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Testing Finance-Led, Export-Led and Import-Led Growth Hypotheses on Four Sub-Saharan African Economies

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ABSTRACT

This study carries out an empirical examination of the finance-led, export-led and import-led growth hypothesis for four of the largest Sub-Saharan African economies namely South Africa, Nigeria, Ghana and Kenya. Within a multivariate Vector-Auto Regressive (VAR) framework, the concept of Granger causality is employed to determine the direction of causation between exports and output, duly taking into account the stationarity properties of the time series data. With further substantiation from impulse response function and variance decomposition, the empirical evidence shows (i) finance-led, export-led and import-led growth in South Africa and Kenya, (ii) finance-led and imports-led growth in Nigeria, and (iii) only finance-led growth in Ghana.

These four Sub-Saharan African nations, with the help of reforms, have experienced expanding exports, increased financial development and accelerated GDP growth rates. Yet, these have yielded varying degrees of success. The agenda for economic growth is a long one in Sub-Saharan Africa. Reforms would require preconditions in the wider economic and political environment, without which they will be ineffective or even counterproductive.

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1. Introduction

A recent World Bank survey found that African nations pursuing reforms have experienced accelerated GDP growth rates, lowered inflation, declining fiscal deficits, and expanding exports. The reforms are in the form of financial**-**led**,** export-led and import-led growth. This new development necessitates the testing of finance-led growth hypothesis, as well as export-led growth hypothesis on the four biggest Sub-Saharan African Economies: South Africa, Nigeria, Ghana and Kenya.

Mirdala (2011), Baltagi (2008), Abu-Bader and Abu-Qarn (2008), Demetriades and Andrianova (2004) and Godhart (2004) contend that a sound financial system is very essential and prime requirement for economic growth. Likewise there are several different studies of the relation between exports and growth (i.e. Tahir (2013), Din (2004), Amiri and Gerdtham (2008) and Shahbaz (2012)) and the evidence seems overwhelming that the two are highly correlated. To test the association between economic growth and financial development, and export growth and economic growth, several studies have been conducted. Most of these studies have actually examined the finance-led and export-led hypotheses separately. Thus, very little has been done about the interrelationship among these variables.

Unlike before, the academic literature on export-led growth now has highly consistent and largely uncontested evidence that firms in more open sectors tend to be more productive, and experience faster productivity growth (Pavcnik 2002). Undoubtedly, export-led growth has brought untold benefits to a wide range of countries, most especially the Asian Tigers: Hong Kong, South Korea, Taiwan, and Singapore. Hardly is there any country in the past 50 years that has sustained high levels of growth and increased per capita incomes significantly without greatly expanding its imports and exports. Gibson, Liebler, and Ward (1992) pointed out that because of the success of the Asian Tigers, export-led growth should be considered the best strategy to promote development.

Export-led growth implies opening domestic markets to foreign competition in exchange for market access in other countries. Reduced tariff barriers, a floating exchange rate, and

government subsidies for exporting sectors are all an example of policies adopted to promote export-led growth. By implementing this strategy, countries hope to gain enough hard currency to import commodities manufactured more cheaply in another country (Goldstein, 2008). Solid empirical evidence has shown that the link between openness and domestic economic volatility is weaker for countries with greater diversified exports. Advances in areas such as trade expansion and reducing barriers to market entry can play a significant role in diversifying the array of products a country exports, as well as the range of overseas markets it deals with (Haddad et al. 2011).

As well, export-led growth is vital for mainly two reasons. The first is that export-led growth can generate profits, granting a country the balance of their finances, as well as settlement of its debts. The second is that improved export growth can spark greater productivity, thus creating more exports in an upward spiral (McCombie et al, 1994).

Because Africa's export portfolio remains, for the most part, based on raw materials, its export earnings have hyper-susceptibility to commodity price fluctuations, aggravating the continent's vulnerability to external shocks (African Economic Outlook, 2012). Sub-Saharan African countries therefore face major challenges: to raise growth and reduce poverty, and to integrate themselves into the world economy. Economic growth rates are still not lofty enough to kick the pervasive poverty in the teeth and enable these countries to measure up with other developing nations.

The current growth performance in sub-Saharan Africa has been dumbfounding given that, for over four decades since 1960, real GDP per capita growth had been bleak, around 0.5% per annum. The World Bank reports Sub-Saharan African economies grew at rates that match or surpass global rates. During 2011, Sub-Saharan economic growth was 4.9%. With the exception of South Africa, which accounts for over a third of the region's GDP, growth in the rest of the region was 5.9%, making it one of the fastest growing developing regions. Trade has propelled much of the growth. China and India are increasingly key trade partners; 12.5% of Africa's exports are to China, and 4% are to India. Indonesia, Malaysia, Saudi Arabia, Thailand, and the United Arab Emirates are another increasingly focal market for Africa's exports (ECA, 2012).

The hurdles to Africa's economic growth include overall difficulties in doing business. Therefore, intra-African trade is slackened by protectionist policies among countries and regions. Regardless of this, trade between countries belonging to the economic region, the Common Market for Eastern and Southern Africa (COMESA), grew six-fold over the past decade up to 2012. Ghana and Kenya, for example, have developed markets within the region for construction materials, machinery, and finished products, unlike the mining and agriculture products that characterize the greater part of their international exports (ECA, 2012).

The average sub-Saharan African country is today over 30% more open to international trade than in1960 (as measured by the ratio of exports plus imports over GDP). The question is whether this surge in exports and imports is a cause or a consequence of the increase in economic growth. Answering this question is important for economic policy. Indeed, in the period 1973-2005, imports by these countries grew at much faster rates than their GOP volume. Imports averaged 15.74, 7.83 and 15.86% per year, whereas GOP volume averaged 5.68, 7.13 and 4.10 in Kenya, Nigeria and South Africa, respectively. In the global listing of countries with the highest imports in September 2007, these countries are ranked as follows: Kenya is ranked 90th; Nigeria is ranked 53; and South Africa is ranked 36th

In many transition economies, manufactured goods are easily used to achieve export-led growth. Unfortunately, SSA countries cannot afford this as they would be competing against industrialized countries' industries, which often have better technology and more capital. SSA countries have resorted to raw materials exports to achieve growth in SSA. However, this strategy is precarious compared to manufactured goods. If the terms of trade shift unfavorably, a country must export more and more of the raw materials to import the same amount of commodities, making the terms of trade worse off (Pavcnik 2002). Primary commodity dependency also links to the weakness of excessive specialization as primary commodities have incredible price volatility, given the inelastic nature of their demand, leading to a disproportionately large change in price given a change in demand for them. As well, to exploit a potential comparative advantage in primary exports requires

substantial capital which is lacking in SSA. Most times, only multinational corporations can provide the required capital, knowledge and skills.

Financial-led growth is imperative not only for increasing economic performance, but also for dampening the volatility of the growth process. An efficient financial system is one of the pillars of vibrant and sustainable economic development. Levine (2005) suggests that financial institutions can foster economic growth through easing the exchange of goods and services through the provision of payment services, mobilising and pooling savings from a large number of investors, acquiring and processing information about enterprises and possible investment projects, thus allocating savings to their most productive use, monitoring investment and carrying out corporate governance, and diversifying, increasing liquidity and reducing intertemporal risk. Each of these functions can influence saving and investment decisions and hence economic growth. Financial systems can alleviate the liquidity constraints on firms and facilitate long-term investment, which ultimately reduces the volatility of investment and growth (Aghion et al., 2010). The magnitude of the financial sector is usually closely linked to the general economic performance of the country.

Without a well-functioning financial sector to allocate and reallocate resources available for investment in these countries, they risk stagnating. Therefore, the most pressing needs in these countries are (a) to increase the availability and lower the cost of credit to productive enterprises and (b) to extend the reach of basic savings, payments, credit, and insurance services for low-income people and for the smallholder farms and microenterprises that provide their livelihood. These countries are in dire need of a wider range of longer-term facilities (including mortgage finance); greater possibilities for risk management and diversification, including more transparent price discovery; and improved marketability of tradable securities, such as debt and corporate equity (Honohan and Beck, 2007).

Still, taking into account the imperativeness of finance for economic development, the insubstantiality of SSA's finance is distressing. SSA financial systems are diminutive, both in absolute and relative terms. Africa's financial systems are typified by very limited

outreach, with less than one in five households having access to any formal banking service. Minimal bank branch, low ATM penetration numbers and high documentation requirements to open an account, high minimum balance requirements and annual fees represent significant barriers to deposit customers. As indicated by high interest spreads and margins and high overhead costs, banking is inefficient and expensive in SSA (World Bank, 2007).

The financial systems in these countries are not all the same; they are spread across a wide spectrum of financial sector performance. Nevertheless, sufficient similarities exist between the underlying economic conditions that face financial firms in most of the countries to allow several generalizations. As measured by aggregate banking depth, African financial systems are shallow. Most of this shallowness can be related to low income. Along with low savings rates, finance in most SSA countries works within an environment that is extreme in four key dimensions: scale, informality, governance, and shocks. Africa's banking systems are characterized not only by low levels of intermediation but also by high interest rates, wide intermediation spreads, and substantial bank profitability. Only closed groups of incumbents (public or private) makes most of the investment and strategic decisions, because only they have the resources to implement large-scale plans. (Honohan and Beck, 2007).

Considering that economic integration is constantly increasing and trade has become a natural part of our world, it is almost evident to ask for the relationship between trade and economic growth. Economic growth is of tremendous importance for economic welfare and the standards of living. Even small variations of growth rates can lead to vast differences over the years and can influence the standard of living enormously.

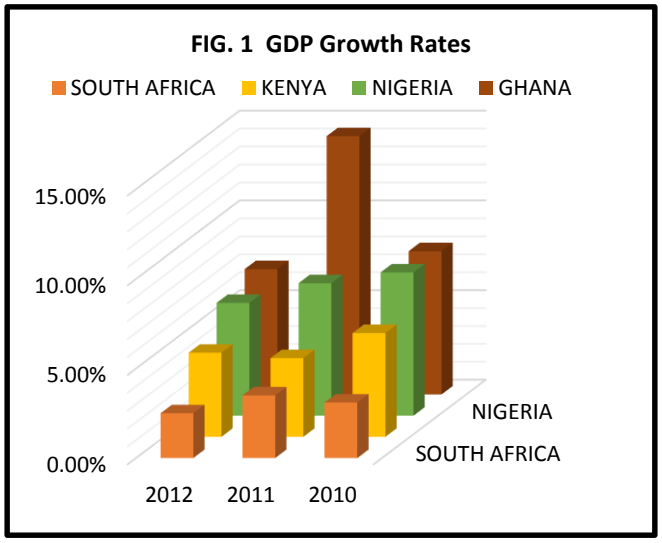
Thus, re-examining financial-led, export-led and import-led growth Hypotheses on South Africa, Nigeria, Ghana and Namibia is vital, considering the continuing progress in SSA financial sectors, especially at the aftermath of the global financial crisis. This study, therefore, combines a set of financial and trade indicators in order to examine financial-led, export-led and import-led growth Hypotheses on South Africa, Nigeria, Ghana and Namibia using time series data from 1970 to 2012.

The remainder of this paper is organized as follows. In the next section, we present a brief overview of the selected Sub-Saharan African economies. Section 3 provides a review of literature. Section 4 presents the theoretical framework. Section 5 gives the empirical methodology. Section 6 presents the empirical results and analysis. Summaries, conclusions and policy implications of the study are given in Section 7.

2. Overview of Selected Sub-Saharan African Economies

Ghana

Ghana is rich in natural resources, including gold, diamonds, manganese ore, and bauxite. High prices for oil, gold and cocoa help to sustain economic growth. The industrial sector is more developed than in many other African countries, yet agriculture is the economic pillar accounting for 50 percent of employment and 40 percent of exports. However, mining and construction have sustained the industrial sector, while manufacturing has been declining as a share of GDP over the past 20 years. Ghana, the world's second-largest cocoa producer after Côte d'Ivoire, harvested around 835,000 tonnes of cocoa during the 2012/13 season, about 21% of the global total. In 2010, Ghana enacted a legal framework for sound management of its oil wealth, and thus far its programme of hedging oil imports and exports has succeeded in maintaining macroeconomic stability. Oil production at Ghana's offshore Jubilee field began in mid-December, 2010, and is expected to boost economic growth. Estimated oil reserves have jumped to almost 700 million barrels. Although Ghana has been classified as a low middle-income country by the World Bank since 2010, its development indicators compare poorly with those of most countries in this



category. Even so, Ghana remains heavily dependent on international financial and technical assistance. Gold and cocoa production, and individual remittances, are major sources of foreign exchange.

South Africa

A middle-income, emerging market with an abundant supply of natural resources with well-developed financial, legal, communications, energy, and transport sectors and a stock exchange that is the 15th largest in the world, South Africa is the largest economy in Africa. Admitted to the BRIC group of countries of Brazil, Russia, India and China (known as BRICS) in 2011, South Africa is one of the world's leading mining and mineral-processing countries. Though mining's contribution to the national GDP has fallen from 21% in 1970 to 6% in 2011, it still represents almost 60% of exports (The Economist, 2011). In its 2012-13 Global Competitiveness report, the World Economic Forum ranked South Africa third in the world for its financial market development.

However, the economy has a marked duality, with a sophisticated financial and industrial economy having grown alongside an underdeveloped informal economy. It is this "second economy" which presents both potential and a developmental challenge. With official unemployment at nearly 25% of the work force, poverty and inequality remain a challenge. The country has had significant budget deficits that restrict its ability to deal with pressing economic problems (CIA, 2012).

South Africa's trade, exports and imports are heavily dependent on the nation's natural resources and the government's highly liberal trade incentives.

Nigeria

A United Nations report shows that in quality of life, Nigeria rates below all other major oil nations, from Libya to Indonesia. Limped by political instability, corruption, inadequate infrastructure, and poor macroeconomic management, its annual per capita income of $1,400 is only close to that of Senegal, which exports mainly fish and nuts. In 1960, agricultural products such as palm oil and cacao beans account for almost

all Nigeria's exports. In 2000s, they barely register as trade items. The oil boom of the 1970s led Nigeria to neglect its strong agricultural and light manufacturing bases in favor of an anemic dependence on crude oil. By 2000, oil and gas exports accounted for more than 98% of export earnings and about 83% of federal government revenue. New oil wealth has led to the concurrent decline of other economic sectors, and a lurch toward a static economic model. Due to inflation, per capita GDP, in 2012, remains lower than in 1960 when Nigeria declared independence. Nigeria is ranked 30th (40th in 2005, 52nd in 2000), in the world in terms of GDP (PPP) as of 2012, and 3rd largest within Africa (behind South Africa and Egypt).

Table 1: Exports and Imports in Ghana, Nigeria, South Africa and Kenya

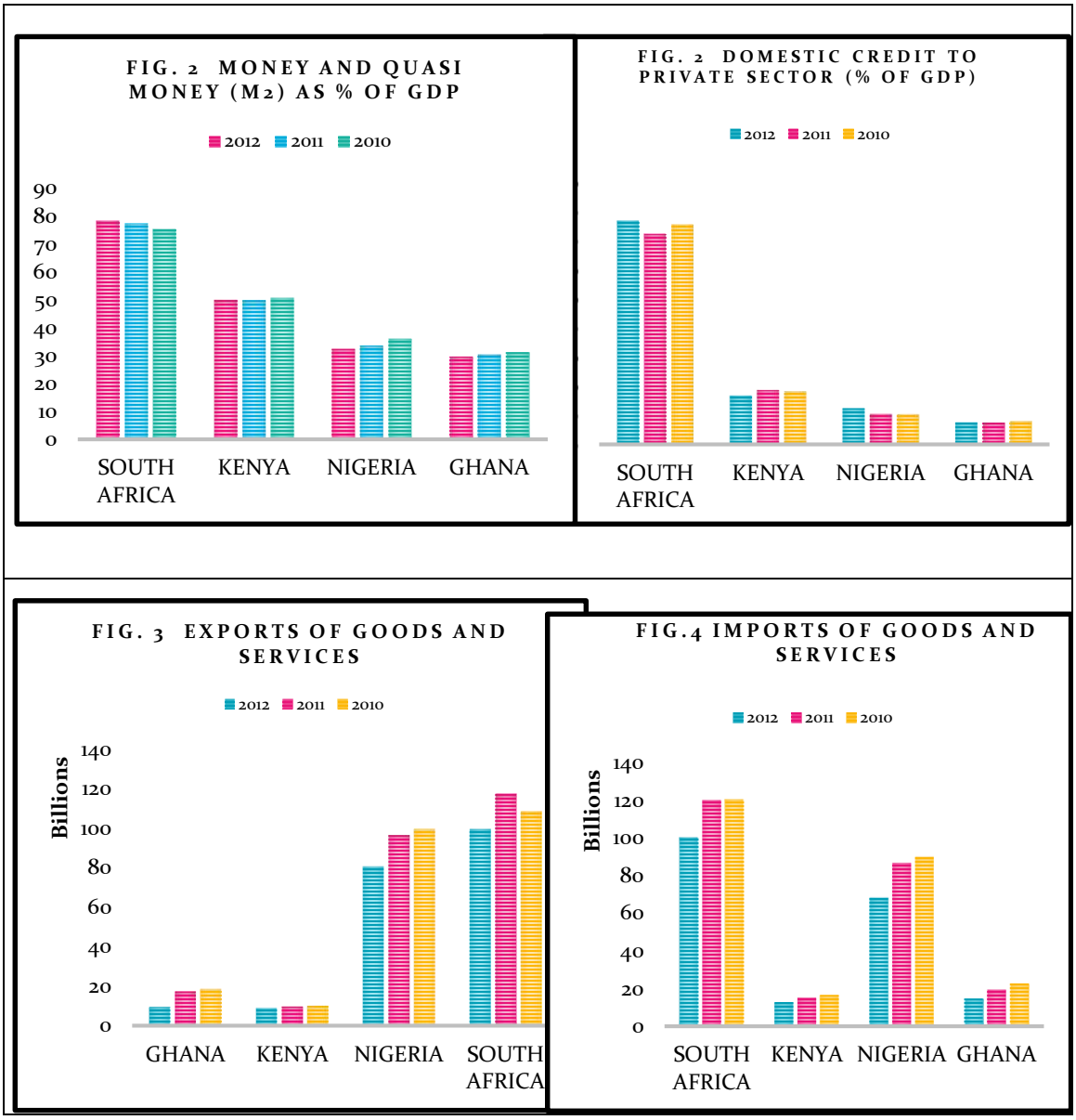
	Exports	Exports partners	Imports	Imports partners
Ghana	oil, gold, cocoa, timber, tuna, bauxite, aluminum, manganese ore, diamonds, horticultural products	France 13.3%, Italy 12.1%, Netherlands 8.7%, China 7.2%, Germany 4.2% (2012)	capital equipment, petroleum, foodstuffs	China 25.8%, Nigeria 10.9%, US 7%, Netherlands 6.3%, Singapore 4.5%, UK 4.1%, India 4% (2012)
Nigeria	petroleum and petroleum products 95%, cocoa, rubber	US 16.8%, India 12.1%, Netherlands 8.6%, Spain 7.8%, Brazil 7.6%, UK 5.1%, Germany	machinery, chemicals, transport equipment, manufactured	China 18.2%, US 10%, India 5.5% (2012)

		4.9%, Japan 4.1%, France 4.1% (2012)	goods, food and live animals	
South Africa	gold, diamonds, platinum, other metals and minerals, machinery and equipment	China 14.5%, US 7.9%, Japan 5.7%, Germany 5.5%, India 4.5%, UK 4.1% (2012)	machinery and equipment, chemicals, petroleum products, scientific instruments, foodstuffs	China 14.9%, Germany 10.1%, US 7.3%, Saudi Arabia 7.2%, India 4.6%, Japan 4.5% (2012)
Kenya	tea, horticultural products, coffee, petroleum products, fish, cement	Uganda 10.5%, Tanzania 10.2%, Netherlands 7.1%, UK 6.7%, US 5.8%, Egypt 5.2%, Democratic Republic of the Congo 4.5% (2012)	machinery and transportation equipment, petroleum products, motor vehicles, iron and steel, resins and plastics	India 20.7%, China 15.3%, UAE 9.5%, Saudi Arabia 6.7% (2012)

Kenya

Disadvantaged by corruption and by over-dependence on primary goods with very low prices, Kenya's long-term position as the largest East African economy is being threatened by truncated infrastructural investment. Unemployment is very high. As a result of prohibitive costs of food and fuel import, the country has experienced chronic budget

deficits, inflationary pressures, and sharp currency depreciation. The 2012 discovery of oil avails Kenya an opportunity to balance its growing trade deficit if the deposits are commercially viable and Kenya can develop transportation facilities for its oil export (CIA, 2012).



3. Literature Review

The empirical evidence on the relationship finance-led, export-led and import-led growth suggests enormous heterogeneity across countries, regions, financial factors, and directions of causality. Succinctly, recent studies have used varied methods to explore the relationships among others such as causality, cointegration, VAR, VECM, GMM, also static and dynamic panel data.

3.1 Finance-Led Growth

Abu-Bader and Abu Quarn (2006) explored the causal relationship between financial development and economic growth in five Middle Eastern and North African (MENA) countries for different periods between 1960 and 2004, using a VAR framework. Employing four different measures of financial development and Granger causality tests with cointegration and VEC methodology, the results showed weak evidence of a long-run relationship between financial development and economic growth.

Apergis, Filippidis and Economidou (2007), employing panel integration and cointegration techniques for a dynamic heterogeneous panel of 15 OECD and 50 non-OECD countries over the period 1975–2000, examines whether a long-run relationship between financial development and economic growth exists. The evidence shows the existence of a single long-run equilibrium relation between financial deepening, economic growth and a set of control variables.

Odhiambo (2008) examined the dynamic causal relationship between financial depth and economic growth in Kenya between 1969 and 2005, including savings as an intermitting variable. Using the dynamic tri-variate granger causality test and the error correction model (ECM Modelling), the findings indicate a uni-directional causality, from economic growth to finance, in Kenya. In other words, finance plays a minor role in the attainment of economic growth in Kenya.

Olofin and Afangideh (2009) examined the financial structure and economic growth in Nigeria, using three stage least square estimation technique on a data spanning 1970 to 2005. Empirical evidence shows that a developed financial system alleviates growth-

financing constraints by increasing bank credit and investment activities with resultant upswing in output. As well, Nzotta and Okereke (2009), in their study using two stages least analytical framework for a period starting from 1986 to 2007, observed that financial deepening did not support economic growth in Nigeria.

Gries, et al (2009) tests for causality between financial deepening, trade openness, and economic development for 16 Sub-Saharan African countries. Using the Hsiao-Granger method, they find only limited support for the hypothesis of finance-led growth.

Rachdi and Mbarek (2011), while investigating the direction of causality between finance and growth in a sample of 10 countries, 6 from the OECD region and 4 from the MENA region during 1990-2006, find that a panel data cointegration analysis confirms a long-term relationship between financial development and economic growth for the OECD and the MENA countries. Empirical evidence indicates bidirectional causality for the OECD countries and unidirectional causality (economic growth - financial development) for the MENA countries.

3.2 Export-Led and Import-Led Growth

Baharumshch and Rashid (1999) find evidence of a stationary long-run relationship between exports, imports and GDP. As well, they discover that an important determinant of long-run growth in Malaysian economy is imports of foreign technology.

Awokuse (2007) examine the contribution of both exports and imports to economic growth in Bulgaria, Czech Republic, and Poland by using a neoclassical growth modeling framework and multivariate cointegrated VAR methods. The findings show that the omission of imports and the over-emphasis of earlier studies on the role of exports as the instrument of growth may be misleading or inadequate.

Asafu-Adjaye and Chakraborty (1999) find evidence that real output, export and imports are co-integrated in inward-oriented countries. They, using the error correction models, find causality running indirectly, namely, from exports to imports and then real output.

Reizman, Summers, and Whiteman (1996) lay emphasis on the significance of imports in the export-economic growth relationship. Utilizing a multivariate framework to incorporate the role of imports, they find evidence of unidirectional causality from exports to economic growth—conditional on import growth—in only 30 countries out of 126 countries analysed. This outcome contrasts sharply with earlier studies that ignore the role of imports. Thus, imports can be influential in explaining export-led growth; omitting it from the analysis may either weaken or inflate the effects of exports on economic growth.

Tahir (2013) examine the relationship between import openness and economic growth for OECD economies. He addressed endogeneity of import openness by instrumentation strategy based on geographical characteristics. The outcome shows that both actual import openness and also instrumented import openness are significantly correlated with economic growth. Financial development is also positively and significantly related with per capita GDP, meaning that well-developed financial system also seems to be growth enhancing.

Din (2004) examines the export-led growth hypothesis for the five largest economies of the South Asian region using a multivariate time-series framework. One important feature of the study is the obvious incorporation of imports in the analysis to make allowance for their role in export-led growth. While controlling for imports, the findings indicate bi-directional causality between exports and output growth in Bangladesh, India, and Sri Lanka in the short-run. They also find long-run equilibrium relationships among exports, imports, and output for Bangladesh and Pakistan. No evidence of a long-run relationship among the relevant variables is found for India, Nepal, and Sri Lanka.

Chang, Simo-Kengne and Gupta (2013) examines the causality between imports and growth in nine provinces of South Africa for the period 1996-2011, using panel causality analysis, which accounts for cross-section dependency and heterogeneity across regions. Their empirical results support unidirectional causality running from economic growth to imports for Gauteng, Mpumalanga, North West, and Western Cape; a bi-directional causality between imports and economic growth for KwaZulu-Natal; and no causality in any direction between economic growth and imports for the remaining provinces. The

outcome is that import liberalisation might not be an efficient strategy to increase provincial economic performance in South Africa.

Amiri and Gerdtham (2008) examine linear and nonlinear Granger causality between exports, imports and economic growth in France over the period 1961-2006 with using geostatistical models. The outcomes of both VEC and Improved-VEC (with geostatistical methods) are same and show the existence of long-run unidirectional causality from exports and imports to economic growth.

Islam et al. (2012), using the Autoregressive Distriburted Lag (ADRL) model with the Granger causality test, examine the import-growth nexus in 62 countries and find that the direction of the causality depends on the level of income. He finds evidence in high-income countries like South Africa supporting the import-led growth hypothesis, while low-income countries show bidirectionality.

Tan, Habibullah, Azali and Baharumshah (2007) tested for financial-led, export-led and import-led growth hypotheses on four Asian emerging economies: Singapore, South Korea, Taiwan and Thailand. They employ vector error correction model (VECM) to distinguish between short-run and long-run causal effects in examining the three led-growth determinants. The empirical results suggest that financial deepening leads to economic growth in South Korea, Singapore and Thailand. In terms of exports, their findings demonstrate that export-led growth hypothesis is supported for all four Asian economies, namely Singapore, South Korea, Taiwan and Thailand. Apart from export promotion strategies and financial liberalisation, their evidence also shows that economic growth in these four Asian economies is found to be generated by capital formation or investment.

Pistoresi and Rinaldi (2011) examine the relationship between real exports, imports and GDP in Italy from 1863 to 2004 by using cointegration analysis and causality tests. Their findings suggest that these variables comove in the long run but the direction of causality varies across time. They also find a weak support for export-led growth and growth-led imports. This suggests that exports are not the only or the major driver of economic growth.

There are wide array of factors at work, among which are high rates of capital formation and the expansion of internal demand.

Taghavi, Goudarzi, Masoudi and Gasht (2012), using VAR, examines between import, export and economic growth in Iran over the period 1962-2011. The outcomes confirm a long run relationship between the variables. Export has direct and positive relationship with economic growth in long run. As well, import has a significant and negative relationship with economic growth. Import has a negative effect on economic growth in long-term. A shock on the export has a positive effect on economic growth while a shock on import error term does not have that much effect on economic growth. Thus, a shock on import does not have positive effect on economic growth.

Shahbaz (2012) examines the effect of trade openness on Pakistan economic growth in the long run. He applies the ARDL bounds testing approach to test for a long run relationship and the augmented production function by incorporating financial development as an additional determinant of economic growth using the framework of Mankiw (1992). The outcomes confirm cointegration among the series. The growth-led-trade hypothesis is vindicated by VECM Granger causality test, which is further confirmed by using the innovative accounting approach.

To test the association between economic growth and financial development, and export growth and economic growth, the above-mentioned studies and many others have been conducted. More than a few different econometric methodologies have been employed to uncover the relationships. Most of these studies have actually examined the finance-led and export-led hypotheses separately. Very little has been done about the interrelationship among these variables. Therefore, in the present study we employ a multivariate framework including GDP, Financial Deepening, Exports and Imports.

4. Theoretical Framework

Vast empirical studies have indicated exports-led growth or import-led growth or finance-led growth hypotheses assuming exports, imports or finance are main determinants to augment economic growth following different growth models.

4.1 Financial-Led Growth

The financial-led growth may run through various transmission channels. Financial development might

i. Reduce the loss of resources required to allocate capital;
ii. Increase the savings ratio; and
iii. Raise capital productivity.

The AK model assumes only one type of goods, which is produced with capital as the only input factor.

$$Y_t=AK_t \quad (1)$$

With Y_t being output in period t produced by capital K and with A symbolising capital productivity. The capital stock in the period $t+1$ is

$$K_t=I_t + (1-d)\, K_{t-1} \quad (2)$$

With d the depreciation rate and I investment, that has to be equal to the non-consumed resources in each period. With the saving ratio s and assuming, furthermore that the channeling of savings to investment implies the loss of a share of savings $(1-\delta)$ with $1>\delta>0$, the funds available for investment are

$$\delta * s * Y_t = I_t \quad (3)$$

The growth rate g is

$$(Y_t/Y_{t-1})-1=(K_t/K)-1 \quad (4)$$

Which implies a steady state of

$$g=[(A*\delta*s)-d]/(1-A*\delta*s) = [(A*\delta*s)-d] \quad (5)$$

For realistically small values of $(A*\delta*s)$.

Thus, with respect to this model, the possible transmission channels from finance to growth are

i. An efficient financial system reduces the loss of resources (1-ð) required to allocate capital.
ii. An efficient financial system increases the savings ratio, s; and
iii. An efficient financial system raises the productivity of capital *A*.

4.2 Heckscher–Ohlin model

Developed by Eli Heckscher and Bertil Ohlin in the early 1900s, Heckscher–Ohlin model postulates that countries will produce and export goods that require resources (factors) which are relatively abundant and import goods that require resources which are in relative short supply. While the pattern of international trade is determined by differences in factor endowments, it predicts that countries will export those goods that make intensive use of locally abundant factors and will import goods that make intensive use of factors that are locally scarce.

Core assumptions:

- Labor and capital flow freely between sectors
- The amount of labor and capital in two countries differ (difference in endowments)
- Technology is the same among countries (a long-term assumption)
- Tastes are the same

The significance of this concept can be shown in the model below from McCombie and Thirlwall, 1994.

Z_B is the balance of payments constraint, meaning the relationship between expenditures and profits.

Z_A is the actual growth capacity of a country, which can never be more than the current capacity.

Z_C is the current capacity of growth, or how well the country is producing at that moment.

(i) $Z_B=Z_A=Z_C$: balance-of-payments equilibrium and full employments

(ii) $Z_B=Z_A<Z_C$: balance-of-payments equilibrium and growing unemployment

(iii) $Z_B<Z_A=Z_C$: increasing balance-of-payments deficit and full employment

(iv) $Z_B<Z_A<Z_C$: increasing balance-of-payments deficit and growing unemployment

(v) $Z_B>Z_A=Z_C$: increasing balance-of-payments surplus and full employment

(vi) $Z_B>Z_A<Z_C$: increasing balance-of-payments surplus and growing unemployment

Countries with unemployment and balance-of-payments problems look to export-led growth because of the possibility of moving to either situation (i) or situation (v).

The significance of Export-led growth is two-fold. One, export-led growth can create profit, allowing a country to balance their finances, as well as surpass their debts as long as the facilities and materials for the export exist. Two, though debatable, increased export growth can trigger greater productivity, thus creating more exports in an upward spiral cycle.

4.3 Endogenous growth models

Endogenous growth models are favourable to the import-led growth hypothesis and assert that imports are important source of economic growth through the transfer of technology from developed to developing countries. Accordingly, foreign R&D as imported intermediate goods such as computers, machines and equipments is important for productivity growth which in turn determines economic growth

5 Methodology

5.1 Model Specification

Following a detailed review of previous studies and improving upon the theoretical postulates described above, economic growth is expressed as a function of financial deepening, exports, and imports. This is expressed by equation (6) below;

$$GDP = f \{ MONEY, EXPORTS, IMPORTS \} \quad (6)$$

$$GDP_i = \gamma_0 + \gamma_1 MONEY + \gamma_2 EXPORTS + \gamma_3 IMPORTS + \phi \quad (7)$$

GDP = Gross Domestic Product (proxy for economic growth)

MONEY = Money and quasi money (M2) as % of GDP (proxy for financial deepening)

EXPORTS = Exports of goods and services

IMPORTS = Imports of goods and services

The a priori expectations are: $\gamma_1, \gamma_2, \gamma_3 > 0$.

GDP

GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars. The data is from World Bank Indicators.

Money and quasi money (M2) as % of GDP

Money and quasi money comprise the sum of currency outside banks, demand deposits other than those of the central government, and the time, savings, and foreign currency deposits of resident sectors other than the central government. The data is from World Bank Indicators.

Exports of goods and services

Exports of goods and services represent the value of all goods and other market services provided to the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. Data are in constant 2005 U.S. dollars. The data is from World Bank Indicators.

Imports of goods and services

Imports of goods and services represent the value of all goods and other market services received from the rest of the world. They include the value of merchandise, freight, insurance, transport, travel, royalties, license fees, and other services, such as communication, construction, financial, information, business, personal, and government services. Data are in current U.S. dollars. The data is from World Bank Indicators.

In using the Multiple Regression Model, the following assumptions are made:

- There is a linear relationship between the dependent variable – GDP and MONEY, EXPORTS and IMPORTS. Hence, the functional relationship: GDP = f { MONEY, EXPORTS, IMPORTS }.
- Both dependent and independent variables are continuous random variable which is normally distributed.
- The random terms of different observations (ϕ_i, ϕ_j) are independent. This means that all the covariances of any ϕ_i, with any other ϕ_j are equal to zero. The value which the random term assumes in one period does not depend on the value which it assumed in any other period.
- The explanatory variables are not perfectly linearly correlated. If there is more than one explanatory variable in the relationship it is assumed that they are not perfectly correlated with each other. Indeed, the regressors should not be highly multicollinear.

5.2 Estimation Techniques

The modeling cycle consists of testing for stationarity, cointegration, granger causality, impulse response function and variance decomposition.

5.2.1 Stationarity Tests

The statistical methodologies employed by researchers who used time series data have concentrated upon simple Granger-type tests assuming that data on variables are stationary. Now, it is well known fact that many macroeconomic time series are not stationary and contain unit roots and give rise to many econometric problems. Stationarity, is defined as

a quality of a process in which the statistical parameters (mean and standard deviation) of the process do not change with time (Challis and Kitney, 1991). In other words, time series is stationary if the mean of the series over some reasonable range does not change when different endpoints for that range are chosen.

The first step in using any methodology for time series analysis is to check if the data is stationary. If two variables are trending over time, a regression of one on the other could have a high R^2 even if the two are totally unrelated. If the variables in the regression mode are not stationary, the standard assumptions for asymptotic analysis will not be valid. In other words, the usual "t-ratios" will not follow a t-distribution, so we cannot validly undertake hypothesis tests about the regression parameters.

This study uses the stationarity test to test if the given series has unit root. Stationarity of a series is an important phenomenon because it can influence its behaviour. If GDP and MONEY series are non-stationary random processes (integrated), then modelling the GDP and MONEY relationship as a simple OLS relationship as in the following equation will only generate a spurious regression.

If a non-stationary series, GDP_t must be differenced d times before it becomes stationary, then it is said to be integrated of order d. If a series is stationary without any differencing it is designated as I (0), or integrated of order 0. On the other hand, a series that has stationary first differences is designated I (1), or integrated of order one (1). An I(2) series contains two unit roots and so would require differencing twice to induce stationarity.

5.2.2 Cointegration

The possibilities of spurious regression relationships among variables exist unless an appropriate statistical test of long run relationship takes into account important characteristics of time series data. The time series on the variables in the model should be tested for their long run relationship prior to testing for causality between them.

Cointegration is an analytic technique for testing for common trends in multivariate time series and modeling long-run and short-run dynamics. It arose out of the concern about spurious or nonsense regressions in time series. Specifying a relation in terms of levels of

the economic variables, say, often produces empirical results in which the R^2 is quite high, but the Durbin-Watson statistic is quite low. This happens because economic time series are dominated by smooth, long term trends. That is, the variables behave individually as non-stationary random walks.

Using the Johansen-Juselius approach, this study uses two tests to determine the number of cointegration vectors: the Maximum Eigenvalue test and the Trace test. The Maximum Eigenvalue statistic tests the null hypothesis of r cointegrating relations against the alternative of r+1 cointegrating relations for r = 0, 1, 2…n-1. This test statistics are computed as:

$$LR_{max}(r/n+1) = -T*\log(1-\lambda) \quad (8)$$

Where λ is the Maximum Eigenvalue and T is the sample size. Trace statistics investigate the null hypothesis of r cointegrating relations against the alternative of n cointegrating relations, where n is the number of variables in the system for r = 0, 1, 2…n-1. Its equation is computed according to the following formula:

$$LR_{\text{tr}}\,(\text{r}/\text{n}) = -\text{T} * \sum_{i=r+1}^{n} log(1-\lambda_i) \quad (9)$$

In some cases Trace and Maximum Eigenvalue statistics may yield different results. In this case, the results of Maximum Eigenvalue should be preferred.

5.2.3 Vector Autoregression Model (VAR)

Used to capture the linear interdependencies among multiple time series, VAR models generalize the univariate autoregression (AR) models. All the variables in a VAR are treated symmetrically; each variable has an equation explaining its evolution based on its own lags and the lags of all the other variables in the model. An n-variable vector auto regression of order n, VAR(n), is a system of n linear equations, with each equation describing the dynamics of one variable as a linear function of the previous n lags of every variable in the system, including its own n lags. Thus, a nth-order VAR is also called a VAR with n lags. Especial attention is given to the lag choosing process in the VAR model because all inference is dependent on the selected lag order.

If cointegration has been detected between the series we know that there exists a long-term equilibrium relationship and we use VECM (VAR error correction model). In case of no cointegration, VAR is used. Then, one directly proceeds to Granger causality tests to establish causal links between the variables. The regression equation form for VAR is as follows:

$$\Delta \mathrm{GDP_t} = \propto_1 + \sum_{i=0}^{n} \beta_1 \Delta GDP_{t-i} + \sum_{i=0}^{n} \delta_1 \Delta MONEY_{t-i} + \sum_{i=0}^{n} \gamma_1 \Delta EXPORT_{t-i} + \sum_{i=0}^{n} \delta_1 \Delta IMPORT_{t-i} \qquad (10)$$

With $\varepsilon_{it} \sim i.i.d(0, \sigma_{\varepsilon i}^2)$ and $\mathrm{cov}(\varepsilon_y, \varepsilon_z) = 0$

In VAR, the cointegration rank shows the number of cointegrating vectors. For instance a rank of two indicates that two linearly independent combinations of the non-stationary variables will be stationary.

5.2.4 Granger Causality test

Granger causality is a statistical hypothesis of causal influence based on prediction via vector autoregression. According to Granger causality, if X_1 "Granger-causes" (or "G-causes") X_2, then past values of X_1 should contain information that helps predict X_2 above and beyond the information contained in the past values of X_2 alone. In other words, a time series X_1 is said to Granger-cause Y if it can be shown, usually through a series of t-tests and F-tests on lagged values of X_1 (and with lagged values of X_2 also included), that those X_1 values provide statistically significant information about future values of X_2.

A critical issue in testing for Granger causality is the specification of the data generating process underlying the observed time series. The standard Granger test is valid only if the variables are stationary and do not share a common stochastic trend. In a setting where the variables are non-stationary, as is the case with most economic time series, Engle and Granger (1987) argue that the conventional Granger causality tests could provide misleading results. One must, therefore, investigate the stationarity properties of the data prior to applying tests for causality in the Granger's sense. If our time series are stationary, the test is performed using the level values. If the variables are non-stationary, then the test is done using first (or higher) differences. The number of lags to be included is chosen using an information criterion, the Schwarz information criterion.

The definition of Granger Causality states that in conditional distribution, lagged values of MONEY add no information to explanation of movements of GDP beyond that provided by lagged values of GDP itself (Green, 2003). In summary, one variable (MONEY) is said to granger cause another variable (GDP) if the lagged values of MONEY can predict GDP and vice versa.

If causality (or causation) runs from MONEY to GDP, we have:

$$GDP_t = \sum_{i=1}^{n} \alpha_i GDP_{t-i} + \sum_{j=1}^{n} \beta_j MONEY_{t-j} + \xi_{1t} \quad (11)$$

If causality (or causation) runs from GDP to MONEY, it takes the form:

$$MONEY_t = \sum_{i=1}^{n} \gamma_i MONEY_{t-i} + \sum_{j=1}^{n} \delta_j GDP_{t-j} + \xi_{2t} \quad (12)$$

It is assumed that the disturbance terms ξ_{1t} and ξ_{2t} are uncorrelated.

5.2.5 Variance Decomposition

Variance decomposition or forecast error variance decomposition helps in the interpretation of a vector autoregression (VAR) model. It indicates how much of the forecast error variance of each of the variables can be explained by exogenous shocks to the other variables. In other words, it depicts the amount of a change in a variable is due to its own shock and how much due to shocks to other variables. In the short-run, most of the variation is due to own shock. However, as the lagged variables' effect starts kicking in, the percentage of the effect of other shocks increases over time.

5.2.6 Impulse response function

Impulse response function (IRF) tracks the impact of any variable on others in the system. It describes the reaction of a system as a function of time (or possibly as a function of some other independent variable that parameterizes the dynamic behavior of the system). It is an essential tool in empirical causal analysis and policy effectiveness analysis.

Let Y_t be a k-dimensional vector series generated by

$$Y_t = A_1 Y_{t-1} + \ldots + A_p Y_{t-p} + \varepsilon_t \quad (13)$$

$$= \Theta(B)\, \varepsilon_t \quad (14)$$

$$= \sum \Theta_i\, \varepsilon_{t-1} \quad (15)$$

$$= (I - A_1B - A_2B - \ldots - A_pB^p)\, \Theta(B) \quad (16)$$

Where cov(Ut) = Σ, Θ_i is the MA coefficients measuring the impulse response. More specifically, $\Theta_{jk,i}$ represents the response of variable j to a unit impulse in variable k occurring i-th period ago.

As Σ is usually non-diagonal, it is impossible to shock one variable with other variables fixed. Some kind of transformation, such as Cholesky decomposition, is necessary. To use Cholesky decomposition, let H be a lower triangular matrix such that Σ = HH'.

Then eq. (1) can be rewritten as,

$$YY_t = \sum_{n=1}^{\infty} \mathbb{P}_i\, z_t \quad (17)$$

Where $\mathbb{P}_i = \Theta_i H$, $z_t = H^{-1}\, \varepsilon_t$, and $E(z_t\, z_t^{'}) = I$. Let M be a diagonal matrix with same diagonals with H and $Z = HM^{-1}$. After some manipulations, we obtain

$$Y_t = B_0 Y_t + B_1 Y_{t-1} + \ldots + B_p Y_{t-p} + V_t \quad (18)$$

Where $B_0 = I_k - Z^{-1}$, $Z = HM^{-1}$, $B_i = Z^{-1}L_i$. Noticeably, B_0 is a lower triangular matrix with 0 diagonals. That is, Cholesky decomposition imposes a recursive causal structure from the top variables to the bottom variables but not the other way around.

For a K-dimensional stationary VAR(p) process: $\varphi_{jk,i} = 0$, for $j \neq k$, $i = 1, 2, \cdots$ is equivalent to $\varphi_{jk,i} = 0$ for $i = 1, \cdots, p(K - 1)$. That is, if the first $pK - p$ responses of variable j to an impulse in variable k is zero, then all the following responses are all zero. Variable k does not cause variable j if and only if $\Phi_{jk,i} = 0$, i = 1, 2, …((Lutkepohl, 1991).

6. Empirical Results and Analysis of Model Results

The modeling cycle consists of testing for stationarity, cointegration, granger causality, impulse response function and variance decomposition for each of the Sub-Saharan Africaneconomies in order.

6.1 Ghana

The first step in using any methodology for time series analysis is to check if the data is stationary. This is accomplished by testing for the unit roots using a test proposed by Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) which tests the null hypothesis that the data generating process is stationary against the alternative that it is integrated of order 1.

Table 2: Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) Tests for Stationarity

		Level	First Difference	Order of Integration
GDP-GA		0.725415	0.257084**	I(1)
MONEY-GA		0.351823	0.108109**	I(1)
EXPORTS-GA		0.763828	0.286832**	I(1)
IMPORTS-GA		0.772133	0.234446**	I(1)
Critical Values	1%	0.739000		
	5%	0.463000		
	10%	0.347000		

As differencing once produces stationarity, we conclude that the series are integrated of order 1. This is a necessary step in order to test the cointegration of the variables.

Now, tests for cointegration are carried out by using the likelihood ratio test due to Johansen (1988) and Johansen and Juselius (1990).

Table 3: Multivariate Cointegration Test Results:The Johansen-Juselius Approach

Series: GDP_GA MONEY_GA EXPORTS_GA IMPORTS_GA
Lags interval (in first differences): 1 to 5

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.854491	97.94476	47.85613	0.0000
At most 1	0.404694	26.62665	29.79707	0.1111
At most 2	0.174914	7.435524	15.49471	0.5276
At most 3	0.008655	0.321619	3.841466	0.5706

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.854491	71.31812	27.58434	0.0000
At most 1	0.404694	19.19112	21.13162	0.0914
At most 2	0.174914	7.113905	14.26460	0.4758
At most 3	0.008655	0.321619	3.841466	0.5706

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Using the concept of a stochastic trend, we may ask whether our series are cointegrated (Engle and Granger, 1987). The results in Table 2 accepts the existence of a cointegrating relationship between MONEY, EXPORTS, IMPORTS and GDP in Ghana.

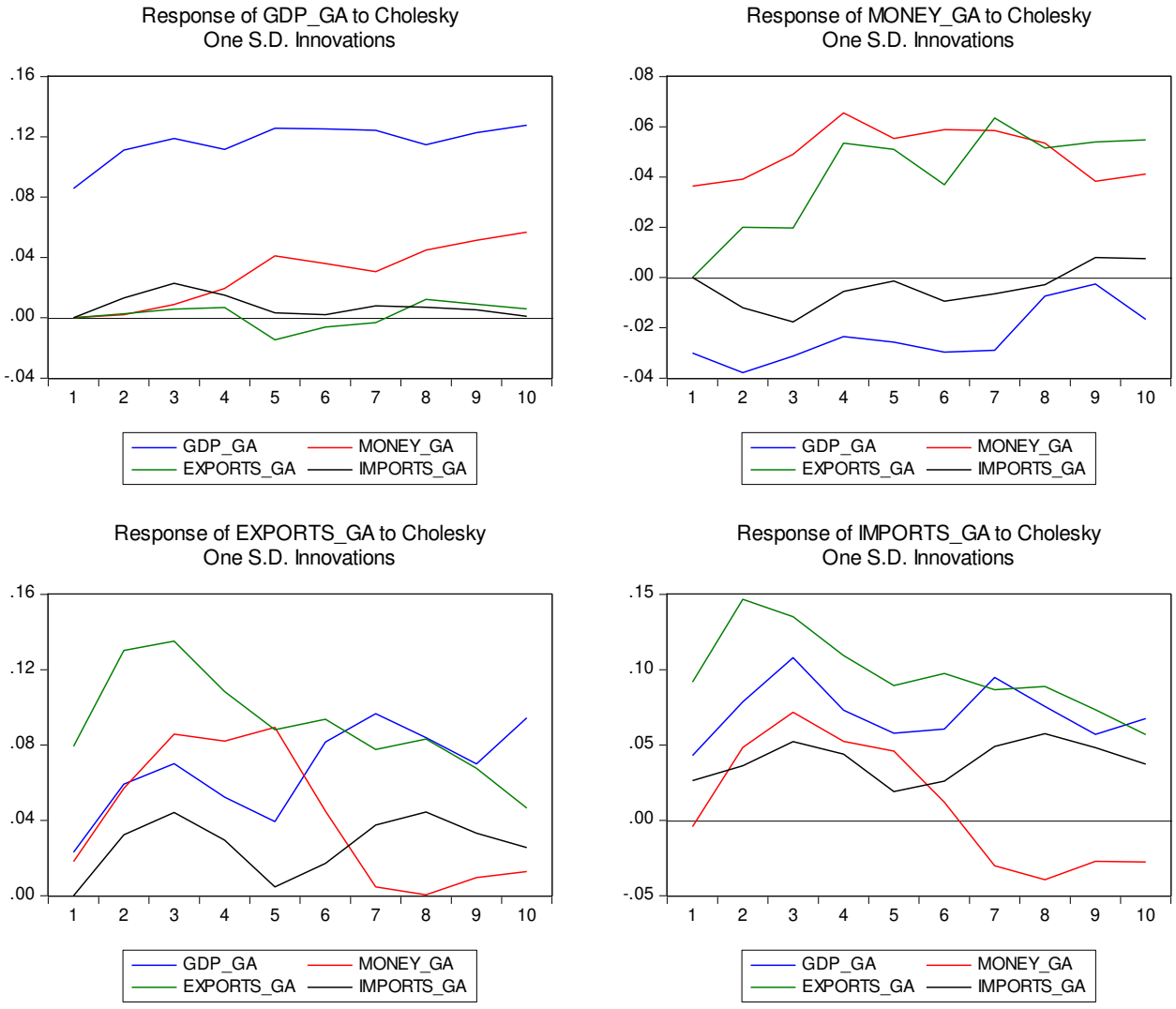
Table 4: Pairwise Granger Causality

Null Hypothesis:	Obs	F-Statistic	Prob.
MONEY_GA does not Granger Cause GDP_GA	42	3.89112	0.0357
GDP_GA does not Granger Cause MONEY_GA		1.04556	0.3128
EXPORTS_GA does not Granger Cause GDP_GA	42	0.94921	0.3359
GDP_GA does not Granger Cause EXPORTS_GA		2.86738	0.0484

IMPORTS_GA does not Granger Cause GDP_GA	42	0.51826	0.4759
GDP_GA does not Granger Cause IMPORTS_GA		1.85833	0.1806

In Table 4, Granger Causality is applied to check for the direction of causation. The results show unidirectional causality between MONEY and GDP, and between GDP and EXPORTS. This means there is evidence of finance-led growth in Ghana. This finding can be strengthened by the plots of 'Impulse Responses' and 'Variance Decomposition' as shown below.

Table 5: Impulse Response Functions



With respect to Table 5, it can be seen that a positive shock to MONEY results in positive response of GDP. They exhibit evidence of a feedback causal-effect (uni-directional). This

is in accordance with earlier conclusion of a uni-directional relationship between MONEY and GDP.

Table 6: Variance Decomposition

Period	S.E.	Variance Decomposition of GDP_GA: GDP_GA	MONEY_GA	EXPORTS_GA	IMPORTS_GA
1	0.085716	100.0000	0.000000	0.000000	0.000000
2	0.141039	99.07878	0.021061	0.035941	0.864217
3	0.186216	97.65585	0.234544	0.115944	1.993661
4	0.218630	96.94124	0.957334	0.182538	1.918888
5	0.255895	94.86343	3.263413	0.456973	1.416185
6	0.287237	94.31259	4.149438	0.409342	1.128630
7	0.314576	94.23641	4.406888	0.352199	1.004507
8	0.338123	93.07190	5.579802	0.435827	0.912470
9	0.363512	91.92741	6.823957	0.438456	0.810174
10	0.389500	90.81664	8.072624	0.404413	0.706323

Table 6 shows the variance decomposition of GDP. The own shocks of GDP constitute a significant source of variation in its forecast error in the time horizon, ranging from 100% to 90.8%. Ten years after, variation in GDP is accounted for by MONEY (8.1%), EXPORTS (0.4%) and IMPORTS (0.7%) shock. It is clear that the predominant sources of variation in GDP in Ghana is MONEY.

6.2 Kenya

Again, we test for stationarity using Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) which tests the null hypothesis that the Kenyan data is stationary against the alternative that it is integrated of order 1.

Table 7: Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) Tests for Stationarity

	Level	First Difference	Order of Integration
GDP-KE	0.799938	0.130961**	I(1)
MONEY-KE	0.718456	0.182514**	I(1)
EXPORTS-KE	0.788272	0.129810**	I(1)
IMPORTS-KE	0.789270	0.115038**	I(1)

Critical Values	1%	0.739000
	5%	0.463000
	10%	0.347000

As differencing once produces stationarity, we conclude that the series are integrated of order 1. This is a necessary step in order to test the cointegration of the variables.

Now, tests for cointegration are carried out by using the likelihood ratio test due to Johansen (1988) and Johansen and Juselius (1990).

Table 8: Multivariate Cointegration Test Results: The Johansen-Juselius Approach

Series: GDP_KE MONEY_KE EXPORTS_KE IMPORTS_KE
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.581264	56.77569	47.85613	0.0058
At most 1	0.352758	23.69610	29.79707	0.2136
At most 2	0.171516	7.164793	15.49471	0.5586
At most 3	0.000389	0.014799	3.841466	0.9030

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.581264	33.07960	27.58434	0.0089
At most 1	0.352758	16.53131	21.13162	0.1953
At most 2	0.171516	7.149994	14.26460	0.4715
At most 3	0.000389	0.014799	3.841466	0.9030

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 8 indicates the existence of one cointegrating vector from the maximal eigenvalue statistic and the trace test statistic at the 5% level. The maximal eigenvalue statistic forms

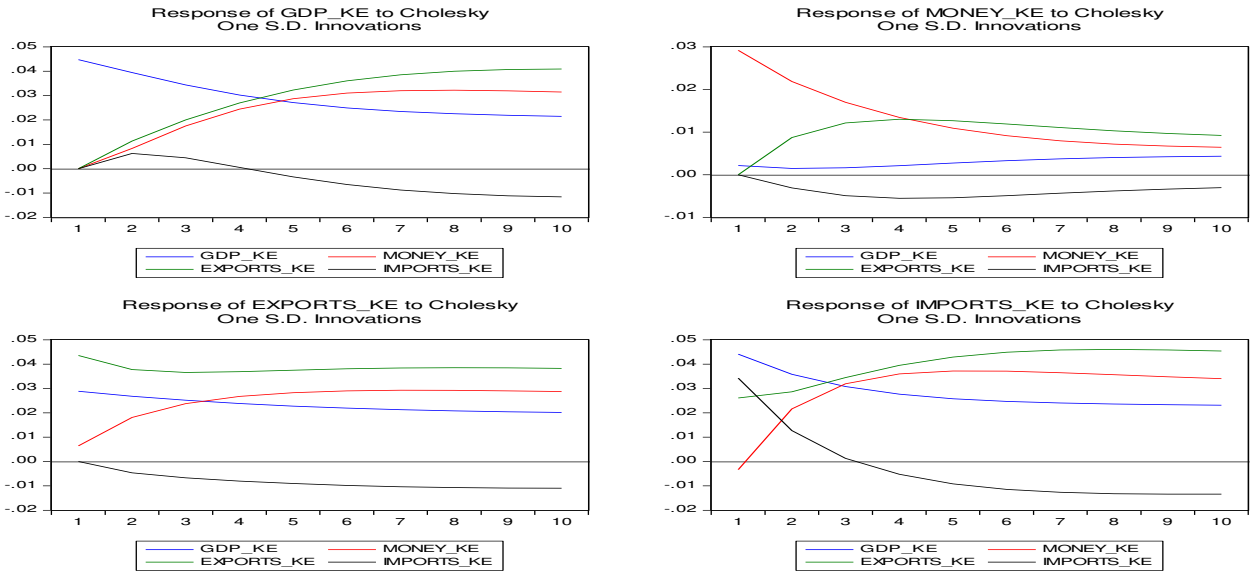
the basis of the formulation of the VAR model and the results accepts the existence of a cointegrating relationship between MONEY, EXPORTS, IMPORTS and GDP in Kenya. The existence of Cointegration is indicative of a long-run relationship between real output and the other variables.

Table 9: Pairwise Granger Causality

Null Hypothesis:	Obs	F-Statistic	Prob.
MONEY_KE does not Granger Cause GDP_KE	42	7.70616	0.0084
GDP_KE does not Granger Cause MONEY_KE		4.12286	0.0492
EXPORTS_KE does not Granger Cause GDP_KE	42	8.84042	0.0050
GDP_KE does not Granger Cause EXPORTS_KE		0.02779	0.8685
IMPORTS_KE does not Granger Cause GDP_KE	42	8.18912	0.0067
GDP_KE does not Granger Cause IMPORTS_KE		0.04006	0.8424

In Table 9, Granger Causality is applied to check for the direction of causation. The results show bi-directional causality between MONEY and GDP. There is uni-directional causality from EXPORTS and IMPORTS to GDP. This means there is evidence of finance-led, export-led and import-led growth in Kenya. This finding can be strengthened by the plots of 'Impulse Responses' and 'Variance Decomposition' as shown below.

Table 10: Impulse Response Functions



With respect to Table 10, it can be seen that a positive shock to MONEY and EXPORTS results in positive response of GDP. Conversely, a negative shock to IMPORTS results in positive response to GDP. They exhibit evidence of a feedback causal-effect. This is in accordance with earlier conclusion of a bi-directional relationship between GDP and MONEY, and uni-directional from EXPORTS and IMPORTS to GDP.

Table 11: Variance Decomposition

		Variance Decomposition of GDP_KE:			
Period	S.E.	GDP_KE	MONEY_KE	EXPORTS_KE	IMPORTS_KE
1	0.044711	100.0000	0.000000	0.000000	0.000000
2	0.061585	93.76881	1.823037	3.383165	1.024983
3	0.075510	83.07520	6.617776	9.275545	1.031480
4	0.089098	71.15963	12.27219	15.82364	0.744548
5	0.102727	60.49998	17.05455	21.77934	0.666127
6	0.116112	51.97470	20.49750	26.69532	0.832486
7	0.128925	45.47875	22.79709	30.59042	1.133740
8	0.140964	40.59748	24.28961	33.63945	1.473465
9	0.152158	36.91601	25.25625	36.03020	1.797529
10	0.162519	34.10507	25.89169	37.91996	2.083274

Table 8 shows the variance decomposition of Kenyan GDP. The own shocks of Kenyan GDP constitute a significant source of variation in its forecast error in the time horizon, ranging from 100% to 34.1%. Ten years after, variation in GDP is accounted for by MONEY (25.9%), EXPORTS (37.9%) and IMPORTS (2.1%) shock. It is clear that the predominant sources of variation in GDP in Kenya are MONEY, EXPORTS and not much from IMPORTS.

6.3 South Africa

To check if the South African data is stationary, we use Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) which tests the hypothesis that the data is stationary.

Table 12: Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) Tests for Stationarity

	Level	First Difference	Order of Integration
GDP-SA	0.791648	0.151906**	I(1)
MONEY-SA	0.354719	0.272067**	I(1)

EXPORTS-SA		0.779245	0.199069**	I(1)
IMPORTS-SA		0.790778	0.134338**	I(1)
Critical Values	1%	0.739000		
	5%	0.463000		
	10%	0.347000		

As differencing once produces stationarity, we conclude that the series are integrated of order 1. This is a necessary step in order to test the cointegration of the variables.

Now, tests for cointegration are carried out by using the likelihood ratio test due to Johansen (1988) and Johansen and Juselius (1990).

Table 13: Multivariate Cointegration Test Results: The Johansen-Juselius Approach

Series: GDP_SA MONEY_SA EXPORTS_SA IMPORTS_SA
Lags interval (in first differences): 1 to 5

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.694567	78.76876	47.85613	0.0000
At most 1 *	0.504883	34.88589	29.79707	0.0119
At most 2	0.203644	8.876324	15.49471	0.3769
At most 3	0.012118	0.451093	3.841466	0.5018

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.694567	43.88286	27.58434	0.0002
At most 1 *	0.504883	26.00957	21.13162	0.0095
At most 2	0.203644	8.425231	14.26460	0.3371
At most 3	0.012118	0.451093	3.841466	0.5018

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

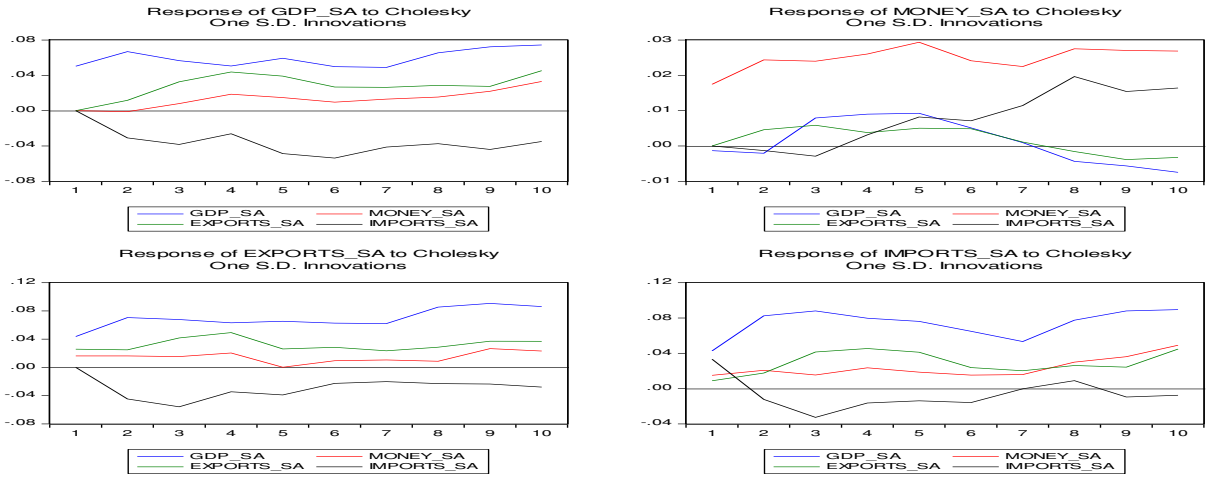
In Table 13, both the maximal eigenvalue statistic and the trace test statistic indicate the existence of two cointegrating vectors at the 5% level. This results indicates the existence of a cointegrating relationship between MONEY, EXPORTS, IMPORTS and GROWTH in South Africa. The existence of cointegration is indicative of long-run impact of financial-led, export-led and import-led growth in South Africa.

Table 14: Pairwise Granger Causality

Null Hypothesis:	Obs	F-Statistic	Prob.
MONEY_SA does not Granger Cause GDP_SA	38	2.65763	0.0089
GDP_SA does not Granger Cause MONEY_SA		1.29820	0.2940
EXPORTS_SA does not Granger Cause GDP_SA	38	2.45453	0.0073
GDP_SA does not Granger Cause EXPORTS_SA		0.85383	0.5243
IMPORTS_SA does not Granger Cause GDP_SA	38	2.94793	0.0091
GDP_SA does not Granger Cause IMPORTS_SA		2.63767	0.0457

In Table 14, Granger Causality is applied to check for the direction of causation. The results show uni-directional causality from MONEY and EXPORTS to GDP. Conversely, there is bi-directional causality between IMPORTS and GDP. This empirical evidence indicates that there is finance-led, export-led and import-led growth in South Africa. This finding can be strengthened by the plots of 'Impulse Responses' and 'Variance Decomposition' as shown below.

Table 15: Impulse Response Functions



With respect to Table 15, it is obvious that a positive shock to MONEY and EXPORTS results in positive response of GDP. A negative shock to IMPORTS result in the positive response of GDP. They exhibit evidence of a feedback causal-effect. This is in accordance with earlier conclusion of finance-led, export-led and import-led growth.

Table 16: Variance Decomposition

		Variance Decomposition of GDP_SA:			
Period	S.E.	GDP_SA	MONEY_SA	EXPORTS_SA	IMPORTS_SA
1	0.050321	100.0000	0.000000	0.000000	0.000000
2	0.090017	86.49599	0.013863	1.708662	11.78148
3	0.117898	73.46291	0.472200	8.694405	17.37048
4	0.139301	65.78401	2.128512	16.11211	15.97538
5	0.164456	60.23887	2.337388	17.20941	20.21433
6	0.182255	56.52583	2.184776	16.16909	25.12030
7	0.195411	55.45304	2.345872	15.89343	26.30765
8	0.211971	56.69110	2.520971	15.32659	25.46133
9	0.230908	57.56822	3.030145	14.33204	25.06959
10	0.251437	57.30386	4.283911	15.33700	23.07524

Table 8 shows the variance decomposition of Kenyan GDP. The own shocks of GDP constitute a significant source of variation in its forecast error in the time horizon, ranging from 100% to 57.3%. Ten years after, variation in GDP is accounted for by MONEY (4.2%), EXPORTS (15.3%) and IMPORTS (23.1%) shock. It is clear that the predominant sources of variation in GDP in South Africa are MONEY, EXPORTS and IMPORTS.

6.4 Nigeria

Again, we test for stationarity using Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) which tests the null hypothesis that the Nigerian data is stationary against the alternative that it is integrated of order 1.

Table 17: Kwiatkowski, Phillips, Schmidt, and Shin (KPSS) Tests for Stationarity

	Level	First Difference	Order of Integration
GDP-NG	0.579778	0.180052**	I(1)
MONEY-NG	0.232589	0.126854**	I(1)
EXPORTS-NG	0.739332	0.084694**	I(1)
IMPORTS-NG	0.723127	0.099981**	I(1)

Critical Values	1%	0.739000
	5%	0.463000
	10%	0.347000

As differencing once produces stationarity, we conclude that the series are integrated of order 1. This is a necessary step in order to test the cointegration of the variables.

Now, tests for cointegration are carried out by using the likelihood ratio test due to Johansen (1988) and Johansen and Juselius (1990).

Table 18: Multivariate Cointegration Test Results: The Johansen-Juselius Approach

Series: GDP_NG MONEY_NG EXPORTS_NG IMPORTS_NG
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.584615	69.73067	47.85613	0.0001
At most 1 *	0.405885	34.58871	29.79707	0.0130
At most 2	0.280077	13.76140	15.49471	0.0897
At most 3	0.015306	0.616967	3.841466	0.4322

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.584615	35.14196	27.58434	0.0044
At most 1	0.405885	20.82731	21.13162	0.0551
At most 2	0.280077	13.14443	14.26460	0.0746
At most 3	0.015306	0.616967	3.841466	0.4322

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

In Table 18, both the maximal eigenvalue statistic and the trace test statistic indicate the existence of two cointegrating vectors at the 5% level. This results indicates the existence

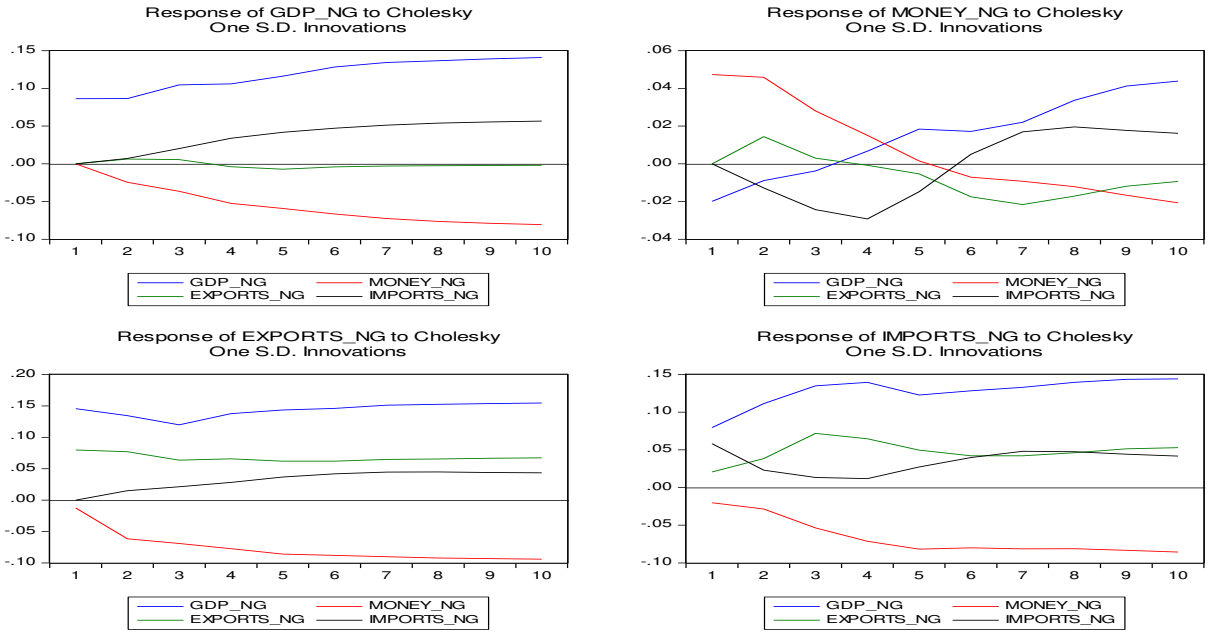
of a cointegrating relationship between MONEY, EXPORTS, IMPORTS and GROWTH in Nigeria. The existence of cointegration is indicative of long-run impact of financial-led, export-led and import-led growth in South Africa.

Table 19: Pairwise Granger Causality

Null Hypothesis:	Obs	F-Statistic	Prob.
MONEY_NG does not Granger Cause GDP_NG	41	4.82892	0.0139
GDP_NG does not Granger Cause MONEY_NG		3.74236	0.0334
EXPORTS_NG does not Granger Cause GDP_NG	41	0.09226	0.9121
GDP_NG does not Granger Cause EXPORTS_NG		0.33769	0.7157
IMPORTS_NG does not Granger Cause GDP_NG	41	0.11526	0.8915
GDP_NG does not Granger Cause IMPORTS_NG		2.56015	0.0413

In Table 19, Granger Causality is applied to check for the direction of causation. The results show bi-directional causality between MONEY and GDP. There is uni-directional causality from IMPORTS to GDP. This means there is finance-led and imports-led growth in Nigeria. This finding can be strengthened by the plots of 'Impulse Responses' and 'Variance Decomposition' as shown below.

Table 20: Impulse Response Functions



With respect to Table 20, it can be seen that a negative shock to MONEY results in positive response of GDP. They exhibit evidence of a feedback causal-effect. This is in accordance with earlier conclusion of a bi-directional relationship between MONEY and GDP, and a uni-directional from IMPORTS to GDP.

Table 21: Variance Decomposition

	Variance Decomposition of GDP_NG:				
Period	S.E.	GDP_NG	MONEY_NG	EXPORTS_NG	IMPORTS_NG
1	0.086217	100.0000	0.000000	0.000000	0.000000
2	0.124931	95.54959	3.874780	0.262339	0.313289
3	0.168214	91.31002	6.834827	0.250264	1.604890
4	0.208418	85.30528	10.79928	0.199631	3.695811
5	0.249488	81.22035	13.18082	0.224273	5.374552
6	0.292188	78.51111	14.79115	0.182944	6.514792
7	0.333616	76.40787	16.08294	0.148009	7.361174
8	0.372462	74.76205	17.11229	0.123594	8.002072
9	0.409164	73.52611	17.89801	0.105179	8.470700
10	0.443781	72.56446	18.52073	0.091309	8.823509

Table 21 shows the variance decomposition of Nigerian GDP. The own shocks of GDP constitute a significant source of variation in its forecast error in the time horizon, ranging from 100% to 72.6%. Ten years after, variation in GDP is accounted for by MONEY (18.5%), EXPORTS (0.1%) and IMPORTS (8.8%) shock. It is clear that the predominant sources of variation in GDP in Nigeria are MONEY and IMPORTS.

7. Conclusion

This study examines empirically the finance-led, export-led and import-led growth hypothesis for four of the largest Sub-Saharan African economies namely South Africa, Nigeria, Ghana and Kenya. Within a multivariate Vector-Auto Regressive (VAR) framework, the concept of Granger causality is employed to determine the direction of causation between exports and output, duly taking into account the stationarity properties of the time series data. With further validation from impulse response function and variance decomposition, the empirical evidence shows (i) finance-led, export-led and import-led growth in South Africa and Kenya, (ii) finance-led and imports-led growth in Nigeria, and (iii) only finance-led growth in Ghana.

These four Sub-Saharan African nations, with the help of reforms, have experienced expanding exports, increased financial development and accelerated GDP growth rates. Yet, these have yielded varying degrees of success. The agenda for economic growth is a long one in Sub-Saharan Africa. A practical strategy needs to take into account implementation constraints. Reforms would require preconditions in the wider economic and political environment, without which they will be ineffective or even counterproductive.

Faster national economic growth is the only sure way to a sizable and sustained reduction and eventual elimination of absolute poverty (as we know it in Africa today). According to Honohan and Beck, (2007), while growth-enhancing policies are beginning to have their effect, improving the access of low-income households and microentrepreneurs to financial services should be the central focus of financial sector policy in Africa. Improved access to financial services for poor people and people in rural areas would directly help improve their circumstances and help reverse what has, at least until recently, been a trend in the continent toward widening inequality and increasing poverty rates.

Although export and imports can bring major economic benefits, it is by no means a panacea for development. No set of policies is. It is important for African policymakers to have a number of important priorities if they are to successfully manage their integration into the world trading system. The first one is to lower the barriers facing their country exports to other developing countries, which are often higher than those faced when exporting to high-income countries. Further, the policymakers need to have instruments in place to help them maximise the benefits of openness and minimise the volatility that might come with it.

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APPENDIX

A. Vector Error Correction Estimates for South Africa

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2
GDP_SA(-1)	1.000000	0.000000
MONEY_SA(-1)	0.000000	1.000000
EXPORTS_SA(-1)	-2.068965	0.121217
	(0.30372)	(0.22345)
	[-6.81199]	[0.54247]
IMPORTS_SA(-1)	0.990777	-0.292286
	(0.29103)	(0.21411)
	[3.40440]	[-1.36509]
C	0.310348	0.015147

Error Correction:	D(GDP_SA)	D(MONEY_SA)	D(EXPORTS_SA)	D(IMPORTS_SA)
CointEq1	-0.538959	-0.049101	0.187566	-0.108905
	(0.24489)	(0.08778)	(0.27019)	(0.30597)
	[-2.20078]	[-0.55935]	[0.69421]	[-0.35593]
CointEq2	1.087668	-0.208057	0.553633	0.084691
	(0.47430)	(0.17001)	(0.52328)	(0.59258)
	[2.29323]	[-1.22379]	[1.05801]	[0.14292]
D(GDP_SA(-1))	0.784145	-0.034134	0.971224	1.368511
	(0.34100)	(0.12223)	(0.37622)	(0.42605)
	[2.29952]	[-0.27926]	[2.58152]	[3.21211]
D(GDP_SA(-2))	-0.245309	0.107587	0.061919	-0.061559
	(0.39152)	(0.14034)	(0.43196)	(0.48917)
	[-0.62655]	[0.76661]	[0.14335]	[-0.12585]
D(GDP_SA(-3))	-0.737869	-0.231269	-0.685715	-0.533683
	(0.35065)	(0.12569)	(0.38687)	(0.43810)
	[-2.10426]	[-1.83998]	[-1.77247]	[-1.21816]
D(GDP_SA(-4))	-0.193786	0.092124	0.403944	0.415733
	(0.43166)	(0.15473)	(0.47624)	(0.53932)
	[-0.44893]	[0.59539]	[0.84819]	[0.77085]
D(GDP_SA(-5))	-0.119939	-0.088774	-0.077407	-0.021272
	(0.39131)	(0.14026)	(0.43172)	(0.48890)
	[-0.30651]	[-0.63291]	[-0.17930]	[-0.04351]
D(MONEY_SA(-1))	-0.706841	0.349595	0.506541	0.670819
	(0.65283)	(0.23401)	(0.72025)	(0.81564)
	[-1.08273]	[1.49396]	[0.70328]	[0.82244]
D(MONEY_SA(-2))	-0.525604	-0.182776	-0.082335	-0.702358
	(0.67620)	(0.24238)	(0.74604)	(0.84484)
	[-0.77729]	[-0.75408]	[-0.11036]	[-0.83135]
D(MONEY_SA(-3))	-1.234820	0.064568	-1.022766	-0.851307
	(0.52690)	(0.18887)	(0.58131)	(0.65830)

	[-2.34357]	[0.34187]	[-1.75940]	[-1.29318]
D(MONEY_SA(-4))	-0.398246	0.094572	-0.511452	-0.077442
	(0.60559)	(0.21707)	(0.66814)	(0.75662)
	[-0.65762]	[0.43567]	[-0.76549]	[-0.10235]
D(MONEY_SA(-5))	0.323147	0.145050	1.044657	1.270117
	(0.58222)	(0.20869)	(0.64235)	(0.72742)
	[0.55503]	[0.69504]	[1.62631]	[1.74606]
D(EXPORTS_SA(-1))	-0.841983	0.225597	0.441280	0.564913
	(0.54692)	(0.19604)	(0.60340)	(0.68332)
	[-1.53950]	[1.15076]	[0.73132]	[0.82672]
D(EXPORTS_SA(-2))	-0.583435	0.089704	0.579325	0.528208
	(0.53774)	(0.19275)	(0.59328)	(0.67185)
	[-1.08498]	[0.46539]	[0.97649]	[0.78620]
D(EXPORTS_SA(-3))	-0.844097	-0.221002	0.077557	-0.423328
	(0.52196)	(0.18710)	(0.57587)	(0.65213)
	[-1.61717]	[-1.18123]	[0.13468]	[-0.64914]
D(EXPORTS_SA(-4))	-1.037772	-0.191932	-1.065269	-0.919968
	(0.51026)	(0.18290)	(0.56296)	(0.63752)
	[-2.03381]	[-1.04937]	[-1.89227]	[-1.44305]
D(EXPORTS_SA(-5))	-1.031924	0.078283	-0.407664	-0.739906
	(0.50239)	(0.18008)	(0.55427)	(0.62768)
	[-2.05403]	[0.43471]	[-0.73549]	[-1.17879]
D(IMPORTS_SA(-1))	0.273177	-0.154266	-1.079575	-1.226880
	(0.59223)	(0.21228)	(0.65339)	(0.73993)
	[0.46127]	[-0.72670]	[-1.65226]	[-1.65811]
D(IMPORTS_SA(-2))	0.819156	0.022020	-0.365270	-0.057977
	(0.61179)	(0.21930)	(0.67498)	(0.76437)
	[1.33894]	[0.10041]	[-0.54116]	[-0.07585]
D(IMPORTS_SA(-3))	1.488543	0.398477	0.679681	0.965679
	(0.54809)	(0.19646)	(0.60469)	(0.68478)
	[2.71588]	[2.02828]	[1.12401]	[1.41021]
D(IMPORTS_SA(-4))	0.720300	0.074593	0.108514	0.114303
	(0.48697)	(0.17455)	(0.53727)	(0.60842)
	[1.47913]	[0.42733]	[0.20197]	[0.18787]
D(IMPORTS_SA(-5))	0.589045	-0.077155	0.282543	0.414519
	(0.36250)	(0.12994)	(0.39993)	(0.45290)
	[1.62497]	[-0.59379]	[0.70647]	[0.91526]
C	0.067862	-0.002065	0.036858	0.021309
	(0.02342)	(0.00840)	(0.02584)	(0.02927)
	[2.89706]	[-0.24591]	[1.42617]	[0.72810]
R-squared	0.753152	0.733496	0.716269	0.743323
Adj. R-squared	0.365248	0.314704	0.270406	0.339974
Sum sq. resids	0.031020	0.003986	0.037759	0.048422
S.E. equation	0.047072	0.016873	0.051933	0.058811
F-statistic	1.941594	1.751456	1.606477	1.842879
Log likelihood	78.55374	116.5147	74.91716	70.31539
Akaike AIC	-3.002905	-5.054851	-2.806333	-2.557589
Schwarz SC	-2.001524	-4.053469	-1.804952	-1.556207
Mean dependent	0.027489	0.002308	0.027727	0.027928
S.D. dependent	0.059082	0.020382	0.060800	0.072390

Determinant resid covariance (dof adj.)	3.68E-13
Determinant resid covariance	7.54E-15
Log likelihood	391.5954
Akaike information criterion	-15.76191
Schwarz criterion	-11.40808

B. Vector Error Correction Estimates for South Africa

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
GDP_NG(-1)	1.000000
MONEY_NG(-1)	-0.905202 (0.23614) [-3.83326]
EXPORTS_NG(-1)	2.225319 (0.44233) [5.03085]
IMPORTS_NG(-1)	-3.129351 (0.49385) [-6.33669]
C	-0.442369

Error Correction:	D(GDP_NG)	D(MONEY_NG)	D(EXPORTS_NG)	D(IMPORTS_NG)
CointEq1	0.006086 (0.11564) [0.05263]	0.208572 (0.06540) [3.18910]	0.112799 (0.21306) [0.52941]	0.316878 (0.12433) [2.54858]
D(GDP_NG(-1))	0.099150 (0.36322) [0.27297]	-0.129011 (0.20542) [-0.62804]	0.035816 (0.66921) [0.05352]	-0.073341 (0.39052) [-0.18780]
D(GDP_NG(-2))	0.158784 (0.30867) [0.51441]	0.276722 (0.17457) [1.58520]	-0.085827 (0.56870) [-0.15092]	-0.442400 (0.33187) [-1.33306]
D(MONEY_NG(-1))	-0.090794 (0.26680) [-0.34031]	0.271884 (0.15088) [1.80194]	-0.352985 (0.49155) [-0.71811]	-0.016885 (0.28685) [-0.05886]
D(MONEY_NG(-2))	0.010986 (0.26660) [0.04121]	-0.080617 (0.15077) [-0.53469]	0.035909 (0.49118) [0.07311]	0.062571 (0.28663) [0.21830]
D(EXPORTS_NG(-1))	0.049535 (0.24381) [0.20317]	-0.221021 (0.13789) [-1.60291]	-0.335614 (0.44921) [-0.74713]	-0.326075 (0.26214) [-1.24391]
D(EXPORTS_NG(-2))	0.065953 (0.20532) [0.32122]	-0.400477 (0.11612) [-3.44893]	-0.213097 (0.37828) [-0.56333]	0.097198 (0.22075) [0.44031]
D(IMPORTS_NG(-1))	-0.055607	0.352992	0.339088	0.372563

	(0.25979)	(0.14692)	(0.47864)	(0.27931)
	[-0.21405]	[2.40257]	[0.70844]	[1.33385]
D(IMPORTS_NG(-2))	0.023162	0.168321	0.177988	0.246631
	(0.20930)	(0.11837)	(0.38561)	(0.22503)
	[0.11067]	[1.42204]	[0.46158]	[1.09602]
C	0.021801	0.012723	0.054837	0.044570
	(0.01882)	(0.01064)	(0.03467)	(0.02023)
	[1.15842]	[1.19539]	[1.58153]	[2.20276]
R-squared	0.099982	0.516698	0.044569	0.412506
Adj. R-squared	-0.170023	0.371707	-0.242060	0.236258
Sum sq. resids	0.264578	0.084623	0.898111	0.305841
S.E. equation	0.093911	0.053111	0.173023	0.100969
F-statistic	0.370298	3.563662	0.155495	2.340487
Log likelihood	43.61246	66.41114	19.16929	40.71385
Akaike AIC	-1.680623	-2.820557	-0.458464	-1.535693
Schwarz SC	-1.258403	-2.398337	-0.036245	-1.113473
Mean dependent	0.033258	0.012979	0.045617	0.044459
S.D. dependent	0.086820	0.067004	0.155251	0.115535

Determinant resid covariance (dof adj.)	5.27E-10
Determinant resid covariance	1.67E-10
Log likelihood	223.2620
Akaike information criterion	-8.963100
Schwarz criterion	-7.105333

C. Vector Error Correction Estimates for Ghana

Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
GDP_GA(-1)	1.000000
MONEY_GA(-1)	1.779760
	(0.14509)
	[12.2662]
EXPORTS_GA(-1)	-2.882402
	(0.26943)
	[-10.6983]
IMPORTS_GA(-1)	1.852272
	(0.21135)
	[8.76400]
C	-3.048227

Error Correction:	D(GDP_GA)	D(MONEY_GA)	D(EXPORTS_GA)	D(IMPORTS_GA)
CointEq1	0.433123	-0.548594	0.922882	0.492048

	(0.36173)	(0.19935)	(0.35698)	(0.44217)
	[1.19738]	[-2.75191]	[2.58526]	[1.11281]
D(GDP_GA(-1))	-0.104495	0.348563	-0.344447	0.145949
	(0.45825)	(0.25255)	(0.45224)	(0.56016)
	[-0.22803]	[1.38019]	[-0.76165]	[0.26055]
D(GDP_GA(-2))	-0.309401	0.541874	-0.725721	-0.154722
	(0.41725)	(0.22995)	(0.41178)	(0.51004)
	[-0.74152]	[2.35647]	[-1.76242]	[-0.30335]
D(GDP_GA(-3))	-0.515756	0.623554	-1.304806	-1.091046
	(0.46732)	(0.25754)	(0.46118)	(0.57124)
	[-1.10366]	[2.42118]	[-2.82925]	[-1.90996]
D(GDP_GA(-4))	0.058080	0.341261	-0.526586	-0.295799
	(0.48649)	(0.26811)	(0.48010)	(0.59467)
	[0.11939]	[1.27285]	[-1.09682]	[-0.49741]
D(GDP_GA(-5))	-0.342862	0.253433	-0.501064	-0.829048
	(0.34074)	(0.18778)	(0.33627)	(0.41651)
	[-1.00623]	[1.34960]	[-1.49008]	[-1.99045]
D(MONEY_GA(-1))	-0.384521	0.607428	-0.042023	0.488398
	(0.51489)	(0.28376)	(0.50814)	(0.62940)
	[-0.74680]	[2.14062]	[-0.08270]	[0.77598]
D(MONEY_GA(-2))	-0.143983	0.415666	-0.627835	-0.407217
	(0.52223)	(0.28781)	(0.51538)	(0.63837)
	[-0.27571]	[1.44425]	[-1.21819]	[-0.63790]
D(MONEY_GA(-3))	-0.150844	0.762436	-0.849041	-0.837832
	(0.41558)	(0.22903)	(0.41013)	(0.50800)
	[-0.36297]	[3.32895]	[-2.07017]	[-1.64927]
D(MONEY_GA(-4))	0.157073	-0.195412	-0.609003	-0.776755
	(0.52959)	(0.29186)	(0.52264)	(0.64736)
	[0.29660]	[-0.66954]	[-1.16525]	[-1.19988]
D(MONEY_GA(-5))	-0.040418	-0.054159	-0.537388	-0.665993
	(0.38878)	(0.21426)	(0.38368)	(0.47524)
	[-0.10396]	[-0.25278]	[-1.40063]	[-1.40139]
D(EXPORTS_GA(-1))	0.704256	-0.800427	1.879423	1.673675
	(0.71394)	(0.39346)	(0.70457)	(0.87271)
	[0.98643]	[-2.03433]	[2.66747]	[1.91779]
D(EXPORTS_GA(-2))	0.185337	-0.428791	0.338551	-0.049798
	(0.51601)	(0.28438)	(0.50924)	(0.63076)
	[0.35917]	[-1.50783]	[0.66482]	[-0.07895]
D(EXPORTS_GA(-3))	0.338497	-0.099279	0.631071	0.365265
	(0.47589)	(0.26227)	(0.46965)	(0.58173)
	[0.71129]	[-0.37854]	[1.34371]	[0.62790]
D(EXPORTS_GA(-4))	0.261234	-0.640519	0.711294	0.368871
	(0.43096)	(0.23750)	(0.42530)	(0.52680)
	[0.60617]	[-2.69687]	[1.67244]	[0.70022]
D(EXPORTS_GA(-5))	0.491961	-0.254142	0.607411	0.455889
	(0.49740)	(0.27412)	(0.49088)	(0.60802)
	[0.98906]	[-0.92710]	[1.23740]	[0.74979]
D(IMPORTS_GA(-1))	-0.302726	0.559134	-0.480812	-0.533678
	(0.50920)	(0.28062)	(0.50252)	(0.62243)
	[-0.59452]	[1.99247]	[-0.95681]	[-0.85740]
D(IMPORTS_GA(-2))	0.058809	-0.055746	-0.317047	-0.451933

	(0.38461)	(0.21196)	(0.37956)	(0.47014)
	[0.15291]	[-0.26300]	[-0.83530]	[-0.96127]
D(IMPORTS_GA(-3))	0.012215	0.134327	0.160079	0.159954
	(0.37134)	(0.20465)	(0.36646)	(0.45391)
	[0.03290]	[0.65639]	[0.43682]	[0.35239]
D(IMPORTS_GA(-4))	-0.299233	-0.033691	-0.581988	-0.471169
	(0.35974)	(0.19826)	(0.35502)	(0.43974)
	[-0.83181]	[-0.16994]	[-1.63932]	[-1.07147]
D(IMPORTS_GA(-5))	-0.096341	0.146454	0.263479	0.357915
	(0.28909)	(0.15932)	(0.28529)	(0.35337)
	[-0.33326]	[0.91926]	[0.92354]	[1.01285]
C	0.022754	-0.014043	0.037053	0.049477
	(0.02148)	(0.01184)	(0.02119)	(0.02625)
	[1.05953]	[-1.18653]	[1.74836]	[1.88477]
R-squared	0.367614	0.723131	0.762106	0.674128
Adj. R-squared	-0.517726	0.335513	0.429053	0.217908
Sum sq. resids	0.110208	0.033472	0.107334	0.164675
S.E. equation	0.085716	0.047239	0.084591	0.104778
F-statistic	0.415224	1.865579	2.288246	1.477639
Log likelihood	55.10093	77.14638	55.58965	47.67119
Akaike AIC	-1.789240	-2.980885	-1.815657	-1.387632
Schwarz SC	-0.831397	-2.023042	-0.857814	-0.429789
Mean dependent	0.031378	0.002063	0.041500	0.044472
S.D. dependent	0.069577	0.057950	0.111951	0.118479
Determinant resid covariance (dof adj.)		4.23E-11		
Determinant resid covariance		1.14E-12		
Log likelihood		298.7180		
Akaike information criterion		-11.17395		
Schwarz criterion		-7.168422		

D. Vector Error Correction Estimates for Kenya

Standard errors in ( ) & t-statistics in [ ]

	GDP_KE	MONEY_KE	EXPORTS_KE	IMPORTS_KE
GDP_KE(-1)	0.592498	-0.075710	0.101534	0.122287
	(0.14685)	(0.09614)	(0.17293)	(0.20263)
	[4.03461]	[-0.78751]	[0.58713]	[0.60350]
MONEY_KE(-1)	0.272438	0.683352	0.395984	0.686253
	(0.17438)	(0.11416)	(0.20535)	(0.24062)
	[1.56228]	[5.98583]	[1.92830]	[2.85203]
EXPORTS_KE(-1)	0.150985	0.254433	0.948717	0.435624
	(0.16608)	(0.10873)	(0.19558)	(0.22916)
	[0.90910]	[2.34013]	[4.85088]	[1.90094]
IMPORTS_KE(-1)	0.182101	-0.089678	-0.135666	0.370315
	(0.18356)	(0.12017)	(0.21616)	(0.25328)

	[0.99203]	[-0.74626]	[-0.62761]	[1.46205]
C	0.528567	-0.292281	0.178066	-0.359182
	(0.29146)	(0.19081)	(0.34323)	(0.40217)
	[1.81349]	[-1.53181]	[0.51880]	[-0.89311]
R-squared	0.983691	0.872737	0.975279	0.973718
Adj. R-squared	0.981928	0.858979	0.972607	0.970877
Sum sq. resids	0.073967	0.031700	0.102572	0.140825
S.E. equation	0.044711	0.029270	0.052652	0.061694
F-statistic	557.9226	63.43428	364.9265	342.7002
Log likelihood	73.58253	91.37578	66.71673	60.06055
Akaike AIC	-3.265835	-4.113132	-2.938892	-2.621931
Schwarz SC	-3.058969	-3.906267	-2.732027	-2.415066
Mean dependent	9.959139	1.536447	9.387981	9.477596
S.D. dependent	0.332593	0.077945	0.318118	0.361508