firms do not have any spare capacity and do not bid because of this.

6. Conclusion

Firms that do not bid for government contracts complain more about corruption in government contracting than firms that do bid (Clarke, 2011b). Since firms only pay bribes if they bid, it seems non-bidding firms should be less, not more, concerned about corruption in government contracting. So why do firms that do not bid complain more? One possibility is that managers that are averse to paying bribes refuse to bid for government contracts. They therefore see corruption as a serious problem for their firm because they lose contracts because of it. This shows that seeing a manager complain about corruption in government contracting does not mean the manager is paying bribes.

Firms that do not bid for government contracts were also more likely to say that corruption was a problem and that firms like theirs paid bribes in situations unrelated to bidding. If firms do not bid for government contracts because they are averse to paying bribes, it seems unlikely that they would be more willing to pay bribes at other times. This suggests managers might not answer general indirect questions only thinking about their own firm. That is, when they say corruption is a problem or that firms like theirs pay bribes, they might not be implicitly admitting to paying bribes.

If this is the case, how does it affect how we use indirect questions? One way that researchers use data on corruption is to rank countries. Even if firms answer indirect questions thinking about what other firms do, this might not affect country rankings. As long as firm managers are correct about what they think other firms are doing, it does not matter whether they answer thinking about what they do or what other firms do.

It does, however, affect other uses of indirect questions. Researchers often regress managers’ responses to indirect questions on firm and manager characteristics. If firm managers are not thinking about themselves or their firm when answering these questions, results from these regressions could be misleading. That is, the other firms that managers are thinking about might be different from the managers’ firm in ways that interest the researcher.

In this paper, we find managers of domestic firms are more likely to say that ‘firms like theirs’ pay bribes. This could be because domestic firms pay bribes more than foreign firms. If managers answer the indirect question thinking about their firm, this would be the correct way to interpret the correlation. It would also be the correct way if managers of domestic firms answer thinking about other domestic firms and managers of foreign firms answer thinking about other foreign firms.

But managers might be thinking broadly about firms in their sector or about their main competitors when they answer. Their answers might show that managers of domestic firms believe that important large foreign

competitors in their sector pay bribes. This would be consistent with focus group discussions where managers of domestic firms complained about foreign firms using connections to win contracts.

Another example from this paper is the correlation between corruption and regulation. As noted above, managers that report spending more time with regulators were more likely to say that firms like theirs paid bribes. If they were answering with their own experiences in mind, this suggests that regulation leads to corruption or corruption leads to heavier regulation. If, on the other hand, they are talking about how they think other managers behave, it could show that they believe that spending time with regulators leads to more opportunities for corruption for their corrupt competitors. That is, the correlation might not be caused by regulation resulting in greater bribe payments, just greater opportunities to bribe.

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References

- Azfar, O., & Murrell, P. (2009). Identifying Reticent Respondents: Assessing the Quality of Survey Data on Corruption and Values. *Economic Development and Cultural Change*, 57, 387-411. <http://dx.doi.org/doi:10.1086/592840>.
- Campos, N.F., & Giovannoni, F. (2006). Lobbying, Corruption, and Political Influence. *Public Choice*, 131, 1-21. <http://dx.doi.org/doi:10.1007/s11127-006-9102-4>
- Clarke, G. R. G. (2011a). How Petty Is Petty Corruption? Evidence From Firm Surveys in Africa. *World Development*, 39, 1122-1132. <http://dx.doi.org/doi:10.1016/j.worlddev.2010.11.002>.
- Clarke, G. R. G. (2011b). The Effect of Corruption on Competition for Government Contracts. *Journal of US-China Public Administration*, 8, 1101-1110.
- Clarke, G. R. G., and Xu, L. C. (2004). Privatization, Competition and Corruption: How Characteristics of Bribe Takers and Payers Affect Bribes To Utilities. *Journal of Public Economics*, 88, 2067-97. <http://dx.doi.org/10.1016/j.jpubeco.2003.07.002>.
- Clausen, B., Kraay, A. & Murrell, P. (2010). Does Respondent Reticence Affect the Results of Corruption Surveys? Evidence from World Bank Enterprise Survey for Nigeria. Policy Research Working Paper 5415. World Bank, Washington DC. <http://go.worldbank.org/J10YIDC0A0>.
- Djankov, S., La Porta, R., Lopez-de-Silanes, F., & Shleifer, A. (2002). The Regulation of Entry. *Quarterly Journal of Economics*, 117, 1-37. <http://dx.doi.org/10.1162/003355302753399436>.
- IMD. (2010). *IMD World Competitiveness Yearbook 2009*. Lausanne, Switzerland: IMD International.
- Jensen, N. M., Li, Q., & Rahman, A. (2010). Understanding Corruption Using Cross-National Firm-Level Surveys. *Journal of International Business Studies*, 41, 1481-1504. <http://dx.doi.org/10.1057/jibs.2010.8>
- Johnson, S., Kaufmann, D., McMillan, J., & Woodruff, C. (2000). Why Do Firms Hide? Bribes and Unofficial Activity After Communism. *Journal of Public Economics*, 76, 495-520. [http://dx.doi.org/doi:10.1016/S0047-2727\(99\)00094-8](http://dx.doi.org/doi:10.1016/S0047-2727(99)00094-8).
- Johnson, S., McMillan, J., & Woodruff, C. (2002). Property Rights and Finance. *American Economic Review*, 92, 1335-1356. <http://dx.doi.org/doi:10.1257/000282802762024539>
- Karlan, D., & Zinman, J. (2008). Lying About Borrowing. *Journal of the European Economic Association*, 6, 510-521. <http://dx.doi.org/10.1162/JEEA.2008.6.2-3.510>
- Kaufmann, D., Kraay, A., & Mastruzzi, M. (2009). Governance Matters VIII: Governance Indicators for 1996-2008. Policy Research Working Paper 4978. World Bank, World Bank, Washington DC. <http://papers.ssrn.com/sol3/papers.cfm?abstract-id=1424591>
- Kuehnast, K., & Dudwick, N. (2004). *Better a Hundred Friends Than a Hundred Rubles? Social Networks in Transition--The Kyrgyz Republic*. World Bank: Washington DC.
- Safavian, M. S., Graham, D. H., & Gonzalez-Vega, C. (2001). Corruption and Microenterprises in Russia. *World Development*, 29, 1215-24. [http://dx.doi.org/doi:10.1016/S0305-750X\(01\)00036-5](http://dx.doi.org/doi:10.1016/S0305-750X(01)00036-5).
- Svensson, J. (2003). Who Must Pay Bribes and How Much? Evidence From a Cross Section of Firms. *Quarterly Journal of Economics*, 118, 207-230. <http://dx.doi.org/doi:10.1162/00335530360535180>.

- Swamy, A., Knack, S., Lee, Y., & Azfar, O. (2001). Gender and Corruption. *Journal of Development Economics*, 64, 25-55. [http://dx.doi.org/10.1016/S0304-3878\(00\)00123-1](http://dx.doi.org/10.1016/S0304-3878(00)00123-1).
- Tourangeau, R., & Smith, T. W. (1996). Asking Sensitive Questions: The Impact of Data Collection Mode, Question Format, and Question Context. *Public Opinion Quarterly*, 60, 275-304. <http://dx.doi.org/doi:10.1086/297751>
- Treisman, D. (2007). What Have We Learned About the Causes and Corruption From Ten Years of Cross-National Empirical Research. *Annual Review of Political Science*, 10, 211-244. <http://dx.doi.org/doi:10.1146/annurev.polisci.10.081205.095418>
- Wiederman, M. W. (1997). The Truth Must Be in Here Somewhere: Examining the Gender Discrepancy in Self-Reported Lifetime Number of Sex Partners. *Journal of Sex Research*, 34, 375-386. <http://dx.doi.org/doi:10.1080/00224499709551905>

Notes

Note 1. The evidence on how successful indirect questions are in reducing underreporting is mixed. Azfar and Murrell (2009) found little evidence that reticent managers are more truthful when answering indirect, rather than direct, questions about corruption.

Note 2. The three firm-level data sources used to construct the Worldwide Governance Indicators measure corruption indirectly (Kaufmann, Kraay, & Mastruzzi, 2009). The EBRD and World Bank's *Business Environment and Enterprise Performance Survey* (BEEPS) uses an approach similar to the World Bank's *Enterprise Surveys* asking about 'firms like yours'. The *Executive Opinion Survey* asks how common it is for firms (not the specific firm) to pay bribes. The *World Competitiveness Survey* asks whether bribery/corruption exist in the economy (IMD, 2010). Many one-off surveys also use indirect questions. See, for example, Johnson, Kaufmann, McMillan, and Woodruff (2000), Svensson (2003) and Safavian et al. (2001).

Note 3. See also, for example, Clarke (2004, p. 2077), Johnson et al. (2000, p. 504), Johnson et al. (2002, p. 1337-1338) and Svensson (2003, p. 212-213).

Note 4. Anonymous field interviews conducted by the author in Zambia in 2007.

Note 5. Based on estimates from this survey, international agencies and foreign militaries accounted for three quarters of public contracts in 2009.

Note 6. Only about 17 percent of firms that bid on international contracts said that bribes were needed to secure contracts compared with 38 percent of firms that bid on government contracts that said the same about these contracts.

Note 7. Clarke (2011b) shows that corruption affects the firms that bid for government contracts by discouraging firms that are averse to corruption from bidding. He also shows this might affect the quality of the firms that win government contracts.

Note 8. Discussing corruption in the Kyrgyz Republic, Kuehnast and Dudwick (2004, p. 24) note "[a]lthough bribery allows people to circumvent networks because middlemen are no longer so essential to transactions, insider connections (sviazy) remain important, since it is often through such connections that one learns who can or should be bribed, what constitutes reasonable payment, and how to time the payment."

Note 9. The question was based upon the question J7 from the World Bank's *Enterprise Survey*. Firms could answer either in monetary terms or as a percent of sales. Clarke (2011a) shows that firms report payments as a percent of sales report amounts between four and fifteen times higher than firms that report them in monetary terms. Because of this, it is difficult to run regressions using the underlying continuous variable.

Note 10. If in contrast, firms that participate in bidding are less likely to say that corruption is a problem is because they are lying about the extent of corruption, then the more natural way to interpret the second result is that the same firms are also lying about other types of corruption. Again, interpreting their answers to indirect questions as describing their own actions is problematic in this case as well—they are less likely to say that corruption is a problem and that firms like theirs pay bribes not because they do not pay bribes but that they are lying about their own actions.

Adjusting the Currency Composition of China's Foreign Exchange Reserve

Kai Shi¹ & Li Nie²

¹ School of Economics, Northeast Normal University, Changchun, China

² Preparatory School for Chinese Students to Japan, Changchun, China

Correspondence: Kai Shi, School of Economics, Northeast Normal University, 2555 Jingyue Street, Changchun 130117, P.R. China. Tel: 86-431-8453-6272. E-mail: shik142@nenu.edu.cn

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Abstract

During the sovereign debt crisis, the national credit of some developed economic entities has been degraded repeatedly. It is adjusting the currency composition of China's foreign exchange reserve that becomes an important risk management tool. In this paper, we first make an analysis on possible currency composition of China's foreign exchange reserve combining data from the Treasury International Capital System of United States with IMF Currency Composition of Official Foreign Exchange Reserve, and then discuss the currency composition of minimum variance risk within the framework of Mean-Variance Analysis. Afterwards, a dynamic adjusting route from the real composition to the optimal structure is built up through the dynamic optimization approach. It is found that converting dollar assets to yen assets according to the optimal schedule will lower the risk of foreign exchange reserve effectively.

Keywords: foreign exchange reserve, currency composition, mean-variance analysis, dynamic optimization

1. Introduction

It is a consensus that the share of dollar assets in China's foreign exchange reserve is excessively high. Since 2002, the weak U.S. dollar against a basket of currencies has become increasingly obvious. Along with the continued accumulation, the loss of China's foreign exchange reserve caused by the devaluation of U.S. dollar and fluctuations in asset price attracts a lot of attention.

On February 5th, 2010, the State Administration of Foreign Exchange (SAFE) makes some improvements about the accounting principle of foreign exchange reserve: in Balance of Payments, the term of foreign exchange reserve will only record trading data; in the meanwhile, the value change of reserve assets irrelevant to transactions will reflect in International Investment Position. This change does not only get closer to the international practice, but also helps us recognize the loss of foreign exchange reserve.

Table 1. The value change of foreign exchange reserve and its sources

	2010	March, 2011	June, 2011	September, 2011
The change of foreign exchange reserve relative to the previous installment in International Investment Position	2800	1433	511	-958
The shortfall of foreign exchange reserve in Balance of Payments	-4717	-1412	-1425	-917
The change of reserve assets value related to non-trading factors	-1917	21	-914	-1875

Notes: The shortfall of foreign exchange reserve in Balance of Payments = credit side – debit side, the negative value of shortfall shows that the foreign exchange reserve increases; Unit: a hundred million dollars.

According to the new accounting principle, the change of net reserve assets positions in International Investment Position consists of two separate parts: the first one is due to transactions; the other is caused by foreign exchange rate, asset prices and other non-trading factors. Clearly, except for the first quarter of 2011, China's foreign exchange reserve has been depreciating in most time, and the extent of devaluation in 2011 is more serious than that in 2010.

On May 6th, 2011, although one of the principals of SAFE presents the view in an interview that the appreciation of the renminbi will not cause the loss of foreign exchange reserve directly and reserve assets book surplus is far more than book loss, the loss caused by exchange rate change, fluctuations in asset price and other non-trading factors does exist.

In the post-crisis era, the voice about International Monetary System reform is getting bigger and stronger. The current International Monetary System is actually in the post-dollar and weak hegemony era. Although the security problem would not be solved thoroughly through the structure optimization about currency composition, it is still an effective approach to eliminate the risk of foreign exchange reserve.

In fact, there are three types of methods for managing currency composition. (Note 1) The most popular one is the Mean-Variance Analysis. The study of Ben-Bassat (1980) was the pioneer research to consider the currency composition of foreign reserves in mean-variance framework. Dellas and Yoo (1991) made the Mean-Variance Analysis important in the area of analyzing the currency composition of foreign reserves by proposing the difference between using the import share and the import currency share as weights of calculating the reference currency. The paper of Papaioannou *et al.* (2006) was one of the most comprehensive analyses on the optimal currency composition within this framework. Some literatures including Sheng and Zhao (2007), Liu (2008) and Zhang *et al.* (2010) did research on the currency composition of China's foreign exchange reserves, and others including Kong (2010) and Wang (2011) put forward their suggestions about the adjustment of currency composition. However, none of them pay enough attentions to the speed and proportion of adjustment.

In this paper, we will not stop in the stage of ascertaining the direction of adjustment. After the comparative analysis between possible practical currency composition of China's foreign exchange reserve based on available public statistic information, and the ideal minimum risk structure within Mean-Variance framework, an optimal adjusting route is set up through the dynamic optimization approach.

2. A Currency Composition Analysis Based on TIC and COFER Data

In China, all information about currency composition, investment classes and term structure of foreign exchange reserve is unpublished. For this reason, we are only allowed to make a sketch about possible currency composition of China's foreign exchange reserve. Here, we make a discussion combining data from U.S. Treasury International Capital System (TIC) with IMF Currency Composition of Official Foreign Exchange Reserve (COFER).

According to the Report on Foreign Holdings of U.S. Securities 2012, up to June 30th, 2012, the total holdings attributed to mainland China amount to 1.73 trillion dollar. The share of dollar assets in total reserve is about 55%. However, it is unable to represent the actual dollar proportion in China's foreign exchange reserve for the next three following reasons: the first one is that TIC annual survey data are likely to underestimate China's investment in America (Setser and Pandey, 2009); the second one is that data from TIC referring to China's security investment in America include not only foreign exchange reserve but also the investment from other domestic institutions; the third one is that data from TIC comprise some investments that should not be included in foreign exchange reserve. (Note 2) The first factor is inclined to underestimate the actual proportion of dollar assets, while the last two are apt to overestimate it. In addition, it is more difficult to explore the shares of euro and yen assets.

Beyond this, as the biggest developing country in the world, the proportion of China's foreign exchange reserve in total holdings belonging to developing countries is relatively high. For this reason, data about the currency composition of emerging and developing countries foreign exchange reserve in COFER are also helpful for recognizing China's reserve composition.

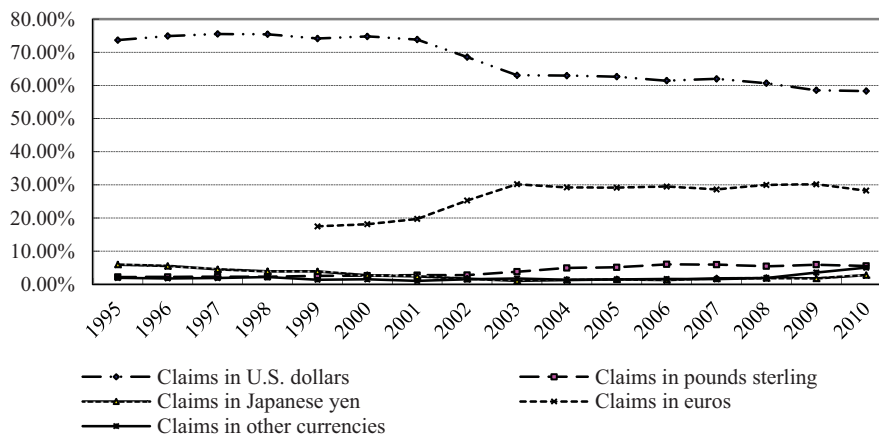


Figure 1. The currency composition of emerging and developing countries

According to COFER, the total proportion of four most major international currencies—dollar, euro, sterling pound and Japanese yen—in the currency composition of emerging and developing countries foreign exchange reserve exceeds 95%. Since 2000, the share of dollar assets has been declining, varying from 75% in 1998 to less than 60% in 2010. In the meanwhile, since the day of its launch, the share of euro has been rising. After four years increasing, it has stabilized in the level of 30%. Besides, neither sterling pound nor Japanese yen exceed 10%. From 2002 to 2006, the share of sterling pound continues to increase and has stabilized between 6% and 7%. From 1995 to 2002, the share of Japanese yen drops significantly. Although there is a slight increase after the Subprime Crisis, it does not exceed 5% yet. It is worth noting that the share of other currencies has been rising since 2008.

Combining TIC report with COFER data, we believe it is credible that China's foreign exchange reserve consists of 60%~65% dollar, 25%~30% euro, 5%~7% sterling pound, and 3%~5% Japanese yen.

3. The Minimum Variance Risk Currency Composition of China's Foreign Exchange Reserve

After analyzing the actual structure of China's foreign exchange reserve, we focus on exploring the minimum variance risk currency composition within the framework of Mean-Variance Analysis.

The Mean-Variance Analysis on currency composition of foreign exchange reserve concerns about two aspects of risk and returns. It is believed that the utility of reserve assets depends on the value of its constituent financial assets denominated in some commodity basket and its variation. Because high returns are always accompanied by high risk, rational holders are not supposed to put all their fortunes in the only one currency assets of the highest returns. Similarly to Markowitz's portfolio theory, in Mean-Variance Analysis, the monetary authority is viewed as an investor, and the currency composition is regarded as asset portfolio. The aim of Mean-Variance Analysis is to pursue minimum variance risk. The main distinction lies in that the minimum risk point in efficient frontier is considered as the optimal portfolio due to the difficulty of determining the risk preference of monetary authority.

3.1 Mean-variance Analysis on the Currency Composition of China's Foreign Exchange Reserve

Let the expected returns vector of four major international currencies be $\mu = (\mu_{usd}, \mu_{euro}, \mu_{pound}, \mu_{yen})'$, the variance of expected returns be $\sigma^2 = (\sigma_{usd}^2, \sigma_{euro}^2, \sigma_{pound}^2, \sigma_{yen}^2)'$, and the weight vector of four currencies be $X = (X_{usd}, X_{euro}, X_{pound}, X_{yen})'$. Different from ordinary securities investors, safety and liquidity of reserve assets are the priority concerns. It is impossible for the monetary authority to hold short position. Thus, the weights of foreign exchange reserve currency composition need to meet the constraints:

$$\sum_i^N X_i = 1, X_i \geq 0, i = usd, euro, pound, yen \quad (1)$$

In order to guarantee the security of reserve assets, it is necessary to pursue the minimum variance risk given the realized returns of foreign exchange reserve. The optimization model is as follows:

$$\min \frac{1}{2} \sigma_p^2 = \frac{1}{2} X'VX \quad (2)$$

s.t.

$$\begin{cases} X'\mu = \mu_p = \mu_0 \\ X'\mathbf{1} = \sum_i X_i = 1 \\ X_i \geq 0, i = \text{usd, euro, pound, yen} \end{cases}$$

where μ_p and σ_p^2 stand for portfolio returns and variance, respectively, V represents the variance-covariance matrix of asset returns, and $\mathbf{1}$ denotes a four dimensional column vector.

Papaioannou *et al.* (2006) point that the fundamental problem embedded in Mean-Variance Analysis lies in two aspects: firstly, it is difficult to estimate the returns of foreign exchange reserve accurately; secondly, it is hard to forecast the variance-covariance matrix. For the first problem, we consult the research of Zhang *et al.* (2010) about the nominal and real returns of China's foreign exchange reserve. Considering more general time-varying correlations, we employ DCC-GARCH model in forecasting the variance-covariance matrix.

3.2 Empirical Results

Within the framework of Mean-Variance Analysis, we consider to spread risk among four major international currencies, namely U.S. Dollar, Euro, Sterling Pound and Japanese Yen. For the convenience of comparative analysis, the total sample is divided into three sections according to the Subprime Crisis and 2nd round Quantitative Easing policy (QE2).

Table 2. The optimal currency composition of minimum variance risk

During the Subprime Crisis	U.S. Dollar	Euro	Sterling Pound	Japanese Yen	Minimum variance risk
3 rd Quarter, 2007	29.04%	25.15%	34.59%	11.23%	0.00001439
4 th Quarter, 2007	11.13%	29.42%	54.65%	4.81%	0.00002416
1 st Quarter, 2008	6.78%	12.22%	72.88%	8.12%	0.00024399
2 nd Quarter, 2008	16.42%	63.04%	15.20%	5.35%	0.01117763
3 rd Quarter, 2008	33.03%	59.50%	0.11%	7.35%	0.01808102
After the Subprime Crisis	U.S. Dollar	Euro	Sterling Pound	Japanese Yen	Minimum variance risk
4 th Quarter, 2008	41.88%	43.29%	10.46%	4.38%	0.12484435
1 st Quarter, 2009	49.62%	34.17%	6.34%	9.87%	0.17316376
2 nd Quarter, 2009	53.46%	35.17%	0.14%	11.23%	0.23217912
3 rd Quarter, 2009	52.33%	29.18%	4.18%	14.31%	0.23753490
4 th Quarter, 2009	52.83%	31.27%	7.23%	8.67%	0.30469038
1 st Quarter, 2010	53.34%	27.35%	6.29%	13.02%	0.35265724
2 nd Quarter, 2010	53.52%	32.03%	4.88%	9.57%	0.38165594
3 rd Quarter, 2010	55.25%	26.58%	4.88%	13.30%	0.36405214
During QE2	U.S. Dollar	Euro	Sterling Pound	Japanese Yen	Minimum variance risk
4 th Quarter, 2010	55.04%	33.67%	2.93%	8.37%	0.35371175
1 st Quarter, 2011	55.26%	32.17%	2.24%	10.33%	0.34386967

At least two key findings can be seen from empirical results: first, during the Subprime Crisis, in order to realize the minimum variance risk, the optimal shares of dollar, euro, pound assets varied significantly, while the share of Japanese yen assets stabilized between 5% and 10%; second, after the Subprime Crisis, the share of dollar assets is stable between 50% and 55%, the share of euro is about 30%, the share of pound fluctuates between 2% and 8%, and the share of Japanese yen increases to between 7% and 15%.

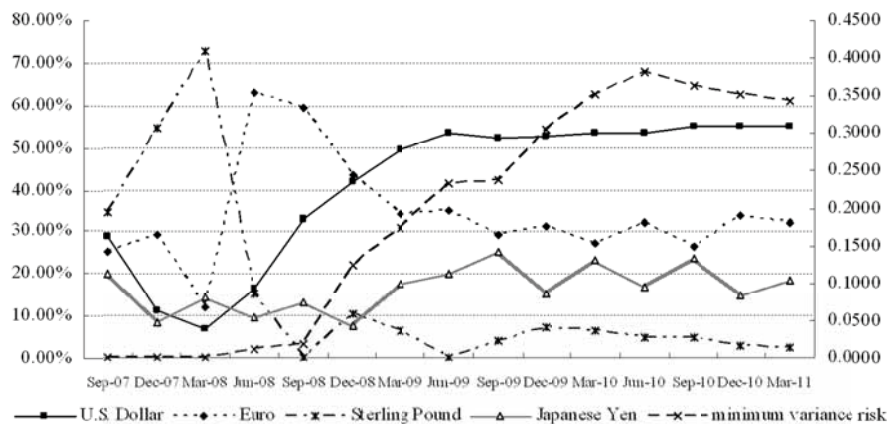


Figure 2. The currency composition of China's foreign exchange reserve and minimum risk

It is easily found that the change trend of dollar share is similar to the variation of minimum variance risk. The correlation coefficient is about 0.8916. Obviously, the weakening of U.S. dollar as well as excessive proportion of dollar assets has become the important risk source implied in China's huge foreign exchange reserve.

3.3 Discussions

After the comparative analysis between the optimal and practical currency composition of China's foreign exchange reserve, there are at least two aspect works to do for risk control.

The first one is to lower the proportion of dollar assets in China's foreign exchange reserve. There is not much debate about American gloom economic outlook after the Subprime Crisis. Expansion fiscal policy and quantitative easing monetary policy are taken to stimulate economic recovery. Both of them result in global dollar flooding. Although hedge funds promote dollar to go strong in some stage, weakening dollar still brings down its real purchasing power and makes dollar assets less attractive. Since there is no dispute about the excessiveness of dollar proportion in China's foreign exchange reserve, it is imperative to reduce dollar assets share. Certainly, China's any activity about decreasing dollar assets should take global finance stability and the maintenance and increment of foreign exchange reserve value into account. Reducing dollar assets rashly may incur global finance market turmoil as well as more loss of foreign exchange reserve. Although Buffett praise China's foreign exchange reserve management policy, neither blind reduction nor continuing bulk-buying dollar assets is a wise choice. For China, it is more reasonable to focus on increment adjustment as well as stock conversion about mature assets. On the one hand, the authority should dilute dollar assets share through reducing purchase; on the other hand, they are encouraged to convert maturity dollar assets to non-dollar assets.

The second work is to expand the purchase of Japanese yen assets. As China's important trade partner, the Japanese yen assets have not been given enough attention. This may result from yen's incomplete internationalization as well as flagging Japanese economy. During the sovereign debt crisis, converting dollar assets to euro is definitely an unwise move. Clearly, it provides an opportunity for Japanese yen. The performance that China Investment Corporation purchases house property in Tokyo before the East Japan Earthquake maybe has revealed some new orientation of China's international reserve management. Besides, the post-disaster reconstruction theme is likely to push up Japanese yen. Thus, cutting down dollar assets as well as augmenting yen assets maybe lower the risk of China's foreign exchange reserve.

4. The Dynamic Optimal Route of Dollar Assets Reduction

Although decreasing dollar assets as well as increasing yen assets is helpful for lowering China's foreign exchange reserve risk, what really needs to be discussed, however, is the dynamic optimal route of dollar assets reduction.

4.1 Fundamental Assumptions

a. China's foreign exchange reserve consists of U.S. dollar, Euro, Sterling pound and Japanese yen assets. The euro assets proportion is about 28%, and the pound assets share amounts to 5%. Let the proportion of dollar assets equal to x , and then the share of yen assets equals to $1 - 28\% - 5\% - x$, where x is the function of time t .

b. China's foreign exchange reserve increases following the pattern $W_t = W_0 \cdot (\beta_0 + \beta_1 \cdot t + \beta_2 \cdot t^2)$, where W_0 represents the initial scale.

In order to explain its rationality, we make some empirical analyses about China’s foreign exchange reserve growth through log-linear model, linear model and binomial model. The fitting results are as follows.

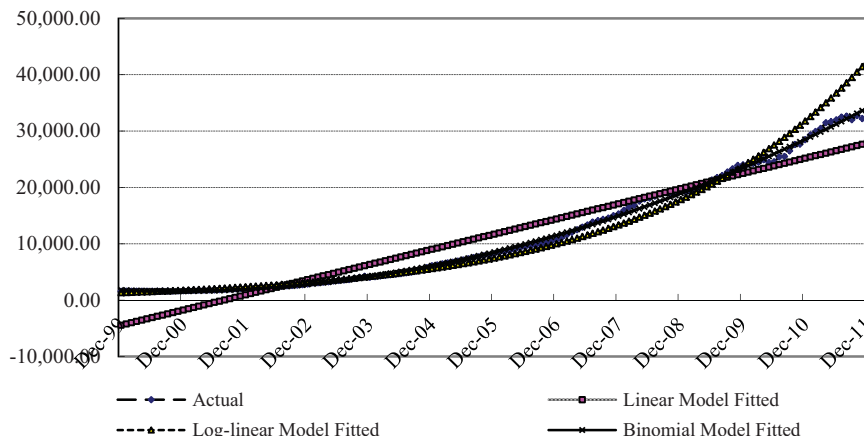


Figure 3. Foreign exchange reserve actual and fitted value

Comparative analysis illustrates that the binomial model describes China’s foreign exchange reserve growth well. Thus, the setting about reserve growth is reasonable and acceptable.

c. The long-term average returns of dollar and yen assets equal to American and Japanese inflation rates, respectively.

Foreign exchange reserve is stored in abroad and denominated in foreign currency. Considering security, liquidity and market capacity, China’s foreign exchange reserve is usually invested in high credit rating long-term treasury bonds. Thus, the returns of foreign exchange reserve are mainly related to treasury bond yields. Meanwhile, the direct loss of holding foreign exchange reserve involves domestic and foreign-related factors that affect reserve currency value: one is the domestic inflation of reserve currency country, and the other is the foreign exchange rate variation of reserve currency. It is generally accepted that the treasury bonds of advanced countries have inflation-protected function. It is not exaggerated to assume the real returns of long-term treasury bonds equal to the inflation rates so long as there are not severe inflations in the U.S. and Japan.

d. Reserve assets value is measured by the real purchasing power of a basket of currencies. The purchasing power change of U.S. dollar against a basket of currencies is Δp , where $\Delta p < 0$ denotes the devaluation of dollar.

e. In order to lower the risk, the SAFE makes an adjustment about the currency composition of China’s foreign exchange reserve, which is to reduce dollar assets, $x' < 0$, as well as to increase yen assets

4.2 Basic Problem

The aim of reserve assets currency composition adjustment is to convert dollar assets to yen assets. Thus, in the process of adjustment, the maximization about total foreign exchange reserve value is equivalent to the local optimization about dollar and yen assets.

Due to the assumption that investment returns of reserve assets equal to inflation rates, the value of reserve assets in time t denominated in the real purchasing power of a basket of currencies consists of two parts: the initial value and the value of newly-increased parts.

In time t , the initial dollar and yen assets value FR_1 follows

$$FR_1 = W_0 \cdot (x + x') \cdot (1 + \Delta p) + W_0 \cdot (1 - 28\% - 5\% - x - x') \tag{3}$$

where $\Delta p < 0$ denotes the loss of U.S. dollar against a basket of currencies.

The increment reserve FR_2 equals to the derivative of W_t to t

$$FR_2 = \frac{\partial W_t}{\partial t} = W_0 \cdot (\beta_1 + 2 \cdot \beta_2 \cdot t) \tag{4}$$

Suppose there is such following linear relationship

$$-\alpha \cdot x' = c_1 \cdot \Delta p + c_2 \cdot (\beta_1 + 2 \cdot \beta_2 \cdot t) + c_3 \cdot x \quad (5)$$

where $\alpha > 0$, $c_1 > 0$, $c_2 > 0$, $c_3 > 0$ and $\Delta p < 0$.

In fact, the adjusting speed x' is related to the devaluation degree of dollar Δp , (Note 3) the proportion of newly-increased reserve $(\beta_1 + 2 \cdot \beta_2 \cdot t)$ and current dollar share x . When the dollar keeps stable, foreign exchange reserve grows rapidly, and the current dollar share is relatively high, the SAFE chooses to cut down dollar assets faster. (Note 4)

The reserve assets needed to be optimized follows that

$$\begin{aligned} FR(t, x, x') &= FR_1 + FR_2 \\ &= W_0 \cdot (x + x') \cdot (1 + \Delta p) + W_0 \cdot (1 - 28\% - 5\% - x - x') + W_0 \cdot (\beta_1 + 2 \cdot \beta_2 \cdot t) \\ &= W_0 \cdot (x + x') \cdot (\lambda_0 + \lambda_1 \cdot x' + \lambda_2 \cdot t + \lambda_3 \cdot x) + W_0 \cdot (0.67 - x - x') + W_0 \cdot (\beta_1 + 2 \cdot \beta_2 \cdot t) \end{aligned} \quad (6)$$

where $\lambda_0 = 1 - c_2 \cdot \beta_1 / c_1$, $\lambda_1 = -\alpha / c_1$, $\lambda_2 = -2 \cdot c_2 \cdot \beta_2 / c_1$, and $\lambda_3 = -c_3 / c_1$.

The fundamental issue of foreign exchange reserve currency composition optimization is reconstructed as finding x to achieve reserve assets value maximization in time span $[0, T]$. (Note 5)

In order to deal with the time value of money, the forward reserve assets value is converted to the present value through a positive discount rate ρ .

In the process of actual reserve management, the usual practice of SAFE is to set the desired dollar assets share target. Thus, the foreign exchange reserve currency management can be expressed as

$$\begin{aligned} \max \quad \Gamma[x] &= \int_0^T FR(t, x, x') \cdot e^{-\rho t} dt \\ \text{s.t.} \quad x(0) &= x_0, \quad x(T) = x_T \end{aligned} \quad (7)$$

where x_0 and x_T are exogenous, and $x_0 > x_T > 0$.

4.3 The Solution

Based on the above mentioned objective function, $F = FR(t, x, x') \cdot e^{-\rho t}$ produces the first-order derivatives

$$\begin{aligned} F_x &= W_0 \cdot [(\lambda_0 - 1) + (\lambda_1 + \lambda_3) \cdot x' + \lambda_2 \cdot t + 2 \cdot \lambda_3 \cdot x] \cdot e^{-\rho t} \\ F_{x'} &= W_0 \cdot [(\lambda_0 - 1) + 2 \cdot \lambda_1 \cdot x' + \lambda_2 \cdot t + (\lambda_1 + \lambda_3) \cdot x] \cdot e^{-\rho t} \end{aligned} \quad (8)$$

and the second-order derivatives

$$\begin{aligned} F_{x'x'} &= 2 \cdot \lambda_1 \cdot W_0 \cdot e^{-\rho t} \\ F_{xx'} &= (\lambda_1 + \lambda_3) \cdot W_0 \cdot e^{-\rho t} \\ F_{xx} &= W_0 \cdot [(\lambda_0 \cdot \rho - \rho - \lambda_2) + 2 \cdot \lambda_1 \cdot \rho \cdot x' + \lambda_2 \cdot \rho \cdot t + (\lambda_1 + \lambda_3) \cdot \rho \cdot x] \cdot e^{-\rho t} \end{aligned} \quad (9)$$

According to the Euler equation, the first-order necessary condition follows that

$$-W_0 \cdot [c - 2 \cdot \lambda_1 \cdot x'' + 2 \cdot \lambda_1 \cdot \rho \cdot x' + (\lambda_2 \cdot \rho + \lambda_2) \cdot t + (\lambda_1 \cdot \rho + 2 \cdot \lambda_3) \cdot x] \cdot e^{-\rho t} = 0 \quad (10)$$

where $c = \lambda_0 - \lambda_2 + (\lambda_0 - 1) \cdot \rho$. Accordingly, the explicit solution of x can be found through Eq. (10). (Note 6)

Besides, it is easy to construct

$$|D| \equiv \begin{vmatrix} F_{x'x'} & F_{x'x} \\ F_{xx'} & F_{xx} \end{vmatrix} \quad (11)$$

and its two principal minors

$$\begin{aligned}
 |D_1| &\equiv |F_{x'x'}| = F_{x'x'} = 2 \cdot \lambda_1 \cdot W_0 \cdot e^{-\rho t} < 0 & \lambda_1 &= -\frac{\alpha}{c_1}, \quad \alpha > 0, \quad c_1 > 0 \\
 |D_2| &\equiv \begin{vmatrix} F_{x'x'} & F_{x'x} \\ F_{x'x} & F_{xx} \end{vmatrix} = -W_0^2 \cdot (\lambda_1 - \lambda_3)^2 \cdot e^{-2\rho t}
 \end{aligned}
 \tag{12}$$

Apparently, the second-order Legendre condition of maximization is also satisfied.

To sum up, the solution of x is the dynamic optimal dollar assets share that maximizes foreign exchange reserve value in $[0, T]$.

4.4 Numerical Simulation

In order to find out the specific steps of reserve currency composition adjustment, it is necessary to determine the structure parameters in growth pattern prior to analysis.

Thus, we first utilize quarterly foreign exchange reserve data from 4th Quarter, 1999 to 4th Quarter, 2011 for the parameter estimation. After the empirical analysis, we make such following settings: $W_0 = 32000$, $\beta_0 = 0.055470$, $\beta_1 = -0.003966$, and $\beta_2 = 0.000498$.

In fact, Eq. (5) illustrates different attitudes of the SAFE to the devaluation degree of dollar, reserve increasing speed and current dollar assets proportion. Given different considerations about political purpose, policy target and government behavior, the SAFE would give those three factors different weights. In this paper, we make such following settings: $\alpha = 1$, $c_1 = 1/3$, $c_2 = 50$, and $c_3 = 0.02$. In the meanwhile, the discount rate $\rho = 3\%$ is used. (Note 7)

The comprehensive analysis combining TIC report with COFER data shows that the U.S. dollar assets share in China’s foreign exchange reserve maybe reach up to 65% by the end of June, 2011. For this reason, the initial dollar assets weight has been set to $x(0) = 65\%$. The policy goal of currency composition adjustment is to lower down dollar assets share to 55% till the end of 2012, namely $x(6) = 55\%$.

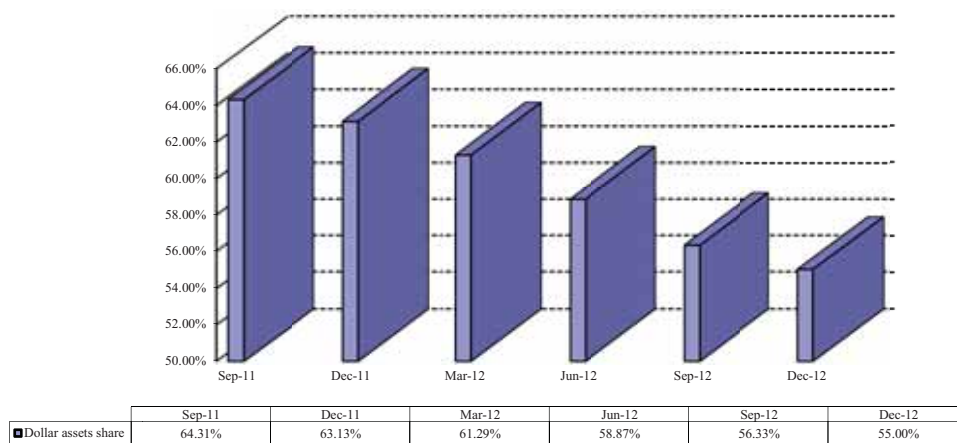


Figure 4. The optimal share of dollar assets

Figure 4 illustrates the dynamic optimal share of dollar assets in China’s foreign exchange reserve, and Figure 5 presents the optimal route for cutting down dollar assets. According to 3.2 trillion dollar foreign exchange reserve scale, in order to achieve structure optimization, the SAFE should accomplish the net decreasing goal of at least 320 billion dollar from September, 2011 to December, 2012. The minimum decreasing scale is about 22.08 billion dollar, and the maximum decreasing scale reaches to 81.28 billion dollar. The average decreasing scale is about 53.33 billion dollar.

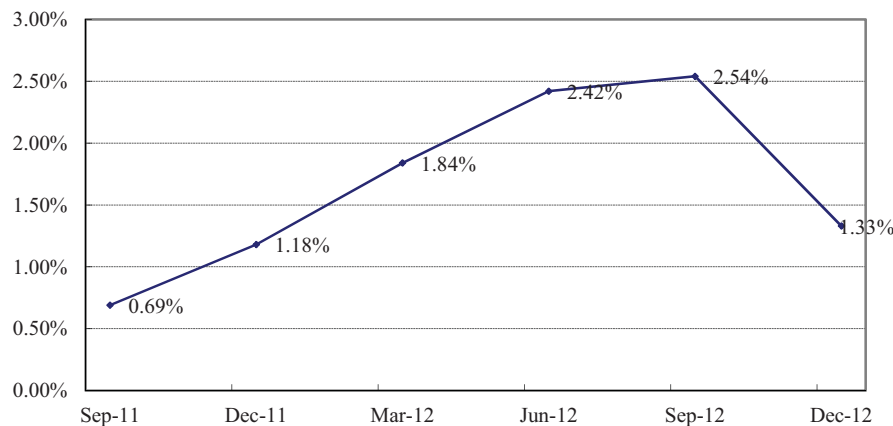


Figure 5. The proportion of decreasing dollar assets

During the adjusting process, the share of dollar assets does not decline linearly. The optimal reducing proportion displays the sickle-shaped feature.

5. Conclusion

Excessive dollar assets make the risk exposure of China's foreign exchange reserve bigger and bigger. The Report on Foreign Holdings of U.S. Securities shows that by June, 2007, all kinds of U.S. securities held by mainland China amounted to 922 billion dollar, including Freddie Mac and Fannie Mae debts 206 billion dollar and other asset-backed securities bonds 11 billion dollar. The proportion of Freddie Mac and Fannie Mae debts in total foreign exchange reserve reaches to 15.46%. Once Freddie Mac and Fannie Mae being delisted, more than seventh of China's foreign exchange reserve is about to be worth nothing. Adjusting the currency composition is probably a more realistic and feasible way to manage foreign exchange reserve risk.

In post-crisis era, the instability of international monetary system strengthens significantly: the dollar still dominates, the euro faces challenges, and the pluralism is full of attractions. It is not beneficial for spreading risk to continue overweighting dollar assets. There are lots of problems in euro zone, thus it is unwise to increase euro assets under the circumstance of sovereign debts crisis. Although some scholars suggest that Asian countries should hold each other's currencies as their foreign exchange reserve (Fan *et al.*, 2010), considering the depth of market and the degree of currency internationalization, it is difficult to lessen the risk of China's foreign exchange reserve following this way.

Within the framework of Mean-Variance Analysis, converting dollar assets to Japanese yen assets is a more realistic and effective way to maintain and increase foreign exchange reserve value. The statistics of international balance of payment jointly released by Japanese Ministry of Finance and Bank of Japan on June 4th, 2012, show that by the end of 2011, the Japanese treasury bonds held by China amount to 18 trillion yen (about 232.8 billion dollar) increasing about 71% over last year. The proportion of yen assets in China's foreign exchange reserve reaches up to the highest 7.27% in history. All of these show that China is accelerating the conversion of dollar assets against yen assets. The dynamic optimization analysis about decreasing dollar assets bridges the minimum variance risk structure and the practical currency composition of China's foreign exchange reserve, providing the authority a more realistic and effective adjusting route.

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References

- Ben-bassat, A. (1980). The Optimal Composition of Foreign Exchange Reserves. *Journal of International Economics*, 10, 285-295. [http://dx.doi.org/10.1016/0022-1996\(80\)90059-8](http://dx.doi.org/10.1016/0022-1996(80)90059-8)
- Dellas, H., & Yoo, C. (1991). Reserve Currency Preferences of Central Banks: the Case of Korea. *Journal of International Money and Finance*, 10, 406-419. [http://dx.doi.org/10.1016/0261-5606\(91\)90018-F](http://dx.doi.org/10.1016/0261-5606(91)90018-F)
- Fan, G., Wang, B. Q., & Huang, Y. P. (2010). Holding each other's currency: A Regional Cooperation

Mechanism of Achieving Foreign Exchange Reserve Diversification. *Report on Reserve Currency Diversification International Symposium*, Beijing.

- Kong, L. P. (2010). The Choice of Currency Composition of China's Foreign Exchange Reserve under International Financial Crisis. *Studies of International Finance*, 3, 64-72.
- Liu, L. Y. (2008). Research on Change in Foreign Reserve Management Model from the Currency Composition and Yield in China. *Journal of Finance and Economics*, 7, 121-132.
- Liu, S. G., & Zhao, H. Y. (2007). Yields and Currency Composition of Foreign Reserves and Hot Money in China. *China Economic Quarterly*, Issue 4, pp. 1255-1276.
- Papaioannou E., Portes R., & Siourounis G. (2006). Optimal Currency Shares in International Reserves: the Impact of the Euro and the Prospects for the Dollar. *Journal of the Japanese and International Economies*, 20(4), 508-547. <http://dx.doi.org/10.1016/j.jjie.2006.07.002>
- Setser, B., & Pandey, A. (2009). China's \$1.5 Trillion Bet: Understanding China's External Portfolio. *Council on Foreign Relations Working paper*. Retrieved from http://www.cfr.org/content/publications/attachments/CGS_WorkingPaper_6_China_update0509.pdf
- Wang, Y. Z. (2011). The Composition, Yield and Risks of China's Foreign Exchange Reserve. *Studies of International Finance*, 1, 44-52.
- Xu, Y. L., & Zhang, Z. C. (2010). Foreign Exchange Reserve Currency Composition Management: A Review of International Studies. *The Journal of World Economy*, 9, 3-27.
- Zhang, B., Wang, X., & Hua, X. P. (2010). Nominal and Real Returns on China's Foreign Exchange Reserve. *Economic Research Journal*, 10, 115-128.

Notes

Note 1. Xu and Zhang (2010) made a detailed literature review on foreign exchange reserve currency composition management.

Note 2. For example, since 2007, domestic commercial banks are allowed to submit part of reserves against deposit in the form of foreign exchange. It should not be counted as national foreign exchange reserve, while it is included in TIC report.

Note 3. The adjusting speed equals to the derivative of dollar assets share x to time t , $x' = \partial x_t / \partial t$.

Note 4. In fact, we consider a reverse operation strategy. When the dollar keeps stable, it is easier to accomplish the transaction of cutting down dollar assets. In the meanwhile, to reduce the dollar assets selling will be helpful for stabilizing reserve assets value if coming across dollar turmoil.

Note 5. This is actually a problem of calculating the integral functional optimal value.

Note 6. Due to the existence of too many exogenous parameters, the explicit solution of x is rather complicated. Thus, we do not pay much attention to it, but really focus on the following numerical simulation.

Note 7. In addition, we have tried different parameter settings. It is found that there are not big influences of c_1 and c_2 on the simulation results. Although the influence of c_3 on results is more significant, it does not change the fundamental trend of simulation results. It is clear that current dollar assets proportion should be given more attention in the process of foreign exchange reserve management.

VAR Analysis of the Determinants of the Foreigners' Transactions in Istanbul Stock Exchange

Bora ÖZKAN¹ & Ali HEPŞEN²

¹ Department of Economics and Finance, College of Business Administration, University of New Orleans, USA

² Department of Finance, Faculty of Business Administration, Istanbul University, Turkey

Correspondence: Ali HEPŞEN, Department of Finance, Faculty of Business Administration, Istanbul University, Istanbul, 34000, Turkey. Tel: 90-212-473-7070 ext. 18321. E-mail: alihepsen@yahoo.com

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Abstract

Increasing amounts of capital flows to developing countries and emerging markets tend to stimulate economic activity in these countries on one hand, and lead to serious macroeconomic fluctuations on the other hand. Foreign investors' activities in an emerging market, specifically in a stock market can have serious implications over the stock market as well as the overall economy of that country. The primary purpose of this research is to analyze the causes of capital inflows by a VAR model, specifically monthly transactions by foreigners in Istanbul Stock Exchange (ISE), for the period January 1997 through December 2011. The model investigates the effects of Foreign Direct Investment, ISE Index, NYSE Index, US Treasury Bill and US Industrial Production over sales, purchases and net transactions of foreigner investors in ISE.

Keywords: capital flows, foreigners' transactions, VAR Model

JEL Classification: C32; F32; F36

1. Introduction

The discussion of capital flows to developing countries has been one of the most popular topics in economics since the emerging markets attract more and more investments every day. Capital flows can be considered as indicators of the overall economic performance for that particular country. Capital flows may help developing countries in several ways. They can provide extra funds available for investment or be in the form of direct investment, and contribute to national production. In addition, if domestic saving is insufficient, the governments can borrow easier in the presence of foreign capital flows. Moreover, capital flows enable developing country households to smooth out their consumption over time. On the other hand, international investors can benefit from capital flows, such that, their investments bring higher returns in developing countries than in industrial countries. In general, international borrowers use capital flows to finance economic growth, and international lenders use capital flows to make profits. Actually, there is no strict definition of capital flows in the international economics literature. Definition and measurement of capital flows can have slight differences among the records of international institutions, such as the World Bank and the IMF, through time. Calvo, Leiderman and Reinhart (1994) define capital flows as the increase in net international indebtedness of a country at a given period of time. Capital flows are calculated as the surplus in the net capital account item of the balance of payments identity. Balance of payments identity indicates that, if errors and omissions are excluded, the capital flows will be equal to the summation of current account deficit and the increase in the net international reserve holdings of the country. The determinants of capital flows can be divided into two groups: domestic and external factors (Kara, 2007). Domestic factors are based on the economic environment of the developing country that receives the flow of foreign capital. These factors are the factors that "pull" capital flows, so called "pull factors", as well. Pull factors are assumed to be under the control of policy makers. External factors are based on the economic environments of the industrial countries and other developing countries, and are beyond the control of domestic policy makers (i.e. debt sustainability; structural policies that increases the efficiency of resource allocation; policies that shape the level of domestic absorption and its components relative to national income). If favorable, external factors "push" capital flows to the developing countries, and they are known as "push factors", as well (i.e. foreign interest rates; recessions in developed countries; bandwagon and contagion effects in international capital movement).

The remainder of this paper proceeds as follows. Section two reviews the literature related to capital flows. Section three introduces the selected data. Section four describes the development of the VAR model and the empirical results of this study. The final section is the conclusion.

2. Literature Review

The effects of the capital flows over the economic performance of that country has been discussed in many literature like Calvo, Leiderman and Reinhart (1993, 1996), Hoggarth and Sterne (1997), Lopez-Mejia (1999), Fernandez-Arias and Montiel (1996), Balkan, Biçer and Yeldan (2002), Alper and Saglam (2001), Yentürk (1999), Celasun, Denizer and He (1999).

The findings of these papers suggest that a surge in capital inflows leads to a rise in consumption and investment. A rise in the capital inflows increases the amount of bank credits extended to the private sector, since resident banks often appear to act as intermediaries between international capital markets and domestic borrowers. This in turn raises domestic consumption and investment demand given the increase in available funds. This development gives rise to inflationary pressures in the economy led by the boost in total aggregate domestic demand. Therefore, countries that receive large capital inflows experience a considerable expansion in their services sectors.

The reasons behind capital flows from developed countries to developing countries have also been topics of several research like Mody, Taylor and Kim (2001), Dasgupta and Ratha (2000), Ying and Kim (2001), Taylor and Sarno (1997), Calvo, Leiderman and Reinhart (1993). These papers mostly examine the push-pull factors of the capital flows. Push factors are the external determinants of capital flows from the developed countries to emerging economies such as the interest rates and economic activities in the developed countries. Pull factors are the domestic determinants of capital inflows in a particular emerging market economy such as domestic interest rates, stock market prices, macroeconomic stability, exchange rate regime, inflation, domestic credit level, creditworthiness and industrial production. These studies show that the pull factors have greater effects than the push factors.

3. Overview of Data

Studies on capital flows mostly use data of Foreign Direct Investments and long-term capital flows. This paper examines a more liquid data; monthly transactions realized on behalf and account of foreign banks/brokerage houses or individuals in Istanbul Stock Exchange (ISE) between January 1997 and December 2011. The data consists of both purchases and sales in that particular month in US Dollars.

When controls over foreign exchange lifted in Turkey in 1980's, foreign investments to Turkey steadily increased. According to Central Bank of Turkey, foreign portfolio investments into Turkey have increased from annual average of \$1,163 million in 1986-1995 to \$7,230 million in 2003-2005. A considerable portion of the portfolio investment went to ISE. The share of foreign ownership in the Istanbul Stock Exchange (ISE) went up from 37.9% in 2000 to over 60% in 2006. This is why foreigner's transactions have very important implications in ISE as well as the overall Turkish economy.

4. Methodology and the Empirical Results

The VAR model, originally introduced by Sims (1980), is used in this paper. This model helps us interpret the dynamic relationship between the foreigners' transactions in ISE and ISE Index, NYSE Composite Index, Foreign Direct Investment to Turkey, Interest rate on 3-month US Treasury Bill and US Industrial Production Index.

The estimation of a VAR model requires two steps. First, a vector of economic variables (dated at time t) is regressed on several lags of itself. The residuals from these regressions are interpreted as innovations - new information about the economic variables that became available during period t . In the second step of estimation, the innovations are regressed on themselves, using one of several statistical procedures. The second-stage regressions are often given a structural or behavioral interpretation. Thus, the residuals from the second-stage regressions are often viewed as structural shocks - the unexpected component of a behavioral relationship.

A rise in ISE stock market index is expected to positively affect capital inflows, since it indicates an improvement in the investment opportunities and improved economic fundamentals in the country. A rise in NYSE index is expected to negatively affect capital inflows. A rise in foreign direct investment is expected to positively affect capital inflows. US 3-month Treasury bill rates indicate borrowing costs and alternative rates of return for the investors in capital exporting countries. Therefore, a rise in this variable is expected to have a negative impact on capital flows into Turkey. US industrial production growth implies an increase in the funds available for investment abroad, thus it may have a positive effect on capital inflows.

4.1 Tests for Stationarity

Before applying the model, it is important to check whether the variables are stationary or not. To check this, we performed Augmented Dickey-Fuller Test on all the variables using EViews. Our findings are reported in Table 1.

Table 1. Augmented Dickey-Fuller Test Results

Variables	ADF Test Statistics	
	Level	1st Difference
Purchases	-1.566979	-14.51796
Sales	-1.62396	-14.01792
Net	-11.38546	-17.61634
FDI	-1.979841	-14.28844
ISE	-1.783601	-13.48228
NYSE	-2.313706	-11.18543
TBILL	-1.536614	-4.4707
USIP	-2.810718	-3.115138
Test critical values:	1% level	-3.467418
	5% level	-2.877729
	10% level	-2.57548

The results show that all series except for Net (Purchases – Sales); Purchases, Sales, ISE, NYSE, TBILL and USIP are non-stationary. If we use the first difference they became stationary. 1st differences of Purchases, Sales, ISE, NYSE and TBILL and USIP are used in the VAR Models in the paper.

4.2 Tests for Causality

Granger (1969) developed a test approach to prove that a time series X contribute to the prediction of another series Y. In this section the relationship between Sales, Purchases, Net Purchases, ISE, NYSE and USIP is investigated using Granger Causality test using EViews.

Table 2. Granger Causality Tests

Null Hypothesis:	F-Statistic	Probability
DPURCH does not Granger Cause DISE	2.50455	0.08469
DISE does not Granger Cause DPURCH	11.3373	2.40E-05
DSALES does not Granger Cause DISE	2.44441	0.08979
DFDI does not Granger Cause DISE	2.53349	0.08234
DSALES does not Granger Cause DFDI	4.44745	0.01309
DISE does not Granger Cause DSALES	26.0424	1.30E-10
DTBILL does not Granger Cause DISE	2.39635	0.09408
DISE does not Granger Cause DTBILL	3.63674	0.02838
DUSIP does not Granger Cause DISE	4.92163	0.00835
NET does not Granger Cause DISE	2.43677	0.09046
DISE does not Granger Cause NET	3.72419	0.0261
DNYSE does not Granger Cause DPURCH	10.8172	3.80E-05
DSALES does not Granger Cause DNYSE	4.16309	0.01716
DNYSE does not Granger Cause DSALES	12.9734	5.70E-06
DPURCH does not Granger Cause DSALES	2.66142	0.07273
DTBILL does not Granger Cause DPURCH	3.57958	0.02998
DUSIP does not Granger Cause DPURCH	2.58822	0.07808
DPURCH does not Granger Cause DUSIP	5.66186	0.00416
DTBILL does not Granger Cause DSALES	4.16476	0.01713
DSALES does not Granger Cause DTBILL	3.32534	0.03829
DUSIP does not Granger Cause DSALES	2.44369	0.08985
DSALES does not Granger Cause DUSIP	4.82836	0.00912
DUSIP does not Granger Cause NET	2.78464	0.06454

Table 2 shows the rejected hypothesis that a variables Granger causes another variable. The table actually has interesting implications; US Industrial Production and T-bill Granger cause ISE index, purchases and sales. NYSE Granger causes only purchases and sales not the ISE index. Neither **one** Granger causes FDI however FDI Granger causes only ISE. Sales of foreigners in Istanbul Stock Exchange Granger cause T-bill, USIP, NYSE, ISE and FDI. This is interesting because which might mean that when foreigners sale their shares at ISE, it has direct effects on all other variables since this liquidated money can be easily transferred across the globe. Purchases, on the other hand, Granger causes only ISE, Sales and USIP.

4.3 Estimation

The coefficient values of the VAR model using Purchases and 5 other variables are listed in **Table 3**. **Table 4** shows the same VAR model using Sales data and **Table 5** shows the model using the Net purchases which is calculate as Purchases minus Sales.

Table 3. The Coefficient Values of VAR (1) Model For Foreigners Purchases

	DPURCH	DFDI	DISE	DNYSE	DTBILL	DUSIP
DPURCH(-1)	-0.733119 -0.07819 [-9.37653]	-0.108397 -0.08145 [-1.33078]	-6.47E-09 -1.70E-08 [-0.38942]	4.35E-08 -2.80E-08 [1.54832]	-5.19E-11 -1.70E-11 [-2.99687]	1.36E-10 -5.50E-11 [2.46082]
DPURCH(-2)	-0.346576 -0.0801 [-4.32688]	0.070743 -0.08345 [0.84777]	1.10E-08 -1.70E-08 [0.64512]	5.56E-08 -2.90E-08 [1.92950]	-5.38E-11 -1.80E-11 [-3.02843]	5.51E-11 -5.70E-11 [0.97194]
DFDI(-1)	0.068904 -0.06781 [1.01609]	-0.705706 -0.07065 [-9.98911]	-1.74E-08 -1.40E-08 [-1.20418]	-3.16E-08 -2.40E-08 [-1.29555]	7.44E-13 -1.50E-11 [0.04948]	1.94E-11 -4.80E-11 [0.40484]
DFDI(-2)	0.084403 -0.06755 [1.24950]	-0.46673 -0.07037 [-6.63231]	8.99E-09 -1.40E-08 [0.62660]	-2.84E-08 -2.40E-08 [-1.16699]	1.76E-11 -1.50E-11 [1.17590]	-2.73E-11 -4.80E-11 [-0.57071]
DISE(-1)	1043715 -442600 [2.35815]	137869.8 -461097 [0.29900]	-0.10859 -0.09406 [-1.15453]	-0.2133 -0.15922 [-1.33966]	0.000191 -9.80E-05 [1.94705]	-0.000409 -0.00031 [-1.30762]
DISE(-2)	625001.7 -446539 [1.39966]	-1219964 -465200 [-2.62245]	0.005229 -0.09489 [0.05511]	-0.20618 -0.16063 [-1.28355]	2.29E-05 -9.90E-05 [0.23181]	-0.000389 -0.00032 [-1.23304]
DNYSE(-1)	478812.1 -244089 [1.96163]	124412.2 -254290 [0.48925]	0.110356 -0.05187 [2.12750]	0.182661 -0.08781 [2.08026]	7.85E-05 -5.40E-05 [1.45009]	0.000102 -0.00017 [0.59077]
DNYSE(-2)	153631.7 -244259 [0.62897]	766991.4 -254467 [3.01411]	-0.02751 -0.05191 [-0.52993]	-0.06399 -0.08787 [-0.72829]	0.000136 -5.40E-05 [2.51185]	0.000556 -0.00017 [3.21718]
DTBILL(-1)	4.56E+08 -3.40E+08 [1.34233]	-2.12E+08 -3.50E+08 [-0.59857]	-0.7832 -72.1319 [-0.01086]	-34.2029 -122.103 [-0.28011]	0.326134 -0.07524 [4.33431]	-0.020539 -0.24007 [-0.08556]
DTBILL(-2)	-1.68E+08 -3.30E+08 [-0.50258]	40502129 -3.50E+08 [0.11634]	96.07295 -71.0119 [1.35291]	-19.7386 -120.207 [-0.16420]	0.07509 -0.07408 [1.01368]	0.590347 -0.23634 [2.49788]
DUSIP(-1)	1.01E+08 -1.00E+08 [0.97125]	57669019 -1.10E+08 [0.53128]	50.49185 -22.1422 [2.28035]	141.5653 -37.4818 [3.77691]	0.0358 -0.0231 [1.54992]	0.141771 -0.07369 [1.92382]
DUSIP(-2)	-12311781 -1.10E+08 [-0.11542]	-51270846 -1.10E+08 [-0.46139]	-3.02682 -22.6675 [-0.13353]	58.64388 -38.371 [1.52834]	-0.010189 -0.02365 [-0.43092]	0.231428 -0.07544 [3.06766]

Table 4. The Coefficient Values of VAR (1) Model For Foreigners Sales

	DSALES	DFDI	DISE	DNYSE	DTBILL	DUSIP
DSALES(-1)	-0.649529	-0.066486	-1.80E-08	3.45E-08	-5.35E-11	1.18E-10
	-0.07573	-0.08322	-1.70E-08	-2.90E-08	-1.80E-11	-5.70E-11
	[-8.57654]	[-0.79889]	[-1.05206]	[1.19128]	[-2.98141]	[2.05383]
DSALES(-2)	-0.249311	0.168113	7.90E-09	6.61E-08	-4.95E-11	8.63E-11
	-0.07348	-0.08074	-1.70E-08	-2.80E-08	-1.70E-11	-5.60E-11
	[-3.39302]	[2.08205]	[0.47584]	[2.35472]	[-2.84373]	[1.55050]
DFDI(-1)	0.117041	-0.696759	-1.81E-08	-2.22E-08	-5.91E-12	4.51E-11
	-0.06389	-0.07021	-1.40E-08	-2.40E-08	-1.50E-11	-4.80E-11
	[1.83176]	[-9.92341]	[-1.25544]	[-0.90804]	[-0.39013]	[0.93189]
DFDI(-2)	0.109351	-0.449718	1.19E-08	-1.88E-08	1.26E-11	-1.35E-11
	-0.06362	-0.06991	-1.40E-08	-2.40E-08	-1.50E-11	-4.80E-11
	[1.71888]	[-6.43292]	[0.83076]	[-0.77301]	[0.83526]	[-0.28026]
DISE(-1)	1951316	69992.71	-0.1058	-0.14664	0.000137	-0.000223
	-400410	-440007	-0.09042	-0.15306	-9.50E-05	-0.0003
	[4.87330]	[0.15907]	[-1.17014]	[-0.95807]	[1.44781]	[-0.73542]
DISE(-2)	877015.7	-1089420	0.048722	-0.20042	3.80E-05	-0.000534
	-418819	-460237	-0.09458	-0.1601	-9.90E-05	-0.00032
	[2.09402]	[-2.36708]	[0.51515]	[-1.25185]	[0.38302]	[-1.68360]
DNYSE(-1)	219982.3	152856.1	0.110458	0.185937	7.16E-05	8.94E-05
	-227871	-250406	-0.05146	-0.0871	-5.40E-05	-0.00017
	[0.96538]	[0.61043]	[2.14659]	[2.13463]	[1.32578]	[0.51779]
DNYSE(-2)	148823.1	725553.2	-0.02677	-0.06323	0.000138	0.000577
	-227832	-250362	-0.05145	-0.08709	-5.40E-05	-0.00017
	[0.65322]	[2.89801]	[-0.52031]	[-0.72607]	[2.55795]	[3.34241]
DTBILL(-1)	4.84E+08	-1.93E+08	1.330878	-29.0015	0.331078	-0.000313
	-3.20E+08	-3.50E+08	-71.7532	-121.461	-0.07531	-0.24078
	[1.52267]	[-0.55409]	[0.01855]	[-0.23877]	[4.39645]	[-0.00130]
DTBILL(-2)	-3.59E+08	-64330692	96.23229	-34.4201	0.076266	0.566732
	-3.10E+08	-3.50E+08	-71.0846	-120.329	-0.0746	-0.23853
	[-1.14040]	[-0.18597]	[1.35377]	[-0.28605]	[1.02228]	[2.37591]
DUSIP(-1)	29781353	57772631	49.76927	137.141	0.034064	0.12061
	-9.60E+07	-1.10E+08	-21.6748	-36.6902	-0.02275	-0.07273
	[0.31028]	[0.54773]	[2.29618]	[3.73781]	[1.49745]	[1.65827]
DUSIP(-2)	25539825	-54555893	-3.9742	56.70083	-0.004681	0.240332
	-9.80E+07	-1.10E+08	-22.2126	-37.6005	-0.02331	-0.07454
	[0.25964]	[-0.50471]	[-0.17892]	[1.50798]	[-0.20081]	[3.22433]

Table 5. The Coefficient Values of VAR (1) Model For Foreigners Net (Purchases – Sales)

	NET	DFDI	DISE	DNYSE	DTBILL	DUSIP
NET(-1)	0.374698 -0.09527 [3.93321]	-0.341791 -0.23008 [-1.48551]	1.07E-07 -4.60E-08 [2.30414]	1.66E-07 -8.00E-08 [2.07800]	-6.94E-13 -5.10E-11 [-0.01362]	3.27E-10 -1.60E-10 [2.08025]
NET(-2)	-0.073743 -0.09757 [-0.75579]	-0.331345 -0.23565 [-1.40610]	-9.53E-09 -4.80E-08 [-0.20023]	-4.32E-08 -8.20E-08 [-0.52880]	-7.01E-12 -5.20E-11 [-0.13433]	-2.10E-10 -1.60E-10 [-1.30096]
DFDI(-1)	-0.081374 -0.02999 [-2.71300]	-0.724695 -0.07244 [-10.0039]	-2.94E-08 -1.50E-08 [-2.01059]	-5.06E-08 -2.50E-08 [-2.01813]	2.95E-12 -1.60E-11 [0.18388]	-4.54E-12 -5.00E-11 [-0.09158]
DFDI(-2)	-0.035954 -0.02889 [-1.24453]	-0.463111 -0.06977 [-6.63742]	4.19E-09 -1.40E-08 [0.29739]	-2.69E-08 -2.40E-08 [-1.11222]	1.11E-11 -1.50E-11 [0.71728]	-8.33E-12 -4.80E-11 [-0.17457]
DISE(-1)	-909000.1 -213743 [-4.25278]	367114 -516226 [0.71115]	-0.2588 -0.10426 [-2.48230]	-0.36107 -0.17881 [-2.01927]	0.000128 -0.00011 [1.12171]	-0.00054 -0.00035 [-1.53028]
DISE(-2)	204932.7 -226985 [0.90285]	-735652 -548208 [-1.34192]	0.072218 -0.11072 [0.65227]	0.004354 -0.18989 [0.02293]	-6.81E-05 -0.00012 [-0.56111]	7.44E-05 -0.00037 [0.19840]
DNYSE(-1)	274131.3 -104572 [2.62146]	217686.1 -252560 [0.86192]	0.119699 -0.05101 [2.34668]	0.190983 -0.08748 [2.18310]	8.21E-05 -5.60E-05 [1.46867]	9.10E-05 -0.00017 [0.52711]
DNYSE(-2)	-9935.524 -104728 [-0.09487]	714316.1 -252938 [2.82408]	-0.04678 -0.05108 [-0.91575]	-0.07657 -0.08761 [-0.87400]	0.000122 -5.60E-05 [2.17118]	0.000564 -0.00017 [3.26339]
DTBILL(-1)	-9819874 -1.50E+08 [-0.06771]	-2.96E+08 -3.50E+08 [-0.84580]	-9.91819 -70.74 [-0.14021]	-46.4754 -121.324 [-0.38307]	0.331916 -0.07753 [4.28111]	0.001015 -0.23945 [0.00424]
DTBILL(-2)	1.45E+08 -1.40E+08 [1.02670]	94631378 -3.40E+08 [0.27650]	95.01812 -69.1206 [1.37467]	9.084098 -118.547 [0.07663]	0.033995 -0.07576 [0.44874]	0.613061 -0.23397 [2.62030]
DUSIP(-1)	1.02E+08 -4.40E+07 [2.34521]	1.47E+08 -1.10E+08 [1.39457]	58.65122 -21.3175 [2.75132]	151.3279 -36.5612 [4.13904]	0.035317 -0.02336 [1.51162]	0.132625 -0.07216 [1.83799]
DUSIP(-2)	-12844722 -4.50E+07 [-0.28574]	-99645291 -1.10E+08 [-0.91781]	-10.8937 -21.9268 [-0.49682]	43.09285 -37.6061 [1.14590]	-0.002657 -0.02403 [-0.11055]	0.224456 -0.07422 [3.02419]

When Table 3, 4 and 5 are examined in detail, it is seen that all variables have direct delayed effect on themselves. The tables also show that there is a positive delayed effect of ISE index over foreigners' sales and purchases. However the effect is negative over net transactions. This might show a reversal behavior of foreigners in Istanbul Stock Exchange. When ISE index increases, foreigners tend to increase their sales the following month. We can also see this trend when we look at the coefficient of the net purchases in **Table 4** and net transactions in Table 5. When ISE increases, net purchases tend to increase the following month however the sales tend to be larger than the purchases therefore net transactions are negative. This shows that when ISE Index increases, foreigners tend to realize their profits and sell more than they purchase. When the market index goes down, that's when foreigners tend to invest more in Istanbul stock exchange, taking positions opposite of the stock market. When we look at the net transactions of foreigners in Istanbul Stock Exchange in Table 5, we can see positive delayed effects of NYSE and USIP and negative delayed effects of FDI and ISE.

4.4 Variance Decomposition

The variance decomposition analyses the impact of unexpected shocks on the variables in a more convenient and comprehensive way. Variance Decomposition separates the variation in an endogenous variable into the component shocks to the VAR. Therefore, the variance decomposition provides information about the relative

importance of each random innovation in affecting the variables in the VAR. Variance decomposition determines how much of the forecast error variance of each of the variable can be explained by exogenous shocks to the other variables.

Table 6. Variance Decomposition

Variance Decomposition of DSALES:						
Period	DSALES	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	100	0	0	0	0	0
2	83.91123	0.215273	14.5699	0.458836	0.814178	0.030578
3	81.51097	0.834021	14.42944	0.810885	1.531234	0.883452
4	80.95927	0.822242	14.70766	0.792032	1.85958	0.859217
Variance Decomposition of DFDI:						
Period	DSALES	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	0.119566	99.88043	0	0	0	0
2	0.15287	99.48245	0.080932	0.092619	0.088631	0.102501
3	3.521745	92.12181	1.676356	2.347674	0.090512	0.241903
4	5.246779	87.79813	3.092712	3.286835	0.19632	0.379219
Variance Decomposition of DFDI:						
Period	DSALES	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	1.659786	2.329466	96.01075	0	0	0
2	2.416144	3.012885	89.90293	2.089666	0.036143	2.542233
3	3.807558	4.372235	86.39208	2.041537	0.83775	2.548837
4	4.134953	4.552867	84.90256	2.119094	1.288763	3.001759
Variance Decomposition of DPURCH:						
Period	DPURCH	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	100	0	0	0	0	0
2	91.38041	0.046206	5.941726	1.582972	0.727877	0.320808
3	90.72291	0.158414	6.015218	1.543111	1.104232	0.456113
4	89.97375	0.188414	6.438207	1.529334	1.333847	0.53645
Variance Decomposition of DFDI:						
Period	DPURCH	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	0.23276	99.76724	0	0	0	0
2	1.170234	98.46445	0.109137	0.053887	0.105424	0.096872
3	2.973256	92.01697	2.153083	2.499162	0.102733	0.254794
4	3.185265	89.77143	2.898599	3.53883	0.157174	0.448704
Variance Decomposition of DISE:						
Period	DPURCH	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	11.30942	2.568244	86.12234	0	0	0
2	11.04466	3.037563	81.20597	2.109645	0.024217	2.577949
3	11.93148	4.109767	78.3577	2.066852	0.895784	2.638418
4	12.34552	4.199419	76.87734	2.175952	1.269054	3.132721
Variance Decomposition of NET:						
Period	NET	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	100	0	0	0	0	0
2	86.92468	1.389648	6.202023	3.088361	0.002986	2.392304
3	86.28529	1.413305	6.156877	3.105904	0.622779	2.415845
4	85.19404	1.398299	6.185232	3.151269	0.797526	3.273637
Variance Decomposition of DFDI:						
Period	NET	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	2.562726	97.43727	0	0	0	0
2	4.482016	94.03479	0.469656	0.188435	0.210407	0.6147
3	4.625491	90.82693	0.855391	1.959097	0.27946	1.453636
4	5.122558	88.61223	0.987248	3.278773	0.267033	1.732157
Variance Decomposition of DISE:						
Period	NET	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	28.18175	3.787449	68.03081	0	0	0
2	26.20343	4.538059	63.21261	2.539726	0.000472	3.505708
3	26.13201	5.407535	61.47247	2.564308	0.9884	3.435274
4	25.70294	5.537511	60.61557	2.675842	1.32104	4.147093

Table 6 shows the results of the variance decomposition up to 4 periods because after 4 periods the variance percentages have been found approximately steady. The table shows that sales, purchases and net transactions are completely explained (100%) by their innovations in the first period, but in second period it drops to 83.91%, 91.38% and 86.92% respectively.

The interesting result is that shocks to Istanbul Stock Exchange explain 14.57% of the forecast error variance in sales in the second period. Other variables like NYSE, TBILL and USIP do not have much effect. When it comes to purchases and net transactions, shocks to ISE explain only 5.94% and 6.20% respectively of the forecast error variance in the second period. Shocks to the other variables like NYSE and USIP explain more.

4.5 Impulse-response Analysis

A shock to any variable not only directly affects that variable but also is transmitted to all of the other endogenous variables through the dynamic (lag) structure of the VAR. An impulse response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. Therefore, one can detect the dynamic relationships over time.

Table 7. Impulse Response of DSALES

Period	DSALES	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	1	0	0	0	0	0
2	-0.64953	0.117041	1951316	219982.3	4.84E+08	29781353
3	0.114893	-0.08996	-561115	317574.1	-5.39E+08	1.60E+08
4	0.190345	-0.00915	-522888	-9581.937	3.44E+08	1445576

Table 8. Impulse Response of DPURCHASES

Period	DPURCH	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	1	0	0	0	0	0
2	-0.73312	0.068904	1043715	478812.1	4.56E+08	1.01E+08
3	0.187622	-0.04568	-300518	59890.11	-3.87E+08	68612118
4	0.179514	-0.04343	-557156	37624.41	2.76E+08	54712861

Table 9. Impulse Response of DNET (Purchases – Sales)

Period	NET	DFDI	DISE	DNYSE	DTBILL	DUSIP
1	1	0	0	0	0	0
2	0.374698	-0.08137	-909000	274131.3	-9819874	1.02E+08
3	0.076085	0.00489	-85880.6	27136.32	1.59E+08	14997457
4	0.001683	0.003891	37834.52	47571.73	75629704	63235725

Table 7, Table 8 and Table 9 report the impulse response coefficients of sales, purchases and net transactions. Figure 1, 2 and 3, on the other hand shows the effects of one standard deviation shocks to T-Bill and US Industrial production over Purchases, Sales, Net Transactions, FDI and ISE.

Table 7 and Table 8 show that the foreigners' sales and purchases respond positively to shocks to ISE in the second period however the response becomes negative in period 3. When it comes to NYSE, the response is also positive however it becomes negative only after 3rd period for Sales only.

Table 9 shows that net transactions respond negatively for the second and third periods to ISE however the response becomes positive in the fourth period. The response is always positive to NYSE.

The graphs of the impulse response coefficients provide a better picture to analyze the shocks. Figure 1, 2 and 3 show responses of each variable over 10 periods to a one standard deviation shock.

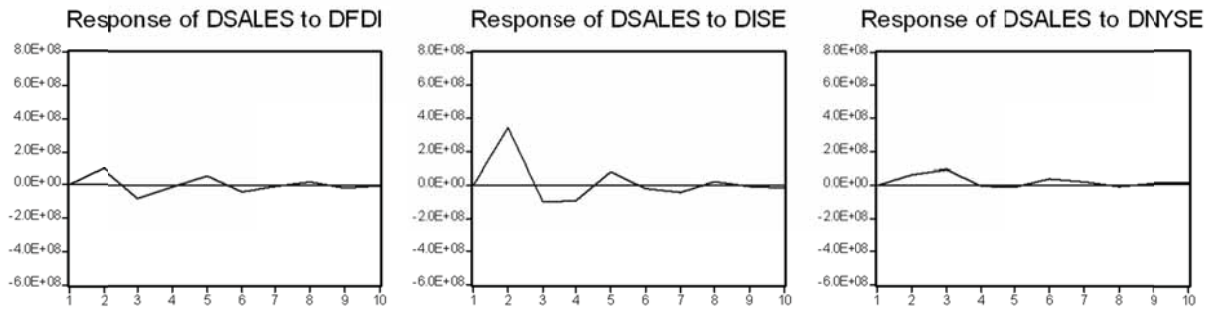


Figure 1. Response of DSALES to DFDI, DISE and DNYSE (Response to Nonfactorized One S.D. Innovations)

Figure 1 shows the response of one standard deviation shock to FDI, ISE and NYSE over sales. There is a positive effect of FDI over Sales in the second period but this effect becomes negative in the third period, and then back to positive in the fifth period before it levels. The positive effect of ISE and NYSE over Sales becomes negative in the third period and then back to positive in the fifth period before it levels.

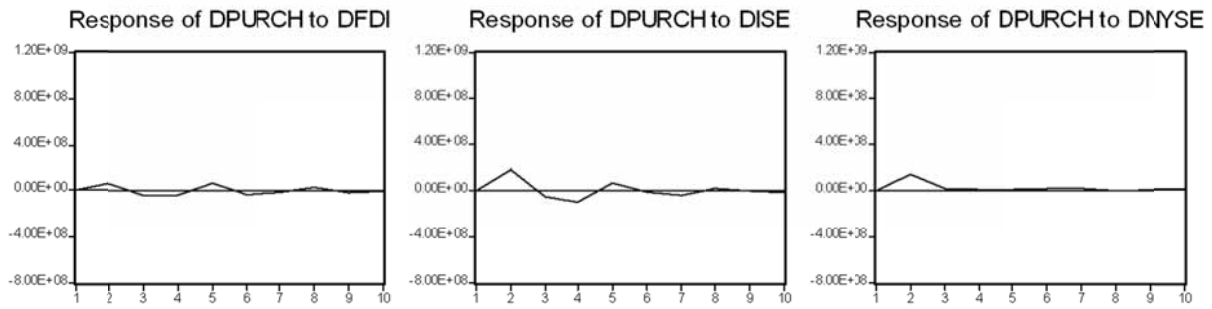


Figure 2. Response of DPURCH to DFDI , DISE and DNYSE (Response to Nonfactorized One S.D. Innovations)

Figure 2 shows the response of one standard deviation shock to FDI, ISE and NYSE over purchases. We can see that there is a positive response in the second period; this response becomes negative in the third period and then levels.

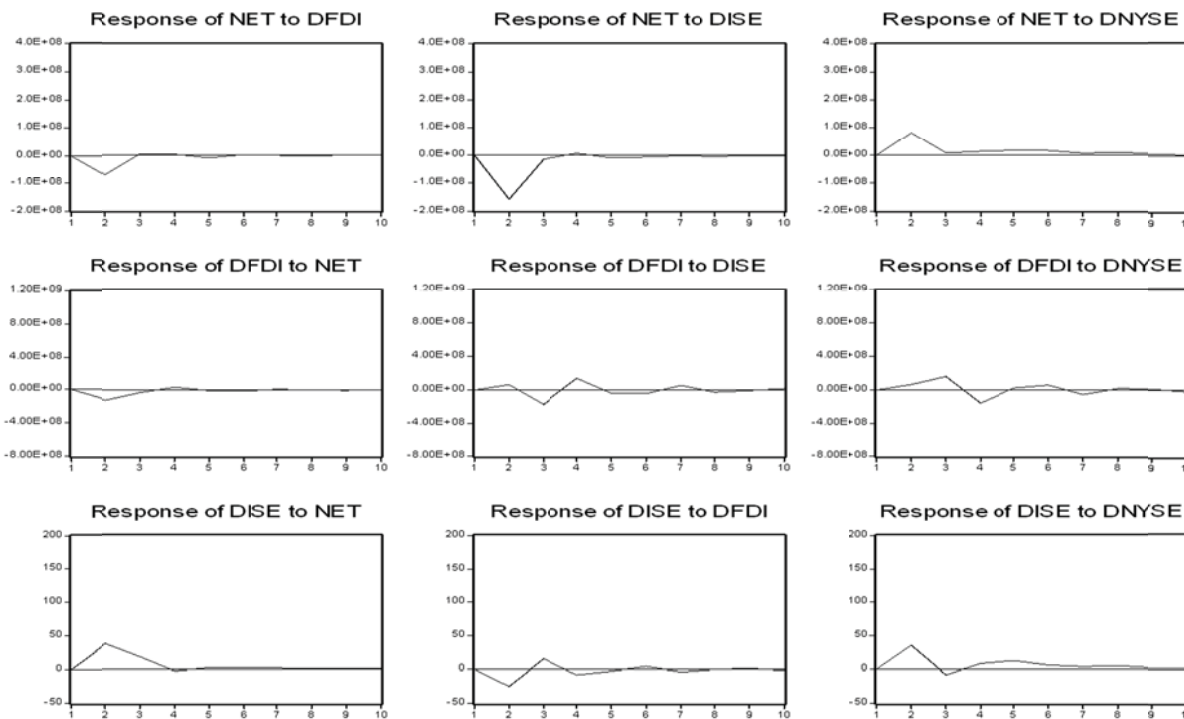


Figure 3. Response of NET to DFDI, DISE, and DNYSE; DFDI to NET, DISE, and DYNSE; DISE to NET, DFDI and DNYSE (Response to Nonfactorized One S.D. Innovations)

Figure 3 shows the response of one standard deviation shock to FDI, ISE and NYSE over net transactions, one standard deviation shock to NET, ISE and NYSE over FDI and one standard deviation shock to NET, FDI, and NYSE over ISE. There is a negative response of both FDI and ISE over net transactions in the second period and then levels. This again shows that when ISE Index decreases, foreigners tend to invest more by taking positions opposite of the stock market. However, the story is different when it comes to NYSE. When NYSE Index increases, foreigners also tend to increase their investments at ISE. We can also see in **Figure 3** that there is a negative effect of foreigners’ net transactions over FDI in the first three periods.

5. Conclusion

Increasing amounts of capital flows to developing countries and emerging market economies tend to stimulate economic activity in these countries on one hand, and lead to serious macroeconomic fluctuations on the other hand. Foreigners’ activities in an emerging market, specifically in a stock market can have serious implications over the stock market as well as the overall economy of that country.

This paper analyzes the causes of capital inflows by a VAR model; specifically monthly transactions by foreigners in Istanbul Stock Exchange (ISE). The model investigates the effects of Foreign Direct Investment, ISE index, NYSE index, US Treasury Bill and US Industrial production over sales, purchases and net transactions of foreigners in Istanbul stock market.

In addition, the relationship between Sales, Purchases, Net Purchases, ISE, NYSE and USIP is investigated using Granger Causality test. Results show that US Industrial Production and T-bill Granger cause ISE index, purchases and sales. NYSE Granger causes only purchases and sales not the ISE index. Neither one Granger causes FDI; however FDI Granger causes only ISE. Sales of foreigners in Istanbul Stock Exchange Granger cause T-bill, USIP, NYSE, ISE and FDI. Purchases, on the other hand, Granger causes only ISE, Sales and USIP.

Variance decomposition analysis also reveals that shocks to Istanbul Stock Exchange explain only 14.57% of the forecast error variance in sales in the second period. Other variables like NYSE, TBILL and USIP do not have much effect.

Impulse response analysis shows that a one standard deviation shock to ISE has a positive effect in the second period over foreigners' purchases and sales but this effect becomes negative in the third period. The response is always positive to NYSE. There is a negative response of both FDI and ISE over net transactions in the second period and then levels. This shows that when ISE Index decreases, foreigners tend to invest more by taking positions opposite of the stock market. However, the story is different when it comes to NYSE. When NYSE Index increases, foreigners also tend to increase their investments at ISE.

References

- Alper, C. E., & Saglam I. (2001). The Transmission of a Sudden Capital Outflow: Evidence from Turkey. *Eastern European Economics*, 39(2), 29-48.
- Balkan, E., Biçer, G., & Yeldan A. (2002). Patterns of Financial Capital Flows and Accumulation in the Post-1990 Turkish Economy. Paper presented at the IDEAS session at METU International Conference on Economics. Ankara.
- Basdas, U., & Gazioglu, S. (2009). Investment Opportunities for Foreign Capital and Economic Fragility in Turkey. *Working Paper*. <http://dx.doi.org/10.2139/ssrn.1432763>
- Brunner, A. D. (2000). On the Derivation of Monetary Policy Shocks: Should We Throw the VAR out with the Bath Water? *Journal of Money, Credit and Banking*, 32(2), 254-279 <http://dx.doi.org/10.2307/2601242>
- Calvo, G., Leiderman L., & Reinhart C. M. (1993). Capital Inflows and Real Exchange Rate Appreciation in Latin America: The Role of External Factors. *IMF Staff Papers*, 40(1).
- Calvo, G., Leiderman L., & Reinhart C. M. (1996). Inflows of Capital to Developing Countries in the 1990s, *Journal of Economic Perspectives*, 10(2). <http://dx.doi.org/10.1257/jep.10.2.123>
- Calvo, G., Leiderman L., & Reinhart C. M. (1994). The Capital Inflows Problem: Concepts and Issues. *Temporary Economic Policy*, 12(3).
- Celasun, O., Denizler C., & He D. (1999). Capital Flows, Macroeconomic Management and the Financial System: The Turkish Case, 1989-97. *The World Bank Working Paper*. No.2141.
- Cevis, I., & Kadilar, C. (2001). The Analysis of the Short-term Capital Movements by Using the VAR Model: The Case of Turkey. *The Pakistan Development Review*, 40(3), 187-201.
- Culha, A. A. (2006). A Structural VAR Analysis of the Determinants of Capital Flows into Turkey. *Central Bank Review*. No.2. 11-35.
- Fernandez-Arias, E., & Montiel P. (1996). The Surge in Capital Inflows to Developing Countries: An Analytical Overview. *The World Bank Economic Review*, 10(1). <http://dx.doi.org/10.1093/wber/10.1.51>
- Hoggarth, G., & Sterne G. (1997). Capital Flows: Causes, Consequences and Policy Responses. *Handbooks in Central Banking*, CCBS, Bank of England.
- Kara S. U. (2007). The Determinants of Capital Flows: The Turkish Evidence. *MS Thesis in the Department of Economics*. University of METU.
- Lopez-Mejia, A. (1999). Large Capital Flows: A Survey of the Causes, Consequences, and Policy Responses. *IMF Working Paper*. No. 99/17.
- Mody, A., Taylor M. P., & Kim J. Y. (2001). Modeling Fundamentals for Forecasting Capital Flows to Emerging Markets. *International Journal of Finance and Economics*, 6(3). <http://dx.doi.org/10.1002/ijfe.159>
- Taylor, M., & Sarno L. (1997). Capital Flows to Developing Countries: Long and Short-Term Determinants. *The World Bank Economic Review*, 11(3), 201-216. <http://dx.doi.org/10.1093/wber/11.3.451>
- Yentürk, N. (1999). Short-Term Capital Inflows and Their Impact on Macroeconomic Structure: Turkey in the 1990s. *The Developing Economies*, 37(1), 89-113. <http://dx.doi.org/10.1111/j.1746-1049.1999.tb00866.x>
- Ying, Y. H., & Kim Y. (2001). An Empirical Analysis on Capital Flows: The Case of Korea and Mexico. *Southern Economic Journal*, 67(4), <http://dx.doi.org/10.2307/1061580>

Notes

Note 1. Istanbul Stock Exchange was established in 1985 and its importance in Turkish capital markets as well as other regional markets has been increasing ever since. As of December 2009, its market capitalization was USD 236 billion with 315 listed companies which ranked 10th among emerging markets. It is the most developed and

liquid stock market in the region. It is ranked 7th, ahead of Bombay behind South Africa, in the developing countries as far as the trading volume is concerned. Turkey being the 16th largest economy in the world, ISE is a rising financial center. Only 20% of the largest industrial enterprises are listed in the stock markets, which show a huge potential for future listings.

The Altruistic Motive of Remittances: A Panel Data Analysis of Economies in Sub Saharan Africa

Dobdinga Cletus Fonchamnyo

Correspondence: Dobdinga Cletus Fonchamnyo, Faculty of Social and Management Sciences, Department of Economics and management, University of Buea, Cameroon. E-mail: dfonchamnyo@yahoo.com

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Abstract

Remittances have become an important source of foreign exchange earnings in many countries as migrants continue to send income to relatives at home. However, the main motives for sending remittances remain controversial. This paper examines the relative importance of the socio-political and economic determinants of remittance inflow using an unbalance panel data of 36 economies in the Sub Saharan African Region in an attempt to assess the altruistic motive of remittance inflow. The results using a random effect estimation technique show that altruism is important for remitting, as the per capita income differential between host and home country and the age dependency ratio are positive and statistically significant. The level of per capita income of the home country is also found to be negative and statistically significant which also supports the altruistic motive of remittances. The results further suggest that the development of the financial sector and the proportion of Catholics in the population will encourage remittance inflow. These results are robust to the different specifications and estimation methodology.

Keywords: remittance, altruism, Sub Sahara Africa

JEL classification: D64, F22, F24, O15

1. Introduction

With the emergence of globalization, workers' remittances – the repatriated earnings of emigrants have become a major phenomenon in international finance. This practice of migrants sending income to family members at home has been occurring for many decades, but the magnitude of remittances, both on the national and international level has skyrocketed in recent years, consequently drawing much attention. According to World Bank estimates, remittances to Sub Saharan African countries totaled about \$3.2 billion in 1995 and increased to \$4.6 billion in 2000. In 2005, migrants in Sub Saharan Africa sent home approximately \$9.4 billion, up by more than 102% from 2000. In 2007, the World Bank reported that remittances to Sub Saharan Africa grew to approximately \$18.6 billion which is about 3.7 percent of the Gross Domestic Product (GDP). However, these numbers declined in 2008 and 2009 to about 3.4 percent of GDP.

The numbers above indicate that remittances are developing into an important source of income for many countries in this region and thus have significant effects on their economic stability and growth. To illustrate this on a global scale, remittances now account for almost a third of global external finance. For many of the developing nations the flow of remittances can increase the GDP by a significant percentage. For example, in 2000 the United Nation reported that remittances increased the GDPs of El Salvador, Jamaica, Jordan, and Nicaragua by about 10%. World Bank estimates showed that in 2007, remittance inflows accounted for approximately 29%, 10%, and 11% of the GDP of Lesotho, Cape Verde and Gambia, respectively. These numbers however decreased in 2009 to 26% and 9% respectively for Lesotho and Cape Verde following the financial crisis.

Despite the increased interest in remittances, relatively little work is being done to improve the understanding of the varying nature of remittance inflow to many developing countries, especially those in the Sub Saharan African Region. Previous works on the economics of remittances have investigated the effect of remittances in specific countries or regions. Moreover, the few papers that have investigated the determinants of remittance inflow have concentrated on Latin American economies, South Eastern European countries, North Africa, and Asia economies, focusing mainly on the micro economic determinants. Thus, there is a need to investigate not

only the determinants of remittance inflow but to look at the role of altruism in influencing remittance inflows to the economies of Sub Saharan Africa.

This paper will therefore contribute to the remittance literature by investigating the macroeconomic and political motives for workers' remittances. Specifically, it verifies whether remittances are altruistic in nature, that is, whether or not remittances are countercyclical by increasing during period of hardship and vice versa. It is worth noting that the countries in the Sub Saharan Africa do not only have a large migrant population, but are very poor, heavily indebted, and characterized by political instability. Moreover, in recent years, this region has continued to witness a tremendous growth in remittance inflows, implying that remittance can be a key factor in improving the living standards in this region. Hence, there is a need to improve our understanding of the factors that account for the varying nature of remittance inflow in this region.

The remainder of this paper is organized as follows: In the section on the economics of remittance inflows, a short survey of the existing literature on the determinants of remittance inflow is presented. Both the theoretical and empirical literatures are reviewed. The section on data description and estimation methodology discusses the data used in the analysis and presents the equation to be estimated. The section on estimation results discusses the estimation technique employed. This section also discusses the results from the estimation. The last section presents the policy implication of the findings in this paper and concludes.

2. The Economics of Remittance Inflows

2.1 Theoretical Literature

There is a vast body of theoretical literature explaining the motivations of migrants to remit money to their relatives at home. Remittances are sent due to a combination of factors which include; altruism, exchange or self-interest and insurance. Understanding these motives has been on the agenda of researchers for the past two to three decades. Rapoport and Docquier (2005) provide an excellent overview of the theoretical models. On the one hand, it is widely acknowledged that altruism towards family members at home is an important motivation for remitting (Johnson and Whitelaw, 1974; Lucas and Stark, 1985). The altruistic behavior is modeled by allowing the utility of a remitter to be derived from the well-being or consumption level of those recipients left behind (Becker, 1974). This basically implies a negative relationship between the income of the recipient and the amount of remittances.

In contrast to altruism, self-interest is also a motive to remit if migrants send remittances with the aspiration to inherit, to demonstrate laudable behavior as an investment for the future or with the intent to return home. If a migrant wants to invest at home, the household can be a trustworthy and well-informed agent. A migrant who intends to return home may invest in housing, livestock etc. and will ask the family to be the agent. The migrant may also send remittances to invest in his reputation at home. Inheritance may be used as a blackmailing device by the household head to receive remittances. According to this theory, remittances increase with the household's assets and income, the probability of inheriting (dependent on the age of parents, number of siblings, etc.), the migrant's wealth and income, and decreases with risk aversion. Only in the case of the aspiration to inherit, can self-interest be distinguished from altruism in the migrant's behavior and a larger income and or wealth of the household should lead to more remittances.

Other papers (Poirine, 1997; Ilahi and Jafarey, 1999) have emphasized the idea of remittances as repayments to the family who finances migration in the first place. This suggests a U-shaped relation between the family's pre-transfer income and remittances. Poor families are unable to make the investment in migration costs while wealthy families have less incentive to send a family member abroad to increase family income. Thus, assuming that wealthy families can invest more in education, remittances should first increase and then decrease in the migrant's skill level.

The phenomenon of migration might also be seen as a means of reducing risk by diversifying the sources of a family's income (Stark, 1991a & 1991b). In this framework, remittances act like an insurance against income shocks that might hit the recipients in the home country (Agarwal and Horowitz, 2002; Gubert, 2002). At the macroeconomic level, this implies that remittances will increase if output is more volatile in the recipient country.

Finally, remittances may be seen in an exchange framework, where they represent a payment by the migrant for services provided by family members, such as taking care of her relatives or property (Cox, 1987; Cox, Eser and Jimenez, 1998). If the family's marginal utility decreases in income, more remittances are required to guarantee the provision of services at home. Hence, a higher pre-transfer income of the family and lower unemployment at home would raise the amount of remittances.

2.2 Empirical Literature

The empirical literature has largely focused on the microeconomic level using survey data. Many of these studies indicated that the education and the income level of the migrant and his family are the major determinants of remittances. Durand et al. (1996) showed that migrant's wage and job situation, the number of dependents at home, marital status, and age of the migrant are major factors that shaped the amount remittance. Briere et al. (2002) used household survey data from the Dominican Republic to test between two motivations to remit: insurance, whereby migrants remit on the basis of an insurance contract with their parents; and investment, whereby migrants remit on the basis of potential bequests from their families. The authors found that the importance of these two motivations to remit varies by destination (internal vs. international migration) and gender. The insurance motive is mainly fulfilled by female international migrants to the US. Female migrants to the US send more remittances when their parents are ill, while male migrants to the US do not do this unless they are the sole migrant from the household. The motive of migrants to remit also crucially depends on whether migration is temporary or permanent. For temporary migrants, remittances are often obligatory, while remittances send by permanent migrants are gifts to relatives in the home country (Glytsos, 1997). Agarwal and Horowitz (2002) recently tested altruism versus risk sharing motives to remit and gave evidence supporting the altruistic incentive. A detailed overview of the microeconomics determinant is given in Buch and Kuckulenz (2004).

Another strand of literature, reviewed by Aydas and Metin-Ozcan (2004), has investigated the macroeconomic determinants of remittances. In this paper, this second path is followed in an attempt to better understand how the macroeconomic and political environment affect remittance flows to the countries in the Sub Saharan African Region. Macroeconomic studies have emphasized determinants such as the level of economic activity in the host and the home countries, the wage rate, inflation, interest rate differentials and the efficiency of the banking system (El-Sakka and McNabb, 1999). Wahba (1991) suggested that political stability, consistency in government policies and financial intermediation have a significant influence on the flow of remittances. In a sample of five Mediterranean countries, Faini (1994) found evidence that the real exchange rate is also a significant determinant of remittances. Real earnings of workers and total number of migrants in the host country were consistently found to have a significant and positive effect on the flow of remittances (Swamy, 1981; Straubhaar, 1986; El-Sakka and McNabb, 1999; Chami, Fullenkamp and Jahjah, 2005).

In addition, demographic factors like the share of female employment or a high age dependency ratio in the host country have a negative influence on remittances, while illiteracy rates have a positive effect (Buch and Kuckulenz, 2004). Aydas et al. (2004) indicated that the black market premium, interest rate differential, inflation rate, growth, home and host country incomes and periods of military regime have significantly affected Turkish remittance flows. Chami, Fullenkamp and Jahjah (2005) found a statistical significant negative relation between the income gap of the recipient country against the US and workers' remittances in percent of GDP. Buch and Kuckulenz (2004) found out that economic growth and the level of economic development do not have a clear cut impact on the magnitude of remittances a country receives.

The above discussion on the recent empirical literature on workers' remittances suggests that altruism tend to play an important role in workers' decision to remit. However, the impact of other macroeconomic variables (e.g. interest rate differential, inflation differential) on such decision is not clear-cut. The present study develops a simple empirical model of macroeconomic and political determinants of workers' remittances to shed further light on the role of altruism in the context of the countries in the Sub-Saharan African Region.

3. Data Description and Estimation Methodology

In this paper, an unbalance panel data of 36 countries (see Table 1, below) in the Sub Saharan African Region is used to investigate the forces that account for remittance inflow in Sub Saharan Africa from 1980 to 2009.

Table 1. List of countries included in the study

Botswana	Kenya	Senegal
Benin	Lesotho	Sao Tome and Principe
Burkina Faso	Madagascar	Seychelles
Cameroon	Malawi	Sierra Leone
Cape Verde	Mali	South Africa
Comoros	Mauritania	Sudan
Congo, Republic	Mauritius	Swaziland
Cote d'Ivoire	Mozambique	Tanzania
Gabon	Namibia	Togo
Gambia, The	Niger	Uganda
Ghana	Nigeria	Zimbabwe
Guinea	Rwanda	
Guinea-Bissau		

Source: World Development Indicators (2009)

The table shows the number of the countries that were included in the analysis. The rest of the countries in this Sub Region were not included due to missing data.

In addition to the altruistic motives to transfer money to the home country, the paper also investigates the impact of other factors which may influence the decision of foreign workers to remit. From the review of the literature regarding the relative importance of the various factors, the altruistic motive of remittance inflow can be captured by equation (1) below:

$$\begin{aligned}
 Remit_{it} = & \beta_0 + \beta_1 Income_{it} + \beta_2 Infl_{it} + \beta_3 Regime_{it} + \beta_4 Fin_Dev_{it} \\
 & + \beta_5 Age_dep_{it} + \beta_6 Interest_Dif_{it} + \sum_{j=1}^K \phi_j X_{jit} + \alpha_i + \varepsilon_{it}
 \end{aligned}
 \tag{1}$$

Where *Remit* is the ratio of remittances to GDP; *income* is the GDP per capita of the home country; *Infl* is the rate of inflation of the home country; *Regime* is the type of political regime; *Fin_Dev* is financial sector development; *Age_dep* is age dependency; *Interest_Dif* is the real interest rate differential and *X_{jit}* is a set of other variables included in the regression equation. α_i is a country specific fixed-effects and ε_{it} is the error term.

GDP per capita of the home country would be used as a proxy for the economic condition in the migrants' home country. The economic condition is considered as one of the important determinants of workers' remittances. Altruistic motive is believed to play a prominent role in sending remittances, thus an adverse economic situation in the migrants' home country, which results in a fall in family income at home may lead to a surge in inflow of remittances.

In order to further verify the effect of the income level on remittance inflow, we will follow Chami et al. (2008) and Schiopu and Siegfried (2005) by using income differential between host and home country to reflect the altruistic motive to remit. The income differential will be measured as the difference in income between country *i* and the United States (i.e. $(Income_differential = y_{USA} - y_i)_t$) (Note 1). A positive coefficient will indicate that remittances are countercyclical, since they increase when the income gap between country *i* and the United States widens and decrease when the income gap narrows. It is worth noting that the results may be biased since worker's remittance comes from other countries. However, we are using United States as a representation of other countries based on the assumption that the income level in US does not differ much from most of the host economies.

Regime type captures the type of political regime in a country in a given year. It takes the value 1 if the political regime is democratic and zero otherwise. As a proxy for regime type we will use the Polity IV project's assessment of constitutional democracy. The sign can either be positive or negative. A democratic regime on the one hand may not encourage emigration and hence will not receive as much remittances as undemocratic regimes. In this case the coefficient will be negative. On the other hand democratic regimes as opposed to

undemocratic regimes can create institutions that are conducive to channel and manage remittances, hence will enhance and encourage remittance inflow.

Age dependency ratio gives the number of dependents to the working age population. The expected effect on remittance inflow is positive and will further support the altruistic motive. This is because there is a higher need for remittance inflow in countries with a high ratio of dependents to working age population.

Improvement of the *financial sector* development will reduce the cost of sending remittances, hence should stimulate remittances (IMF, 2005). In the absence of a good measure for the development of the financial sector, we will follow Wahba (1991) by using bank deposits per GDP in the receiving countries as a proxy for financial development.

The domestic *inflation* rate captures the degree of macroeconomic instability. The expected impact on remittances is not clear-cut. While an unstable macroeconomic environment creates incentives to migrate abroad, high inflation might also have a positive impact on remittances. This is because high inflation rate and greater uncertainty about future price changes will result to lower expected rate of return on money remitted. The expected impact of inflation on remittances would thus be negative.

Interest rate differential is a proxy for the investment opportunities or return on financial assets in the remittance receiving country. It is computed as the home country real interest rate minus host country real interest rate and is defined as: $Interest_Dif_{it} = (r_i - r_{USA})_t$ (Note 2). If remittances are influenced by investment motive then the level of remittances should be positively correlated with the return on financial assets. Therefore, the amount of remittances to the home country can be negatively correlated with the host country real interest rate or positively correlated with the home country real interest rate. A positive coefficient on the real interest rate differential implies that remittances behave like other opportunistic capital flows, assuming equal market risk in both countries.

The following additional variable is also controlled for: religion (Note 3). However, there were also a set of variables for which sufficient data were not obtained. Data on the number of migrants, for instance, have not been available for a sufficiently large set of countries and a sufficiently long time period. For the same reason, we could not include unemployment and political stability, as a proxy for the level of economic activity and political atmosphere, respectively in the home country. With high unemployment, both the incentives to migrate and the need of the migrants' families are higher. An unstable political atmosphere would also encourage migration, but may not lead to inflow of worker's remittance.

With the exception of the variable on regime type, the variables used in this study were obtained from the World Development Indicators of the World Bank.

4. Estimation Results

From Table 2 below, the pairwise correlation between remittance inflow and the main variables of interest shows that remittance inflow is negatively and significantly correlated with income level, albeit very low (less than 15 percent).

Table 2. Pairwise correlation

	Remit	Religion	Income level	Income Differential	Age Dependency	Inflation
Remittance	1					
Religion	0.16***	1				
Income level	-0.11***	0.27**	1			
Income differential	0.04	-0.16***	-0.49***	1		
Age dependency	0.09***	0.14***	-0.45***	-0.09**	1	
Inflation rate	-0.04	-0.02	-0.13***	-0.08**	-0.02	1
Financial development	0.2***	0.06**	0.14***	-0.03	-0.09***	-0.08**
Regime type	-0.015	-0.09***	0.14**	0.26***	-0.36***	-0.03
Interest differential	0.04	0.02	-0.07**	0.14**	-0.09**	-0.59***
Interest rate	-0.04	0.08**	0.07*	-0.99***	-0.05	-0.61***

***, ** and * statistically significant at one, five and ten percent levels, respectively

There is also a positive and statistical significant correlation between religion, age dependency financial development and remittance inflow. The relationship between remittance and income differential is negative but insignificant.

Part of the correlation noted between remittance inflow and its determinants may be spurious, reflecting the effects of other factors. This section checks whether the pairwise correlation observed are robust in a multivariate regression analysis. The analysis looks at the relationship between the variables discussed above and workers' remittances using a panel model. A good model to use here is either the random or fixed effect model. This is because they account for the individuality of each cross – sectional unit. In order to decide on which model is best the Hausman test for model specification is applied. The results do not allow us to choose the fixed effects model at 10% level. Thus, the results for the Error Component Model (Random Effect Model) are presented. To check on the robustness of these results, the regression equation is also fitted using the instrumented variable via the Generalized Methods of Moment (GMM) using the default heteroskedasticity-robust weight matrix estimation technique. In order to solve potential problems of heteroskedasticity, all the results are estimated using robust standard errors.

Table 3 below presents the estimated results of the determinants of remittance inflow to the economies of the Sub Saharan African region.

Table 3. Empirical results for remittance determination

Dependent variable: Remittance to GDP				
Variable	Error component model (Random effect model)		Instrumental variable estimation (GMM)	
	Coefficient (z-statistics)	Coefficient (z-statistics)	Coefficient (z-statistics)	Coefficient (z-statistics)
Income level _t	-0.0005** (-2.50)	-	- 0.0019*** (-6.88)	-
Income differential _t	-	0.0002*** (3.71)	-	0.0001** (2.19)
Dependency ratio _t	0.2028*** (5.22)	0.4213*** (5.50)	0.2586*** (4.84)	0.3549*** (6.22)
Inflation rate _t	0.0361** (2.07)	-0.0321 (-0.72)	0.0729** (2.17)	-0.0336 (-0.73)
Financial development _t	0.3119*** (4.05)	0.4985*** (5.18)	0.2827*** (4.04)	0.4345*** (3.34)
Regime type _t	-0.5905 (-0.75)	-0.7016 (-0.60)	-1.1566 (-1.10)	-0.5978 (-0.51)
Interest differential _t	0.0461** (2.08)	0.1799*** (3.06)	0.1832*** (3.40)	0.1461** (2.45)
Religion	0.1392* (1.75)	0.1798** (2.07)	0.1788*** (4.33)	0.1393*** (4.08)
Constant	-13.387** (-2.56)	-54.9587*** (-5.57)	-27.0117*** (-4.56)	-41.626*** (-6.90)
Wald chi2(7)	45.75	45.29	46.01	46.48
Number of observations	509	509	509	509
Number of groups	32	32		
R-Square	-	-	0.2104	0.1939

***, **, * significant at 1%, 5% and 10% levels, respectively.

From Table 3, the main variables of interest, income level and income differential are found to be significant with the expected coefficient. The result from column one shows that there is a negative and statistical significant relationship between remittance inflow and the level of per capita income. Precisely, an increase in real per capita income will lead to a reduction in the level of remittance inflow to the SSA region. To validate if the result on income level explains the altruistic motive to remit, column 2 presents results estimated using the income differential between the host and home country. The result shows that the lower the income of remittance

receiving country relative to sending country, the higher the amount of workers' remittance inflow. This means that the flow of remittances tends to increase when home country income is relatively low. Thus, remittances are countercyclical, compensatory in nature and are used for altruistic motive.

The effect of age dependency on remittance inflow is positive and significant. Thus, workers' remittances increase with increase in the age dependency ratio. This result can also be considered as supporting the idea that remittance inflows are generally used to assist the poor and unemployed family members left behind. Thus, it further supports the altruistic motive of remittances and the fact that they are countercyclical in nature.

We find that the proxy for financial sector development is positively related to the inflow of remittances. The main implication of this result is that improvement in the financial sector development of the home country will increase the inflow of remittances by making it easier and cheaper to transfer money.

The inflation rate is positive and significant in models with income level, but insignificant and negative when income differential is used. The positive and significant effect of inflation on remittance inflow may also support the altruistic motive for remittances, which postulates that an increase in inflation will negatively affect the family income of those left behind, thus a need for more remittance inflow to offset this negative effect on real income.

Other results presented in Table 3 show that remittance inflow is positively correlated with the proportion of Catholics in the total population. That is, the higher the proportion of Catholics in the population relative to other denomination, notably Muslim the higher the inflow of worker's remittance. It is unfortunate that this variable does not vary over the years, and so may not reflect the current trend in the proportion of Catholics in the population. Interest rate differential is also positive and has a significant influence on the inflow of worker's remittance. The regime type variable is negative but statistically insignificant.

5. Conclusion and Policy Implication

This paper looks at the socio – political and macroeconomic determinants of remittance inflow in an unbalance panel data of 36 countries in the Sub Saharan African Region. The findings in this paper complement the empirical evidence reviewed above which indicates that remittance inflow are compensatory transfers. In this regard remittances are used to compensate family members who are dependent or used to compensate for bad economic conditions which may be accompanied by a fall in home per capita income relative to host per capita income, or simply by a fall in home per capita income. This implies that, remittance recipients may use the funds to bring the family closer to its desired standard of living through the purchase of consumption goods, services, and consumer durables. Thus, income inequality can be reduced by channeling remittance inflow to macro projects which can benefit the society as a whole. In addition, we find evidence suggesting that the financial sector has an important role to play as an intermediary between remitters and recipients. Taken together, the theoretical and empirical literatures on remittance determination describe a complex interaction between remitters and their home economies that may not fit neatly into a single equation like the one presented above.

Nevertheless, we do believe that the empirical evidence presented here emphasizes the need for policy-makers, when formulating migration-related policies, to be aware of the fact that many migrants retain strong economic links to those left behind. From the results in order to facilitate the inflow of workers' remittance there is a need for a collaborative effort between partners of development, and money transfer agencies such as Western Union, Money Gram and others, in an attempt to reduce the cost and administrative procedures involved in sending money. There is also a need for a much broader cooperation between remitters and developmental partners in receiving countries to set up policies that can better capture and channel remittances to poverty alleviating projects which can be beneficial to the society at large.

References

- Agarwal, R., & Horowitz, A. W. (2002). Are International Remittances Altruism or Insurance? Evidence from Guyana Using Multiple-Migrant Households. *World Development*, 30, 2033-2044. [http://dx.doi.org/10.1016/S0305-750X\(02\)00118-3](http://dx.doi.org/10.1016/S0305-750X(02)00118-3)
- Aydas, O. T., Neyapti, B., & Metin-Ozcan, K. (2004). Determinants of Workers' Remittances: The Case of Turkey. Department of Economics Discussion Paper.
- Becker, G. (1974). A Theory of Social Interactions. *Journal of Political Economy*, 82, 1063-1093. <http://dx.doi.org/10.1086/260265>
- Brière, E. Sadoulet, A. de Janvry, & Lambert S. (2002). The Role of Destination, Gender and Household Composition in Explaining Remittances: An Analysis for the Dominican Sierra. *Journal of Development*

Economics, 58(2), 309-28.

- Buch, C. M., & Kuckulenz, A. (2004). Worker Remittances and Capital Flows to Developing Countries, ZEW Discussion Paper No. 04-31, Mannheim.
- Chami, R., Adolfo Barajas, Thomas Cosimano, Connel Fullenkamp, Michael Gapen, & Peter M. (2008). *Macroeconomic Consequences of Remittances*. Washington: International Monetary Fund.
- Chami, R., Fullenkamp, C., & Jahjah, S. (2005). Are Immigrant Remittance Flows a Source of Capital for Development? *IMF Staff Papers*, 52(1).
- Cox, D. (1987). Motives for private transfers. *Journal of Political Economy*, 95(3), 508-46. <http://dx.doi.org/10.1086/261470>
- Cox, D., Z. Eser, & Jimenez E. (1998). Motives for private transfers over the life cycle: An analytical framework and evidence for Peru, *Journal of Development Economics*, 55, 57-80. [http://dx.doi.org/10.1016/S0304-3878\(97\)00056-4](http://dx.doi.org/10.1016/S0304-3878(97)00056-4)
- Durand, J., Kandel, W., Parrado, E. A., & Massey, D. (1996). International Migration and Development in Mexican Communities., *Demography*, 33(2), 249-264. <http://dx.doi.org/10.2307/2061875>
- El-Sakka, M. I. T., & McNabb, R. (1999). The Macroeconomic Determinants of Emigrant Remittances. *World Development*, 27(8), 1493-1502. [http://dx.doi.org/10.1016/S0305-750X\(99\)00067-4](http://dx.doi.org/10.1016/S0305-750X(99)00067-4)
- Faini, R. (1994). Workers' remittances and the real exchange rate. A quantitative framework. *Journal of Population Economics*, 7, 235-245. <http://dx.doi.org/10.1007/BF00173621>
- Glytsos, N. (1997). Remitting Behavior of Temporary and Permanent Migrants: The Case of Greeks in Germany and Australia. *Labour* 11(3), 409-435. <http://dx.doi.org/10.1111/1467-9914.00043>
- Gubert, F. (2002). Do Migrants Insure Those Who Stay Behind? Evidence from the Kayes Area (Western Mali). *Oxford Development Studies*, 30, 267-87. <http://dx.doi.org/10.1080/1360081022000012699>
- Ilahi, N., & Jafarey, S. (1999). Guest worker Migration, Remittances, and the Extended Family: Evidence from Pakistan. *Journal of Development Economics*, 58, 485-512. [http://dx.doi.org/10.1016/S0304-3878\(98\)00122-9](http://dx.doi.org/10.1016/S0304-3878(98)00122-9)
- IMF. (2005). *World Economic Outlook 2005*. Washington: International Monetary Fund.
- Johnson, G. E., & Whitelaw, W. E. (1974). Urban-Rural Income Transfers in Kenya: An Estimated-Remittances Function. *Economic Development and Cultural Change*, 22(3), 473-479. <http://dx.doi.org/10.1086/450731>
- Lucas, R. E. B., & Stark, O. (1985). Motivations to Remit: Evidence From Botswana. *Journal of Political Economy*, 93(5), 901-917. <http://dx.doi.org/10.1086/261341>
- Poirine, B. (1997). A Theory of Remittances as an Implicit Family Loan Arrangement. *World Development*, 25, 589-611. [http://dx.doi.org/10.1016/S0305-750X\(97\)00121-6](http://dx.doi.org/10.1016/S0305-750X(97)00121-6)
- Rapoport, H., & Docquier, F. (2005). The Economics of Migrants' Remittances. *IZA Discussion Paper 1531*.
- Schiopu, I., & Siegfried N. (2006). Determinants of Workers' Remittances: Evidence from The European Neighbouring Region. *European Central Bank Working Paper No. 688*.
- Stark, O. (1981a). On the Role of Urban-to-Rural Remittances in Rural Development. *Journal of Development Studies*, 16, 369-374. <http://dx.doi.org/10.1080/00220388008421764>
- Stark, O. (1981b). The Asset Demand for Children During Agricultural Modernization. *Population and Development Review*, 7, 671-675. <http://dx.doi.org/10.2307/1972803>
- Straubhaar, T. (1986). The Determinants of Workers' Remittances: The Case of Turkey. *Weltwirtschaftliches Archiv*, 122, 728-740. <http://dx.doi.org/10.1007/BF02707858>
- Swamy, G. (1981). International Migrant Workers' Remittances: Issues and Prospects. *Staff Working Paper No.481*. The World Bank, Washington, DC.
- Wahba, S. (1991). What Determines Workers' Remittances. *Finance and Development*, 28(4), 41-44.

Notes

Note 1. y_{USA} is income level in USA and y_i is income level in country i. The income level is measured as GDP per capita in purchasing power parity (PPP). The PPP measure accounts for non-tradable, thereby avoiding inflating the income gap. Second, the variable captures the fact that the migrant makes his decision based on the

goods and services that the transferred amount of money can buy for his family at home.

Note 2. r_i is real interest rate in country i and r_{USA} is real interest rate in USA.

Note 3. Proportion of catholic in the country to total population of 1980

The Quantity and Quality of Environmental Disclosure in Annual Reports of National Oil and Gas Companies in Middle East and North Africa

Kamal Mehemed Eljayash¹, Dr Kieran James¹ & Dr Eric Kong¹

¹ School of Accounting, Economics and Finance, Faculty of Business and Law, University of Southern Queensland, Australia

Correspondence: Kamal Mehemed Eljayash, School of Accounting, Economics and Finance, Faculty of Business and Law, University of Southern Queensland, Australia. Tel: 61-43-419-8744. E-mail: kamal.eljayash@usq.edu.au

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Abstract

The increased activities of oil companies around the world have contributed to increasing environmental concern over the past few years. The international oil corporations have a significant role in shaping global politics and economics. Therefore, there has been a global trend to increase environmental awareness in the international companies, especially oil companies in order to better manage natural resources and reduce environmental pollution as a result of the exploitation of natural resources. Arab oil exporting countries are not immune from the global calls for the protection of the environment and especially the Arab countries' rich oil and gas resources.

This study seeks to examine the quantity and quality of environmental disclosure in the oil companies in the Arab oil exporters. 174 annual reports of 58 national companies were surveyed for the years 2008, 2009, and 2010. Content analysis was applied in this study in order to study the environmental disclosure. The word count was used to measure the amount of environmental disclosure in the annual reports whereas environmental disclosure index was used to measure the quality of disclosure in the oil companies. Results of the study indicate differences in environmental disclosure between the countries of Arab Petroleum Exporting Countries, but overall, environmental disclosure in the Arab oil countries is still low compared with other oil companies in developed countries.

Keywords: environmental disclosure, Middle East and North Africa, Countries of Arab Petroleum Exporting, Annual Reports, oil and gas firms, Word Count and Disclosure Index

1. Introduction

Petroleum industry has become the main industry in many economies of countries over the world. However, environment surroundings of the petroleum industry have become threatened by oil pollution. The Land or marine environment faces many the environmental risks as a result oil pollution from petroleum industry. In recent decades, the oil industry has developing included all oil operations in land or seas and oceans alike. Pulsipher et al. (2001) state that there are at least 6,500 oil platforms located in the Gulf of Mexico. In addition, many oil tankers roam the seas and oceans. On the other hand, there are many oil pipelines buried in the ground for the transfer of points and its derivatives. Moreover, the refineries are spread along the coast of many countries, especially in the oil producing countries. All this contributed to the increase in environmental risk as a result of oil incidents which cause environmental Catastrophes. For example, the oil spill resulting from the explosion in one of the oil platforms owned by BP, leading to leakage of large quantities of crude oil caused oil pollution of the marine environment in the Gulf of Mexico in 2010, as well as the oil spill incident in the oil tanker Exxon in 1989. In addition, the oil spill occurred in the Arab Gulf during the Gulf War II.

The occurrence of environmental incidents as a result of activities of companies, including oil companies, have contributed to the increase of environmental awareness in many countries over the world, especially developed countries. In this context, much legislation has been enacted in many developed countries in order to protect the environment. Additionally, environmental organizations have played a significant role in Protection of the environment in many developed countries through the exercise of pressures on firms in order to limit corporations' activities affecting the environment. Moreover, the companies themselves have contributed to the

increase of environmental awareness through increased disclosure of environmental information in annual reports. (Kamal) found that the amount of environmental disclosure has increased in the oil companies after the oil tanker Exxon incident. However, over the past years, attention on the environmental disclosure has been confined to the companies of developed countries such as the USA, the UK, Japan, Australia, Canada, and the countries of the European Union, while the developing countries suffer from environmental disclosure practices in corporations.

Countries in the Arab region are still suffering from few research studies in the field of accounting studies, especially studies addressing environmental disclosure in companies. Although the Arab countries have oil wealth and control approximately 77% of global oil reserves, these countries are classified within developing countries. The oil wealth of many Arab countries contributed to the establishment of the Organization of Arab Petroleum Exporting Countries in 1968, which includes in its membership Saudi Arabia, Libya, Kuwait, Qatar, UAE, Bahrain, Egypt, Algeria, Tunisia, Syria and Iraq. Therefore, this study seeks to examine the quantity and quality of environmental disclosure in domestic oil companies in OAPEC through examining the annual reports of companies for the years 2008, 2009 and 2010.

2. Middle East and North Africa (MENA)

2.1 Overview of Arab World

The Arab world contains 2 regions, divided into the continents of Asia and Africa. Arab countries in Asia are 12 namely Saudi Arabia, Kuwait, Yemen, Bahrain, UAE, Iraq, Syria, Lebanon, Palestine, Qatar, Bahrain, Oman and Jordan, while 10 countries are located in Africa namely Egypt, Libya, Tunisia, Algeria, Morocco, Mauritania, Sudan, Djibouti, Somalia and Comoros (Findly 2003). The area of Arab world is estimated at 14,291,469 km² whereas the population of Arab homeland is 338,621,469, according to estimates by 2007 (Agency 2009). The most important natural resources of the Arab world are oil and gas. Therefore, some oil countries established oil Organization named the Organization of Arab Petroleum Exporting Countries, namely Saudi Arabia, Libya, Iraq, Syria, Bahrain, Algeria, Tunisia, Egypt, UAE, Qatar and Kuwait. In addition, the Saudi Arabia, Libya, Algeria, Qatar, UAE, Iraq and Kuwait are members of Organisation Petroleum Exporting Countries (OPEC).

2.2 Petroleum Industry in Middle East and North Africa (MENA)

The lifeblood of the planet Earth is the energy which assists to expanding the global economy over the world. Since the discovery of oil, the main resource of energy over the world is oil and gas. Therefore, since few last decades, oil and gas industry has become global industry. The operations related to this industry are conducted in every corner of the globe, in addition to many other industries which depend on petroleum products. However, as a result of the conflict on acquisition of natural resources between developed countries and producing countries, international oil companies seek to acquire investment opportunities in oil countries. Nevertheless, it is worth noting that many national firms become have a greater role in the global oil industry especially in Oil-producing countries such as countries of the Middle East and North Africa (Findly 2003; Jahamani 2003).

In recent years, the world has been aware that oil is still the real source of energy in the world. According to (OPEC, 2011), the world has global proven reserves estimated at almost 1,193 billion barrels. The share of national oil companies of these reserves is estimated at 88.33%, while 18.67% of reserves are controlled by international corporations. For this reason, many national companies seek to re-evaluate their strategies in line with the evolution of the global oil industry in order to obtain advanced positions in the oil industry which was under the control of international companies for a long period of time. It should be noted, according to Oil and Gas Journal (2012), that among the 20 largest oil companies in the world there are 14 national companies, including 10 national companies owned by the governments of countries in the Middle East and North Africa.

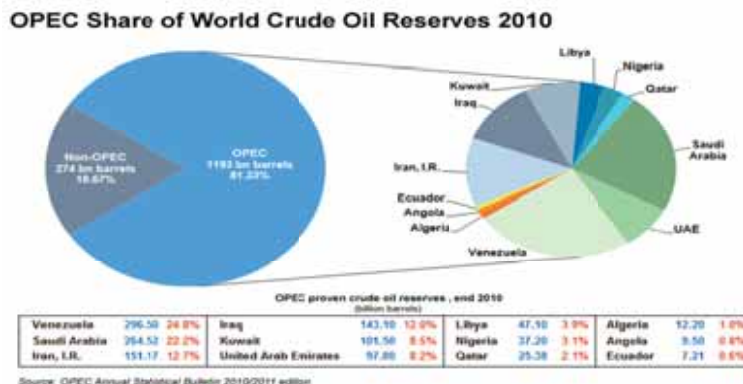


Figure 1.

The Middle East and North Africa (MEAN) is a centre of oil industry in the world. Two-thirds of members in the Organization of Petroleum Exporting Countries (OPEC) are from the Middle East and Africa. Thus, Countries of Arab Petroleum Exporting dominate the 57% of the world's oil reserves (OAPEC, 2011), where proportion is distributed across the Arab countries as follows; Saudi Arabia 22.2%, Iraq 12%, Kuwait 8.5%, UAE 8.2%, Libya 3.9%, Qatar 2.1% and Algeria 1.0%, in addition to Syria 0.18%, Egypt 0.36%, Tunisia 0.03% and Bahrain 0.01% which are not members of OPEC (but they are members of OAPEC). Furthermore, Oil experts estimate that the countries of the Middle East have the highest rate for a reserve to production (R/P) estimated 80 years, while Libya has the highest rate in Africa, 60 years, where R/P means The Reserves-to-production ratio and indicates to the remaining amount of a non-renewable resource.

Table 1. Proven crude oil reserves in OAPEC 2006-2010

country	2006	2007	2008	2009	2010
UAE	97.9	97.9	97.9	97.9	97.9
Bahrain	0.1	0.1	0.1	0.1	0.1
Tunisia	0.4	0.4	0.4	0.4	0.4
Algeria	12.2	12.2	12.2	12.2	12.2
Saudi	264.3	264.2	264.1	264.6	264.5
Syria	3	2.3	2.3	2.3	2.3
Iraq	115	115	115	115	143.1
Qatar	26.2	25.1	25.4	25.4	25.4
Kuwait	101.5	101.5	101.5	101.5	101.5
Libya	41.5	43.7	43.3	46.42	47.1
Egypt	3.7	3.9	4.2	4.4	4.5
OAPEC	665.6	666.1	667.2	670.1	698.9
OPEC	935.8	948.1	950.5	952.5	996.1
Total World	1151.6	1170.8	1169.1	1148.1	1232.3
% OAPEC to OPEC	0.71126	0.70256	0.70195	0.70352	0.70164
% OAPEC to world	0.57798	0.56893	0.5707	0.58366	0.56715

Source: annual report 2011, OAPEC

With respect to the production of oil, the Arab countries exporting oil provides about 27% of global production of oil, which is almost 72 million barrel in 2010 (Table 2). Daily production of crude oil exporting Arab countries for oil is 19.5 million barrels in 2010. Saudi has largest amount of oil production among MENA almost 8 million barrel day (OAPEC, 2011). However, the amount of production in general declined from 21.563 million barrel in 2006 to 19.773 million barrels in 2010.

Table 2. Crude oil production in OAPEC 2006-2010

Country	2006	2007	2008	2009	2010
UAE	2568	2529	2572.2	2241.6	2323.8
Bahrain	183.3	184.3	182.2	182.4	181.1
Tunisia	96.5	70	85	82	81.7
Algeria	1426	1398	1356	1216	1189.8
Saudi	9208	8978.6	8532	8184	8165.6
Syria	377.1	370	390	375.1	387
Iraq	1952.2	2035.2	2280.5	2336.2	2358.1
Qatar	802.9	845.7	842.8	733	733.4
Kuwait	2644.5	2574.5	2676	2261.6	2312.1
Libya	1751.2	1673.9	1721.5	1473.9	1486.6
Egypt	554	562	528.2	564.3	554.3
OAPEC	21563.7	21221.2	21166.4	19650.1	19773.5
OPEC	31841.6	31342.2	31570.3	28927.1	29830
Total World	80651.3	85606.3	84049.2	70908.6	72365.5
% OAPEC to World	0.26737	0.24789	0.25183	0.27712	0.27324
% OAPEC to OPEC	0.67722	0.67708	0.67045	0.6793	0.66287

Source: annual report 2011, OAPEC

In contrast, in respect of natural gas, less than half of world's natural gas reserves exist in MENA and produce about 17 percent of the world gas production. The proven natural gas in OAPEC estimated 53157 billion meter cubic. In 2010, Qatar has largest natural gas reserves which estimated at approximately 47% of total OAPEC reserves. The most important is that the natural gas reserves of Arab Petroleum Exporting Countries have increased by more than 112% for the year 2006 (Table 3). This increase in gas reserves has enabled some countries of the Arab world such as Qatar and Saudi to occupy an advanced position in the world regarding proven natural gas reserves where they are third and fourth respectively after Russia and Iran.

Table 3. Proven natural gas in OAPEC 2006-2010

Country	2006	2007	2008	2009	2010
UAE	6040	6072	6091	6091	6091
Bahrain	92	92	92	92	92
Tunisia	64	55	65	65	65
Algeria	4504	4504	4504	4504	4504
Saudi	7153	7305	7570	7920	8016
Syria	290	290	285	285	285
Iraq	3170	3170	3170	3170	3158
Qatar	25636	25636	25466	25366	25201
Kuwait	1780	1784	1784	1784	1784
Libya	1420	1540	1540	1549	1495
Egypt	1910	2024	2152	2186	2466
OAPEC	25059	52472	52719	53012	53157
OPEC	86747	87140	90290	90669	94292
Total World	178320	172939	176362	188254	191893
% OAPEC to world	0.14053	0.30341	0.29892	0.2816	0.27701
% OAPEC to OPEC	0.28887	0.60216	0.58389	0.58468	0.56375

Source: annual report 2011, OAPEC

In the beginning of the second decade of the third millennium, the Arab world has witnessed popular uprisings against power regimes. These popular uprisings represent a historic turning point in Arab region. Because the Arab world represents economic importance, these events have economic impact on the region first and on the whole world in a second phase (Ratner & Nerurkar 2011). These implications become clear on the oil markets.

Ratner and Nerurkar (2011) state that Arab spring has impact on economies of countries, reflecting in large part on global oil markets. The oil price had witnessed the sharp run-up as well as in the pattern of oil production. For example, oil revenues in countries of Arab Petroleum Exporting except Libya and Yemen have seen growth contrary to oil-importing countries had slower growth. On this basis, the expected growth of some oil-exporting countries increased from 5.1% in 2010 to 6.5% in 2011 accompanied by increase in levels of oil production. On the other hand, the political turmoil has effected on the Arab countries' imported oil where Real GDP growth slumped from an average of 4.4% in 2010 to be -0.5% in 2011.

3. Environmental Disclosure in Developed Countries and Developing Countries

Environmental issues and problems arising from the environmental activities of companies have been paid attention to by the societies of the developed countries more than developing communities in the past few decades. The accounting studies that addressed environmental issues have focused on developed countries such as the UK, the USA, Australia, Japan, Canada and European Union. Growing interest in environmental issues by companies in developed countries has contributed to increase in the amount of environmental information in annual reports of companies. Mitchell et al. (2006) state that the amount of environmental information has witnessed increase in annual reports Furthermore, many corporations started to issue voluntary independent environmental reports in the annual report.

In North America, the United States and Canada, attention to environmental accounting has witnessed a boom in growth over recent decades. U.S. companies are given special attention to the environment in terms of showing the environmental impacts on the commercial activities in public and private sectors and try to reverse these effects in the annual reports (Aerts et al. 2008). In addition, governments and professional organizations in North America have played a significant role to encourage companies to increase disclosure. In 1993, a workshop had been organized with the participation of a group of experts, academics, businessmen, professional organizations, and non-profit organizations in order to develop an action plan to encourage and motivate businesses to fully understand the importance of environmental accounting, including environmental costs and how to make decisions according to it (Hopwood 2009; Sawani 2009). Furthermore, Kraft (2011) reported that environmental information disclosure has emerged in the United States since 1980s and environmental performance varies widely among the fifty states in USA

In the UK Campbell (2004) indicated in his study which covered 27 years from 1974 to 2000 that the amount of disclosure in companies has increased over time where all companies have paid attention to the level of disclosure since the late 1980 (See figure 2). Moreover, Hasseldine et al. (2005) concluded in their research on U.K. firms, that disclosure is not directly related to the quality of actual performance in order to disclose environmental information. Further, another study which included firms in the U.K. showed that the rate of environmental information disclosed increased among UK companies (Brammer & Pavelin 2004, 2006, 2008). On the other hand, Brammer and Pavelin (2006) examined the voluntary environmental disclosures made by a sample of large UK companies during 2000. The findings indicated that the quality of disclosures is positively associated with firm size and corporate environmental impact. Furthermore, Salama et al. (2012) proved that U.K firms have paid a large attention to amount of environmental information by his study that included 169 firms in 1999. Findings show that 138 (out of 169) companies disclosed environmental sentences which is 81%.

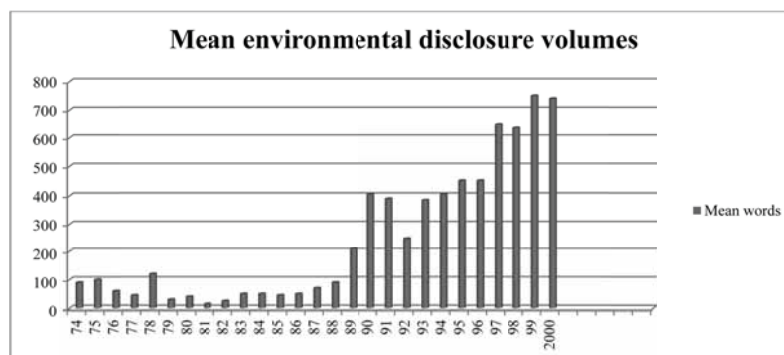


Figure 2. Mean environmental disclosure volumes in U.K firms

D. Campbell / The British Accounting Review 36 (2004, p.111)

Similarly with studies conducted in other European countries, Portuguese companies have witnessed an early response to corporate environmental reporting practices since 1990s. da Silva Monteiro and Aibar-Guzmán (2010) concluded that the extent of environmental disclosure has increased as well as the number of Portuguese companies that disclose environmental information, although the level of environmental information disclosed is low in a study of 109 large firms operating in Portugal during the period 2002–04. Moreover, German corporations also have positive environmental and social disclosure where the companies from “polluting industries” tend to have higher levels of environmental disclosure (Gamerschlag et al. 2011). Halme and Huse (1997) studied environmental reporting in Scandinavian countries namely Sweden, Finland, and Norway. In their study, the authors investigated the relationship between corporate environmental reporting in annual reports and corporate governance, industry and country variables in 140 larger corporations. They concluded that corporate environmental reporting is linked with industry.

In an Australian context, the attitudes of all sections of society such as investors, employee, and environmentalists towards the environment, contributes to increases of environmental awareness. Tilt (2001a) states that “Over the past twenty or so years interest in the relationship between business and the environment has grown dramatically, mirroring the increasing importance of the environment to broader society”. Interest in environmental disclosure in Australian context has witnessed increase significantly in companies disclosing during the period 1980 to 1991 (Deegan & Rankin 2009). In addition, increase in environmental reporting included governments beside corporations, Lynch (2007) found that environmental reporting in Australian state governments departments had increased during a five year period from 200 to 2005. It is relevant to point out that use of separate environmental reports has increased and there is suggestion to change in the direction of environmental disclosure research (Cowan & Gadenne 2005; Tilt 2001b). A recent study by Rao et al. (2012) on 100 Australian firms listed on the Australian Stock Exchange, concluded that environmental reporting in Australia is associated with positive Corporate Governance attributes and 96 firms out of 100 had some level of environmental reporting.

In Japan, Stanwick and Stanwick (2006) examined the environmental disclosure in Japanese corporations during the period 1997 and 2005. This study which covered 30 firms indicated that all companies have increase in environmental disclosure during years of study. In addition, highest level of environmental disclosure was in consumer product firms, whereas heavy manufacturing firms registered lowest level of environmental disclosure. Moreover, Hirayama et al. (2001) said that a foreign environmental guideline contributed to increase environmental disclosure in Japan year by year. In the context, the authors concluded that number of companies which presented environmental reports have increased year by year where companies which published environmental reports increased from 236 companies in 2000 to 297 companies in 2001.

4. Environmental Disclosure in MENA

The social and environmental research in Arab countries is still scarce compared with the rest of the world, including the rest of the developing countries. O’Connor (2006) reported that published studies according to the regions of the world indicated that the Middle East is the lowest among the regions of the world in published studies that deal with environmental issues (see figure 3). However, during current decade some attempts have been conducted in Arab countries to attempt fill a gap in accounting literature in regarding to environmental issues.

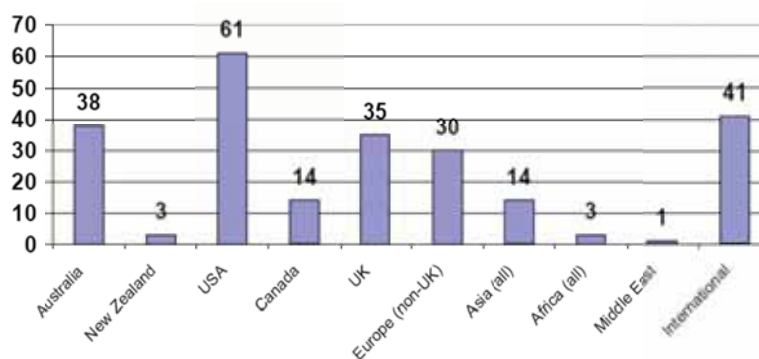


Figure 3. Country of Origin of Published Studies (O’Connor, 2006:16)

In Middle East and North Africa, Jahamani (2003) studied annual reports of Jordanian firms and UAE firms in 1998. The finding indicated the existence of 9 and 11 companies only presenting environmental disclosures in annual reports out of 86 and 94 surveyed firms in Jordan and UAE respectively. In another study conducted in Qatar, Al-Khater and Naser (2003) examine different aspects of corporate social responsibility disclosure by perceptions of various user groups. They concluded that the inclusion of corporate social and environmental disclosure in annual reports would reflect social responsibility to the public as well as companies that seek to justify their existence within the society, by highlighting the social responsibility of the company in their reports. Thereby supporting the results of the low level of disclosure in companies in the developing world, including companies in the Arab region, the results of a study presented on environmental reporting in the UAE companies by Jahamani (2003) showed that only 12 percent of the companies in the UAE issued environmental reports. The results of the low level of disclosure in companies in the developing world include companies in the Arab region. In Libya, Ahmad (2004) provided study on environmental disclosure conducted in 18 companies from major industrial companies in Libya indicated that there was no evidence of environmental disclosure in annual reports of industrial companies in Libya.

Kamla (2007) conducted study in nine of the Arab Middle East countries which examined the volume, quality and nature of social reporting practices in the annual reports of 68 companies from nine Arab Middle East countries. The finding indicated that only 10 companies, 15% of the sample, provided some form of environmental information. In addition, most disclosed information related to employee issues. In other study conducted in Egyptian context, Rizk et al. (2008) studied corporate social and environmental reporting practices of Egyptian corporate entities. Findings of the study indicate a significant variation regarding social and environmental disclosure practices in 60 companies operating in industrial segments. The researchers also mentioned that reviews of disclosure practices in different parts of the world are always welcome and are arguably somewhat limited in developing countries.

Furthermore, Hossain and Hammami (2009) and Naser et al. (2006) conducted studies in Qatar regarding environmental disclosure including companies listed in Doha Securities Market. These studies concluded that there are variations in corporate social disclosure in the sampled Qatari companies. It is also indicated that disclosure is associated with firm size measured by the firm's market capitalization, business risk measured by leverage and corporate growth. In addition, the findings indicate that age, size, complexity, and assets-in-place are significant and other variable (profitability) is insignificant in explaining the level of voluntary disclosure.

During 2010, study conducted by Elsayed and Hoque (2010) found that 55 firms out of 100 Egyptian corporations provided environmental information. In Saudi Arabia, Al-Gamrh (2010) concluded that the level of disclosure in the annual reports of 93 companies surveyed is very low. Results of the study refer to only one company which disclosed all items of disclosure (the study included 25 items of environmental and social disclosure) while there are 13 companies which did not record any disclosure items. In 2011, Al-Janadi et al. (2011) examined annual reports for the available financial years 2006 and 2007 in Saudi Arabia and the UAE. They prove that the level of voluntary disclosure is low with an average of approximately 36 per cent for the whole sample of companies. Voluntary disclosure was found to be lacking for most of the items of social and environmental information. In addition, the results of Ahmad and Mousa (2011) research confirmed the notion that a little improvement in corporate environmental disclosure occurred in Libya between 2001 and 2007 compared with a study conducted during 1998 and 2000.

Furthermore, In Jordan, Islam (2011) examined the level of environmental disclosure in Jordanian firms using a sample of 60 companies in the manufacturing and service sectors. Results find that 85% of the companies disclose some social and environmental information. Islam (2011) commented on the results of his studies as improved as compared to other studies conducted on Jordanian companies such as (Al-Khadash 2003) which concluded that 26% of the companies covered in the study were known to release environmental information. As well the study of Jahamani (2003) who found that 10 percent of out of 86 Jordanian firms presented environmental reports as part of their annual reports in study which examined the extent, awareness and level of environmental responsibility of Jordanian companies.

Two studies were conducted in Tunisian context during 2011, Gana and Dakhlaoui (2011) concluded that the average disclosure score has slightly improved over the years of study. This finding was concluded from study conducted on 36 Tunisian firms over the period 2000 to 2005. Belhaj and Damak-Ayadi (2011) examined environmental disclosure in 31 Tunisian firms and related it to financial performance and environmental performance in 2007. The findings indicated that the mean disclosure score is 9.77 and firms from industries with higher sensitivity to the environment tend to provide more environmental disclosure than firms from less

environmentally sensitive industries. It is worth noting that out of 500 largest Tunisian firms; only 53 have published environmental information in their annual reports or in their websites (Belhaj & Damak-Ayadi 2011).

During 2012, it has been witnessed some attempts of some researchers in order to add some studies dealing with environmental issues. For example, Ismail and Ibrahim (2012) found that 85% of the Jordanian companies disclose some environmental information where the sample included 60 companies in the manufacturing and service sectors. As well, Bayoud et al. (2012) found for annual reports 60% of companies from different sectors disclose four categories “employee disclosure; community involvement disclosure; consumer disclosure; environmental disclosure” of corporate social responsibility (CSR) whereas 5% of companies do not present CSR information in their annual reports. However, the trend towards environmental disclosure for companies in MENA refers to an increase in the number of companies that disclose environmental information.

5. Study Method

This study investigates the extent and content of environmental disclosure in annual reports of local oil and gas corporations operating in Arab oil countries. Content analysis used word count in order to measure quantity environmental disclosure and disclosure index in order to measure quality environmental disclosure in corporate annual reports issued in 2008, 2009 and 2010. It is worth noting that these methods have been used by many researchers in their studies to examine environmental disclosure. Along similar lines, Cowan and Gadenne (2005), Mahadeo et al. (2011) and Suttipun (2011, 2012) who have used word as a unit of measurement in content analysis to determine level of environmental disclosure in annual reports. Thereby supporting the study to use word count, Campbell (2004) justified use of words as a unit of measurement, because it provides a greater amount of detailed description. Moreover, the application of words in business research allows the analysis to be more precise and defined upon identification of the subject matter being sought (Ahmad 2004). In next part of measurement, the quality of environmental disclosure has applied the environmental disclosure index. This measurement technique derived from content analysis (Al-Tuwaijri et al. 2004). Many studies have adopted this technique in measuring the quality of disclosure, such as (Ahulu et al. 2010; Al-Khadash 2003; Buniamin et al. 2011).

Based on previous studies by Burritt (1982), (Wiseman 1982), (Deegan & Gordon 1996), and Hackston and Milne (1996), there are 16 items that can be used in this study to categorise environmental information in annual reports. Therefore, in order to measure the quality of environmental disclosure of items, this study assigns the greatest weight (+3) to monetary disclosures related to the environmental items, and assigns the next highest weight (+2) to quantitative. Finally, general disclosure receives the lowest weight (+1). Firms that do not disclose information for a given indicator receive a score of zero for that item. Thus, a total score of each company equal 48 score. In other word, the highest quality of environmental disclosure is 48 while the lowest quality is zero.

The data needed for this study were collected from the annual reports of each of the companies sampled. The sample in present study included 100 oil and gas companies operating within the Group of Arab Petroleum Exporting Countries. This group is composed of 11 Arab countries exporting oil are Saudi Arabia, Kuwait, Qatar, UAE, Bahrain, Iraq, Syria, Egypt, Libya, Tunisia and Algeria. Syrian and Iraqi companies were excluded from the study due to the current security conditions in Syria and the lack of data for Iraqi companies. Oil and gas companies registered in the Oil Ministry in each country have produced their 2008, 2009 and 2010 annual reports, whether in Arabic or English, and were obtained from websites of the companies or from visits to the company's offices.

6. Findings

6.1 Descriptive Analysis

This section provides a brief overview of some of the general facts and characteristics that were identified in respect to this study. Discussion concentrates on two aspects: - response rates, countries breakdown. Based on the details outlined in the following two sections it is worth noting that most of the firms surveyed are representative of the total of oil industry in each country.

6.2 Response Rate

This study sought to examine the annual reports for 2008, 2009 and 2010 of 58 oil and gas companies. A table 4 illustrates number of target companies in Arab Petroleum Exporting Countries (APECs). They also present number of companies that meet the conditions of a sample in this study. Table 4 focuses on the national companies operating in APECs. It can be noted that Algeria had the lowest rate of the number of companies that met the requirements of study (28.57%). The number of companies targeted was 5 companies, whereas there

were only two companies which provide annual reports according to the conditions in this study. In contrast, the United Arab Emirates had the highest percentage of companies that met the conditions of the study. The percentage of these companies is 67%. It is interesting to point out that although Arab Emirates has the highest percentage of firms in the sample in this study Saudi Arabia had the largest number sample. The actual number is 9 Saudi companies.

Table 4. Response rate of National oil and gas corporations In Arab Petroleum Exporting Countries

	Number of target companies	number of selected companies	Response rate-percentage (%)
Algeria	7	2	28.57
Bahrain	9	3	33.33
Egypt	8	5	55
Kuwait	12	6	50
Libya	9	5	55.56
Oman	7	3	42.86
Qatar	11	7	63.64
Saudi Arabia	16	9	56.25
Tunisia	6	3	50
United Arab Emirates	12	8	66.67
Total	100	51	51

In general, to derive a final score for percentage of the sample study, it can be said that the percentage of companies that meet the conditions in this study for national companies were 57%. In comparison with other studies which have used the annual reports, it is of paramount importance to point out that response rate of this study is similar to the response rates in other studies. Momin (2006, p. 199) for example responded rate of 27% where his study was in one nation. Although the proportion of the sample in his study were 68%, Cowan considered that sample size of twenty-five was appropriate for an Australian study where Cowan (2007, p. 105) states that “when considered in comparison to other published Australian studies”. Zunker (2011, p. 116) examined the annual reports for 649 companies out of 970 targeted company, where the percentage of the sample was 68%.

6.3 General Descriptive Statistics of Environmental Disclosures

Through review of annual reports of organisations surveyed in this research study, it can be noted that companies that disclosed at least one item of environmental information in annual reports had increased during study period 2008, 2009 and 2010. Table 5 summarizes companies surveyed and corporations that disclosed at least one item in their annual report. To regarding national companies, it can be argued that total companies had increased significantly from 2008 to 2010 by almost 50%. In 2008, number of companies was 23 firms whereas it was 43 companies in 2010. Therefore, it can said that percentage of national oil and gas firms that disclosed at least one item has increased over three years from 45.09% in 2008 into 84.31% in 2010. In contrast, international companies witnessed a relative increase in companies that disclosed at least one item. While the number of companies was 89 per 2008 by 90%, the number of companies in 2010 reached 98 companies increased by 100%.

Table 5. Number and percentage of national companies with environmental disclosures

	2008	2009	2010
Total companies	51	51	51
Disclosers	23	33	43
Percent (%)	45.09%	64.70%	84.31%

In general, it can be observed from the following figure that national oil and gas firms have witnessed increase in the number of corporations that disclose at least one item of environmental information in their annual reports. Through a review of corporations and environmental disclosure items referred to in Table 11, it can extract the number of companies; whether national companies that have provided at least one item of environmental disclosure are shown in tables 6. This table contain countries and number of companies surveyed of each country as well as number of companies which provided at least one item for the years 2008, 2009 and 2010, and in addition the percentage for each country. Table 6 focuses on national oil companies in countries of Arab

Petroleum Exporting (CAPE). Overall, it is interesting to point out that number of companies that provided at least one item have increased during 2008 and 2010, where it was 23 in 2008 and 43 in 2010. The percentage of increase from 2008 to 2010 was almost 85%.

In terms of raw numbers, in 2008, companies in Algeria and Tunisia had not disclosed any item in their annual reports. However, in 2010, although they had lowest number of companies surveyed, they had 33% of companies that provided at least one item of environmental disclosure. In contrast, Qatar, Saudi Arabia and UAE had a highest percentage of number of companies that provided at least one item in their annual reports which was 100%. Therefore, it can be said that during 2010 there were 43 companies presented in their annual reports with at least one item of environmental disclosure items of 51 companies surveyed. All Saudi companies that were surveyed provided in their annual reports at least one item whereas there were 7 Saudi corporations which provided at least one item in 2008.

Table 6. National Breakdown of EDPs for NOGCs

Country	Number firms surveyed	No Companies Reporting at least One EDPs 2008	(%) 2008	No Companies Reporting at least One EDPs 2009	(%) 2009	No Companies Reporting at least One EDPs 2010	(%) 2010
Algeria	3	0	0.00%	1	33.33%	1	33.33%
Bahrain	4	1	25.00%	2	50.00%	2	50.00%
Egypt	4	1	25.00%	2	50.00%	3	75.00%
Kuwait	6	3	50.00%	4	66.67%	5	83.33%
Libya	6	1	16.67%	2	33.33%	4	66.67%
Qatar	8	5	62.50%	7	87.50%	7	87.50%
Saudi	9	7	77.78%	9	100.00%	9	100.00%
Tunisia	3	0	0.00%	1	33.33%	1	33.33%
UAE	9	6	66.67%	8	88.89%	8	88.89%
Total	52	22	42.31%	31	59.62%	40	76.92%

Environmental disclosure practices in countries surveyed which provided at least one item in their annual reports shows that percentage of companies was similar to other studies national or international. Differences in the results as a percentage between this study and other studies covering other regions of the world are not substantial. Therefore, review of the results of previous studies on disclosure of environmental in many countries across the world and comparison with the results of this study set out in table 7 shows growth in most countries of the study whether the Arab oil-exporting or developed countries that have companies operating in the oil sector in the Arab oil-exporting.

6.4 Quantity and Quality of Environmental Disclosure

With respect to the quantity and quality of disclosure made by companies in their annual reports, it can conclude that the amount of disclosure in general has increased during the study period. As mentioned before, word counting is used to evaluate the quantity of corporate environmental disclosures whereas environmental disclosure index is used to measure the quality of disclosure.

6.4.1 The Quantity of Corporate Environmental Disclosures

Table 7. Descriptive Statistics of Environmental Disclosure Word Counts for National Companies

year	Minimum	Maximum	Mean	Standard Deviation
2008	0	182	89.1111	63.8934
2009	0	262	130.3333	88.1377
2010	0	288	154.3333	87.2153

Table 7 shows descriptive statistics of environmental disclosure word counts for national corporations respectively. With respect to national oil and gas during a period study, the amount of environmental disclosures had increased significantly from 0 in 2008 to 288 words in 2010 where the average quantity of environmental disclosure had increased almost 73 percent from 2008 to 2010.

On the other hand, in order to obtain the differences in disclosure between countries, it is important to examine the amount of disclosure in annual reports of organisations for each country. This study was based on word count to examine environmental disclosure contained in the annual reports of oil and gas corporations in order to measure the amount of disclosure. The following table 8 summarizes the information on amount of disclosure word count for NOGCs in Arab oil countries.

Table 8. Amount of disclosure word count in Arab oil countries

	Years	No. Companies	Word count	average of word at each firm *	Percentage of Word Count (%) **
Algeria	2008	0	0	0	0
	2009	1	36	36	3.01
	2010	2	66	33	4.75
Bahrain	2008	1	32	32	4.55
	2009	2	59	29.5	4.92
	2010	2	62	31	4.46
Egypt	2008	1	32	32	4.55
	2009	2	66	33	5.51
	2010	3	115	38.33	8.27
Kuwait	2008	3	65	21.67	9.25
	2009	4	97	24.25	8.1
	2010	5	129	25.8	9.28
Libya	2008	1	22	22	3.13
	2009	2	46	23	3.84
	2010	4	71	17.75	5.11
Qatar	2008	5	175	35	24.89
	2009	7	235	33.57	19.62
	2010	7	238	34	17.12
Saudi	2008	7	220	31.43	31.29
	2009	9	297	33	24.79
	2010	9	326	36.22	23.45
Tunisia	2008	0	0	0	0
	2009	1	26	26	2.17
	2010	1	27	27	1.94
UAE	2008	6	157	26.17	22.33
	2009	8	336	42	28.05
	2010	8	356	44.5	25.61

* Average of word at each firm equals words count divided on number of companies for each year.

** Percentage of Word Count equals words count divided on total words for each year

As shown in Table 8, it can be concluded that national companies in the OPAEC presented environmental disclosure information in their annual reports. This disclosure varies from year to year and from one country to another. Generally, Arab Emirates and Saudi Arabia had the highest amount of disclosure in annual reports amounting to 356 words and 326 words respectively. This is consistent with study of Al-Janadi et al. (2011) who concluded that the level of disclosure in the UAE companies is larger than Saudi companies. In contrast, the lowest amount of words in the annual reports are 22 and 26 words for Libyan and Tunisian companies respectively, if excluded 2008 for Algerian and Tunisian companies due to there being no companies which disclosed at least one item of the environmental disclosure items. The extracted finding from Libya companies is compatible with Nasr's studies (2004, 2011) who concluded that Libyan firms did not present any information related to environment in their annual report in 2004 whereas the result in 2011 indicated that environmental disclosure had been improved. As for the Tunisian companies, the level of disclosure is similar to the level of disclosure in the study of Belhaj and Damak-Ayadi (2011) which showed that the highest level of disclosure in the 31 Tunisian companies is to 23. Moreover, it also can be noted that the quantity of disclosure has grown in all the national companies in OPAEC. UAE companies have showed biggest increase in the amount of disclosure which was 199 words from 2008 to 2010, while Tunisia recorded a lesser increase in the amount of disclosure which was 27 words. However, the percentage of the number of words shows a substantial difference between

the Arab countries. Largest proportion was for Saudi Arabia in 2008 at 31.29% of the total number of words disclosed in the annual reports for 2008. In 2009, the largest proportion was 28.05% for the United Arab Emirates. In 2010, although UAE had a largest percentage, it had decreased from 28.05% in 2009 into 25.61% in 2010. On the other hand, countries such as Libya, Tunisia, Algeria, and Bahrain had low rates which did not exceed approximately 5%.

6.4.2 The Quality of Corporate Environmental Disclosures

Table 9 shows that the quality of disclosure has increased over the three years of study. The average was 19 in 2008 and it increased in 2010 to 26.66 in national corporations. In relation to international companies, the increase in the average quality of disclosure was very modest during the years of study. However, in spite of the modest increase, it was higher than the national companies..

Table 9. Descriptive Statistics of Environmental Disclosure Index for national Companies

Year	Minimum	Maximum	Mean	Standard Deviation
2008	9	34	19	8.7321
2009	15	34	24.1111	7.737
2010	16	37	26.6667	6.6144

Table 10 summarises a quality of environmental disclosure using environmental disclosure index for national. Measuring the quality of disclosure for each country in this study relied on the following: If the disclosure in the annual report disclosure is monetary, item scored as 3, but if the disclosure is quantitative, the score of disclosure to be 2. Finally, the score is 1 in case disclosure of information is qualitative. The final score for each country is a collection of scores of all companies surveyed from that country. Regarding NOGCs, from table 10, the highest score was 37 for Qatar firms in 2010 whereas the lowest score was 8 for Tunisian firms in 2009 if excluded years 2008 and 2009 for Algerian and Tunisian corporations. Overall, in spite of the fact that the quality of environmental disclosure for IOGCs is higher in some countries than others, the quality of environmental disclosure had increased for all countries over three years.

Table 10. Quality of disclosure by EDindex in Arab countries

country	years	No. Companies	Environmental Index	average of Index at each firm	Percentage of Index (%)
Algeria	2008	0	0	0	0
	2009	2	17	8.5	7.56
	2010	2	16	8	6.43
Bahrain	2008	3	10	3.33	6.17
	2009	3	20	6.67	8.89
	2010	3	23	7.67	9.24
Egypt	2008	4	14	3.5	8.64
	2009	4	19	4.75	8.44
	2010	4	26	6.5	10.44
Kuwait	2008	6	16	2.67	9.88
	2009	6	22	3.67	9.78
	2010	6	26	4.33	10.44
Libya	2008	5	14	2.8	8.64
	2009	5	15	3	6.67
	2010	5	21	4.2	8.43
Qatar	2008	7	34	4.86	20.99
	2009	7	34	4.86	15.11
	2010	7	37	5.29	14.86
Saudi	2008	9	27	3	16.67
	2009	9	34	3.78	15.11
	2010	9	33	3.67	13.25
Tunisia	2008	0	0	0	0
	2009	1	8	8	3.56
	2010	1	9	9	3.61
UAE	2008	8	28	3.5	17.28
	2009	8	34	4.25	15.11
	2010	8	33	4.13	13.25

6.5 Items of Environmental Disclosure in Oil and Gas Companies

Previous research that addressed the environmental disclosure sought to examine many of the items. However, this study relied on previous studies in determining the items of disclosure and adopted the items described in the table 12 which would give a broader dimension of environmental disclosure in companies. In particular, environmentally sensitive companies include companies operating in the petroleum industry. Previous studies have shown that items such as environmental policy, environmental management and environmental spending are among the more common disclosure items in annual reports (Suttipun & Stanton 2012). Table 11 illustrates the disclosure for each item of disclosure items. It can be noted that most companies gave great importance to Education and Training item where it scored the highest disclosure over the three years followed by environmental management and risk management. On the other hand, the items of Environmental Cost Accounting and Environmental awards were not disclosed in the annual reports of any companies covered in this study.

Table 11. Items of environmental disclosures in annual reports

Items	2008	2009	2010	percentage of	percentage of	percentage of
				2008	2009	2010
Education and Training	825	969	1212	14.24	14.58	13.73
Environmental management	768	813	901	13.26	12.24	10.21
Risk management	663	727	830	11.45	10.94	9.4
environmental accidents	501	514	844	8.65	7.74	9.56
Wastes	486	558	754	8.39	8.4	8.54
Environmental Policy	482	622	805	8.32	9.36	9.12
Litigation about Environmental Issues	412	476	599	7.11	7.16	6.79
Land Rehabilitation and Remediation	340	416	494	5.87	6.26	5.6
sustainable development reporting	337	420	491	5.82	6.32	5.56
Air Emission	295	369	480	5.09	5.55	5.44
Spill	245	273	847	4.23	4.11	9.6
Environmental Auditing	180	206	208	3.11	3.1	2.36
Water Effluent	157	173	216	2.71	2.6	2.45
Environmental Spending and Activities	101	108	145	1.74	1.63	1.64
Awards	0	0	0	0	0	0
Environmental Cost Accounting	0	0	0	0	0	0
Total	5792	6644	8826			

The table 11 displayed the important items disclosed in annual reports of oil and gas corporations. It is worth noting that most of firms have paid attention to some of the items without the other. From the table 12, it can be seen that the Education and Training, Environmental management and Spill were disclosed in the annual reports of companies more than other items over three years. Regarding 2010, Education and Training was reported in 1212 words in annual reports of companies included in the study sample followed by both Environmental management and Spill with 901 and 847 words respectively. In 2009 and 2008, the largest number of disclosed words were Education and Training, Environmental management and Risk management which reported 969, 813 and 727 respectively in 2009 whereas they reported 825, 768 and 663 words in 2008. It is relevant to point out that the number of times to disclose item spill increased significantly in 2010. This increase was due to the spill incident which occurred from oil platforms owned by BP in the Gulf of Mexico. In other hand, items such as Awards and Environmental Cost Accounting were not disclosed in annual reports by any corporation over the study period. Quantity vs. quality of environmental disclosure

To derive a final score for each country, table 12 displays comparison of environmental disclosure in accordance with the quantity and quality of disclosure in order to show the picture as complete. Most previous studies in the literature concerning the disclosure of environmental accounting that dealt with the countries in this study did not address a comparison between the amount of disclosure and quality of disclosure. This study is one of the first studies that make this comparison in order to fill gaps in previous studies.

Table 12. Environmental disclosure index and word counts for Arab oil Countries

	2008		2009		2010	
	word count	environmental disclosure index	word count	environmental disclosure index	word count	environmental disclosure index
Algeria	0	0	36	17	66	16
Bahrain	32	10	59	20	62	23
Egypt	32	14	66	19	115	26
Kuwait	65	16	97	22	129	26
Libya	22	14	46	15	71	21
Qatar	175	34	235	34	238	37
Saudi	220	27	297	34	326	33
Tunisia	0	0	26	8	27	9
UAE	157	28	336	34	356	33

7. Conclusion

In conclusion, this study intended to give an overview of variations in the environmental disclosure practices between national oil and gas corporations which are operating in OPAEC. To derive a final score, analysis of environmental disclosure practices across OPAEC was undertaken at three different levels. The initial findings indicate that number of oil and gas surveyed companies which made environmental disclosures in their annual reports has increased over period study. However, this study concludes that environmental reporting practice in Arab oil countries is still low. Furthermore, in spite a general increase in environmental disclosures by oil and gas corporations during the period 2008 to 2010 in terms of both the quantity and the quality of disclosure, differences were noted regarding the number of companies from each country providing at least one environmental disclosure, an addition to the themes being reported and the amount of disclosure in annual reports. Moreover, the analysis shows that the extent of environmental disclosure practices vary between companies according to country. It is interesting to point out that there was a big gap in the level of environmental disclosures across sample companies. It has to be recognized that some national oil and gas corporations (Qatar, Saudi Arabia, and UAE) had provided a quality of environmental disclosure superior to similar corporations in other countries.

This study was conducted under several limitations. Most of the petroleum activities in Arab oil countries are under the control of main national oil company and affiliated to the government. Consequently, many other local companies play a secondary role in the oil industry. In addition, many of the local oil companies do not provide annual reports on their websites. Moreover, only three years of data is considered in the current study. Hence, it would be interesting to conduct a longitudinal study on more than three years which may help to trace the trend of environmental disclosure.

However, this study sets the first step for future research which focuses on the oil sector in Arab countries. These results showed a difference in disclosure between the Arab countries. Therefore, this paper contributes to the literature which examine reasons for the difference of environmental disclosure between oil companies as well as it contributes to the comparisons with international oil companies.

References

- Aerts, W, Cormier, D., & Magnan, M. (2008). Corporate environmental disclosure, financial markets and the media: An international perspective. *Ecological Economics*, 64, 643-59. <http://dx.doi.org/10.1016/j.ecolecon.2007.04.012>
- Agency, C. I. (2009). *The World Factbook 2008*. Central Intelligence Agency, <<https://www.cia.gov/library/publications/the-world-factbook/>>.
- Ahmad, NSM, & Mousa, F. R. (2011). Corporate environmental disclosure in Libya: A little improvement. *World Journal of Entrepreneurship, Management and Sustainable Development*, 6, 149-59. <http://dx.doi.org/10.1108/20425961201000012>
- Ahmad, N. S. M. (2004). Corporate Environmental Disclosure in Libya: Evidence and Environmental Determinism Theory, PhD thesis, Napier University, Edinburgh.

- Ahulu, H, Kotey, B., & Al Farooque, O. (2010). *Advances in Environmental Reporting among Australian MNEs using GRI Guidelines*, Sydney, NSW, Australia, <<http://www.une.edu.au/business-school/research/corp-gov-conf/papers/ahulu-kotey-farooque.pdf>>.
- Al-Gamrh, B. A. A. (2010). Social and Environmental Disclosure in Saudi Companies, master thesis, Universiti Utara Malaysia.
- Al-Janadi, Y, Rahman, R. A., & Omar, N. H. (2011). The level of voluntary disclosure practices among public listed companies in Saudi Arabia and the UAE: Using a modified voluntary disclosure index. *International Journal of Disclosure and Governance*, 9, 181-201. <http://dx.doi.org/10.1057/jdg.2011.19>
- Al-Khadash, H. A. (2003). The Accounting Disclosure of Social and Environmental Activities A Comparative Study for the Industrial Jordanian Shareholding Companies. *Abhath Al-Yarmouk Journal: Humanities and Social Sciences*, 19, 21-39.
- Al-Khater, K., & Naser, K. (2003). Users' perceptions of corporate social responsibility and accountability: evidence from an emerging economy. *Managerial Auditing Journal*, 18, 538-48. <http://dx.doi.org/10.1108/02686900310482678>
- Al-Tuwaijri, S, Christensen, T., & Hughes, K. (2004). The relations among environmental disclosure, environmental performance, and economic performance: a simultaneous equations approach. *Accounting, Organizations and Society*, 29, 447-71. [http://dx.doi.org/10.1016/S0361-3682\(03\)00032-1](http://dx.doi.org/10.1016/S0361-3682(03)00032-1)
- Bayoud, N. S, Kavanagh, M., & Slaughter, G. (2012). Corporate Social Responsibility Disclosure and Corporate Reputation in Developing Countries: The Case of Libya. *Journal of Business and Policy Research*, 7, 131-60.
- Belhaj, M., & Damak-Ayadi, S. (2011). Financial performance, environmental performance and environmental disclosure: the case of Tunisian firms. *Afro-Asian Journal of Finance and Accounting*, 2, 248-69. <http://dx.doi.org/10.1504/AAJFA.2011.041632>
- Brammer, S., & Pavelin, S. (2004). Voluntary social disclosures by large UK companies. *Business Ethics: A European Review*, 13, 86-99. <http://dx.doi.org/10.1111/j.1467-8608.2004.00356.x>
- Brammer, S., & Pavelin, S. (2006). Voluntary environmental disclosures by large UK companies. *Journal of Business Finance & Accounting*, 33, 1168-88. <http://dx.doi.org/10.1111/j.1468-5957.2006.00598.x>
- Brammer, S., & Pavelin, S. (2008). Factors influencing the quality of corporate environmental disclosure. *Business Strategy and the Environment*, 17, 120-36. <http://dx.doi.org/10.1002/bse.506>
- Buniamin, S, Alrazi, B, Johari, N. H., & Rahman, N. R. A. (2011). Corporate government practices and environmental reporting of companies in Malaysia: finding possibilities of doubles thumbs up. *Jurnal Pengurusan*, 32, 55-71.
- Campbell, D. (2004). A longitudinal and cross-sectional analysis of environmental disclosure in UK companies--a research note. *The British Accounting Review*, 36, 107-17. <http://dx.doi.org/10.1016/j.bar.2003.09.001>
- Cowan, S. (2007). Environmental reporting and the impacts of mandatory reporting requirements. PhD thesis, RMIT University.
- Cowan, S., & Gadenne, D. (2005). Australian corporate environmental reporting: a comparative analysis of disclosure practices across voluntary and mandatory disclosure systems. *Journal of Accounting & Organizational Change*, 1, 165-79. <http://dx.doi.org/10.1108/18325910510635344>
- da Silva Monteiro, S. M., & Aibar - Guzmán, B. (2010). Determinants of environmental disclosure in the annual reports of large companies operating in Portugal. *Corporate Social Responsibility and Environmental Management*, 17, 185-204. <http://dx.doi.org/10.1002/csr.197>
- Deegan, C., & Gordon, B. (1996). A study of the environmental disclosure practices of Australian corporations. *Accounting and Business Research*, 26, 187-199.
- Deegan, C., & Rankin, M. (2009). Do Australian companies report environmental news objectively? An analysis of environmental disclosures by firms prosecuted successfully by the environmental protection authority. *Accounting, Auditing & Accountability Journal*, 9, 50-67. <http://dx.doi.org/10.1108/09513579610116358>

- Elsayed, M. O., & Hoque, Z. (2010). Perceived international environmental factors and corporate voluntary disclosure practices: an empirical study. *The British Accounting Review*, 42, 17-35. <http://dx.doi.org/10.1016/j.bar.2010.01.001>
- Findly, A. M. (2003). *The Arab World*. Taylor and Francis 2 edn, Simultaneously, USA and Canada.
- Gamerschlag, R., Möller, K., & Verbeeten, F. (2011). Determinants of voluntary CSR disclosure: empirical evidence from Germany. *Review of Managerial Science*, 5, 233-262. <http://dx.doi.org/10.1007/s11846-010-0052-3>
- Gana, M. R., & Dakhlaoui, M. (2011). Societal Information Disclosure and The Cost of Equity: The Case of Tunisian Companies. *Global Journal of Management And Business Research*, 11, 1-9.
- Hackston, D., & Milne, M. J. (1996). Some determinants of social and environmental disclosures in New Zealand companies. *Accounting, Auditing & Accountability Journal*, 9, 77-108. <http://dx.doi.org/10.1108/09513579610109987>
- Hasseldine, J., Salama, A., & Toms, J. (2005). Quantity versus quality: the impact of environmental disclosures on the reputations of UK Plcs. *The British Accounting Review*, 37, 231-48. <http://dx.doi.org/10.1016/j.bar.2004.10.003>
- Hirayama, K., Kokubu, K., Kanda, Y., Shinabe, T., Higashida, A., Kawahara, C., Kitamura, M., & Nakaso, Y. (2001). Environmental Reports by Japanese Companies: An analysis of environmental reports of companies listed on the First Section of the Tokyo Stock Exchange.
- Hopwood, A. G. (2009). Accounting and the environment. *Accounting, Organizations and Society*, 34, 433-9. <http://dx.doi.org/10.1016/j.aos.2009.03.002>
- Hossain, M., & Hammami, H. (2009). Voluntary disclosure in the annual reports of an emerging country: The case of Qatar. *Advances in International Accounting*, 25, 255-65. <http://dx.doi.org/10.1016/j.adiac.2009.08.002>
- Islam, M. A. (2011). Environmental incidents in a developing country and corporate environmental disclosures: A study of a multinational gas company. *Society and Business Review*, 6, 229-48. <http://dx.doi.org/10.1108/17465681111170984>
- Ismail, KNIK, & Ibrahim, A. H. (2012). Social and Environmental Disclosure in the Annual Reports of Jordanian Companies. *Issues in Social and Environmental Accounting*, 2, 198-210.
- Jahamani, Y. F. (2003). Green accounting in developing countries: The case of UAE and Jordan. *Managerial Finance*, 29, 37-45. <http://dx.doi.org/10.1108/03074350310768418>
- Kamla, R. (2007). Critically appreciating social accounting and reporting in the Arab Middle East: a postcolonial perspective. *Advances in International Accounting*, 20, 105-77. [http://dx.doi.org/10.1016/S0897-3660\(07\)20005-4](http://dx.doi.org/10.1016/S0897-3660(07)20005-4)
- Kraft, M. E. (2011). *Environmental Information Disclosure in the United States: Comparing State Policy Actions, Effects, and Needs*, the American Political Science Association, USA. <http://ssrn.com/abstract=1901840>
- Lynch, B. (2007). Environmental reporting in annual reports: an examination of Australian state government departments. *International journal of knowledge, culture and change*, 7, 47-59.
- Mahadeo, J. D., Oogarah-Hanuman, V., & Soobaroyen, T. (2011). A Longitudinal Study of Corporate Social Disclosures in a Developing Economy. *Journal of Business Ethics*, 104, 545-58. <http://dx.doi.org/10.1007/s10551-011-0929-3>
- Momin, M. A. (2006). Corporate social responsibility and reporting by multinational corporations in Bangladesh: an exploration. PhD thesis, University of Glasgow.
- Naser, K., Al-Hussaini, A., Al-Kwari, D., & Nuseibeh, R. (2006). Determinants of corporate social disclosure in developing countries: the case of Qatar. *Advances in International Accounting*, 19, 1-23. [http://dx.doi.org/10.1016/S0897-3660\(06\)19001-7](http://dx.doi.org/10.1016/S0897-3660(06)19001-7)
- O'Connor, L. (2006). *Empirical research in social and environmental accounting: a metareview*, working paper La Trobe University, Australia, diakses dari <http://www.vuw.ac.nz/sacl/about/csr2006/papers/oconnor,larry.pdf>.

- Pulsipher, A. G, Iledare, O. O, Mesyanzhinov, D. V, Dupont, A., & Zhu, Q. L. (2001). *Forecasting the number of offshore platforms on the Gulf of Mexico OCS to the year 2023*. illustrated edn, DIANE Publishing Company, USA.
- Rao, K. K., Tilt, C. A., & Lester, L. H. (2012). Corporate Governance and Environmental Reporting: An Australian Study. *Corporate Governance*, 12, 143-63. <http://dx.doi.org/10.1108/14720701211214052>
- Ratner, M., & Nerurkar, N. (2011). Middle East and North Africa Unrest: Implications for Oil and Natural Gas Markets, Congressional Research Service (CRS) Report: March 10, 2011 (R41683), available at: <http://www.fas.org/sgp/crs/mideast/R41683.pdf>.
- Rizk, R, Dixon, R., & Woodhead, A. (2008). Corporate social and environmental reporting: a survey of disclosure practices in Egypt. *Social Responsibility Journal*, 4, 306-23. <http://dx.doi.org/10.1108/17471110810892839>
- Salama, A, Dixon, R., & Habbash, M. (2012). An Examination of Environmental Disclosures in UK Corporate Annual Reports. *Accounting – Business & Management*, 19, 19-42.
- Sawani, A. (2009). The Changing Accounting Environment: International Accounting Standards and US implementation. *Journal of Finance and Accountancy*, 1, 1-9.
- Stanwick, P., & Stanwick, S. (2006). Corporate environmental disclosures: A longitudinal study of Japanese firms. *Journal of American Academy of Business*, 9, 1-7.
- Suttipun, M. (2011). Disclosure of Environmental Information on Annual Reports of Listed Companies in the Stock Exchange of Thailand., PhD thesis. University of Newcastle. Faculty of Business and Law, Newcastle Business School. <http://hdl.handle.net/1959.13/930391>
- Suttipun, M., & Stanton, P. (2012). Determinants of Environmental Disclosure in Thai Corporate Annual Reports. *International Journal of Accounting and Financial Reporting*, 2, 99-115. <http://dx.doi.org/10.5296/ijaf.v2i1.1458>
- Tilt, C. A. (2001a). The content and disclosure of Australian corporate environmental policies. *Accounting, Auditing & Accountability Journal*, 14, 190-212. <http://dx.doi.org/10.1108/09513570110389314>
- Tilt, C. A. (2001b). Environmental disclosure by Australian companies: what is happening outside the annual report? paper presented to the Asia Pacific Interdisciplinary Research in Accounting (APIRA), Adelaide South Australia.
- Wiseman, J. (1982). An evaluation of environmental disclosures made in corporate annual reports. *Accounting, Organizations and Society*, 7, 53-63. [http://dx.doi.org/10.1016/0361-3682\(82\)90025-3](http://dx.doi.org/10.1016/0361-3682(82)90025-3)
- Zunker, T. (2011). Determinants of the Voluntary Disclosure of Employee Information in Annual Reports: An Application of Stakeholder Theory. PhD thesis, Bond University.

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