THE DETERMINANTS OF GROWTH IN THE SOUTH AFRICAN ECONOMY: CVAR ANALYSIS

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Abstract

The key to a brighter future for South Africa is a sustained growth which requires an on-going improvement in the supply side of the economy. The purpose of this paper is to identify the set of variables that may potentially act as determinants of growth in the South African economy with the application of the cointegrated vector autoregressive approach. Impulse Response Function is also used to explain the response to shock amongst the variables. The results indicate that the underlying variables of our model; real GDP, export, import and infrastructure investment are cointegrated. The estimates indicate that all the variables influence growth, albeit positive or negative effects. These results provide some indication to the policy makers on which variables to focus on in order to stimulate economic growth in South Africa. The study will contribute to a body of knowledge about the growth suggestions and recommendations that can redesign the growth promotion programs.

Keywords: Economic Growth, Infrastructure Investment, Vector Error Correction Model, South Africa

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1 Introduction

Every economy of the world strives to be internationally competitive so as to improve its growth and ultimately its nation's welfare. Contrary to this, South Africa is faced with very low levels of economic growth. World Bank (2014a) has revised the country's economic growth outlook in 2014 to 2.7% from an earlier forecast of 3.2%. The Bank indicates that regardless of this down grade, the 2014 outlook would be better than the expected 1.9% growth in 2013 and reach 3.4% in 2015. The hope is that it would be boosted by an improvement in global demand and export.

Sustained improvement in the economic activity proved elusive in South Africa in 2013, as the domestic factors continued to weigh on the recovery and offset the benefit of improving external conditions. Economic growth, which was already weakened substantially in 2012, continued to falter in 2013. The labour unrest compounded long standing structural constraints and reduced confidence. Growth in both consumer spending and private investment continued to moderate, reaching just 2.3% and 2.6% respectively, reflecting low confidence amid increasing uncertainty, tighter credit conditions and persistently high unemployment (World Bank, 2014a). At the beginning of the second quarter of 2014, the growth forecast for 2014 was further amended to 2% from earlier forecast of 2.7% and left the outlook of 2016 at 3.5% (World Bank, 2014b). This time the bank attributed all these revision to the tight monetary policy, labour unrests and weak and unreliable electricity supply.

According to World Bank (2014b) Sub-Saharan Africa's GDP grew 4.7% in 2013 led by robust domestic demand, and is set to continue to rise. Despite emerging challenges, the medium-term outlook remains positive. Supported by investment in the resource sector, public infrastructure and agriculture, GDP growth is projected to remain stable at 4.7% in 2014 and to rise to 5.1% in 2015 and 2016. The outlook is sensitive to downside risks from lower commodity prices, tightening global financial conditions and political instability. On the contrary South Africa's GDP is projected to remain well below the average of 5.4% projected for the Sub-Sahara Africa for 2014 to 2016 period.

Based on growth rate of the past five years, South Africa seems to fall under the category of the "slow growing economies"[14]. Statistics South Africa (Stats SA) (2014) indicates that the real GDP at market price during the first quarter of 2014 decreased by 0.6%. The main contributors to this decrease were the mining and quarrying with -1.3% points and the

[14] Chuhan-Pole et al. (2014) regards the fast-growing countries as those that have experienced an expansion in real GDP per capita that has lasted five years or more and where output per capita grew more than 3.5% per year.

manufacturing industry decline by -0.7%. According to the World Bank (2014a) GDP figures of 2014 first quarter depict a country facing a recession while much of the world is beginning to pull upwards. Given the potential in human, capital and natural resources in the South African economy, this is a course for concern.

Restarting the export engine is critical to reinvigorating growth and to developing a more diversified export base to help reduce growth volatility in the South African economy (WorldBank, 2014a). According to Fallon and de Silva (1994) the key to a brighter future is a sustained growth which requires an on-going improvement in the supply side of the economy. Shahid (2013) argues that the success of exports depend on the planning and adopting the suitable strategy that could increases profit and economic.

The exports remained relatively stable during the 1970s and early 1980s, but grew strongly from the mid-1980s. Export growth was particularly strong within manufacturing which has become the dominant source of export revenue, accounting for 64 % of total exports (excluding services) in 2000. Indicators of openness (exports as a share of GDP, import penetration and export orientation) have also risen sharply, reflecting the rising importance of international trade for the domestic economy. For example, manufacturing exports as a share of output grew from 10.2 % in 1985 to 27.5 % in 2000 (Edwards and Alves, 2006).

Maswanganyi (2014) argues that exports will be relied upon to lift economic growth because household spending, the driver of economic activity since the 2008/2009 recession; can no longer play this role. The reason behind this notion is that consumers are facing rising borrowing costs, stricter lending criteria from financial institutions and uncertain employment prospects. Several researchers such as Shahid (2013), Palley (2011) and Westphal (2002) have also pointed out the importance of export-led growth in the economy and why it is important to understand the exports' fundamental as one of the determinants of economic growth. However very few studies have looked at this relationship in the South African context, therefore we take the advantage of this research gap by linking exports with infrastructure and imports to examine the determinants of economic growth in South Africa.

In addition, this study employs econometric techniques, whose application is still in its infancy in the analysis of determinants of growth in the South African context. Therefore this study will contribute the growth suggestions and recommendations that can redesign the South Africa's growth promotion programs. It will also be a valuable source of information for policy makers as they need such information in formulating policies and the knowledge of several factors that affect growth. The information might also be useful to the international community and the multinational companies in order to make informed decision about investing in South Africa. In addition, this study will act as a good source of information for researchers and academics who are involved in debates on this subject. Finally this research will contribute to empirical literature on the factors that influence growth in South Africa.

The objective of this study is to identify the set of variables that may potentially act as determinants of economic growth in the South African economy through the estimation of the cointegrated vector autoregressive (CVAR) approach. The organization of the study is as follows; Section 2 provides theory and literature review of the study. Section 3 discusses empirical model, estimation techniques and data. Empirical Results and Discussion are presented in Section 4 and the study is concluded in Section 5.

2 Theory and literature review

According to Kokko (2002) the relevant lessons from the Asian miracle economies point to the importance of sound macroeconomic policies and some of the "softer" forms of export promotion. They include public investment in infrastructure and investment in institutions that support export financing and insurance, market research, training and education in export-related skills and technology transfer.

Export-led growth is a strategy of promoting exports production which will ultimately lead to economic growth. The developing countries like South Africa use this strategy to find comfortable position in the world economy for a particular type of export. The strategy is implemented to gain hard currency for importing of commodities manufactured at cheaper rates somewhere else. Therefore, most of the developing countries are shifting towards export-led growth strategy. This strategy facilitates export expansion leads for creating economies of scale, improving production efficiency, employment generation, capital formation and better resource allocation. Export and export policy is the engine of economic growth of the country that introduce new technologies, stimulate demand, encourage savings and accumulates capital. Moreover, exporting is not an easy task but needs to take important decisions and requires proper planning. For that reasons, government of emerging countries like India, adopts strategy that could encourage and support export production in the country (Shahid, 2013).

Contrary to this Palley (2011) argues that export-led growth as a development paradigm is exhausted owing to changed conditions in emerging market and developed economies. The global economy needs a recalibration that facilitates a new paradigm of domestic demand-led growth. Globalisation has so diversified global economic activity that no country or region can act as the lone locomotive of global growth. That been the case, Palley maintains that political reasoning suggests that emerging markets countries are not likely to abandon exported-led

growth, nor will the international community implement the international arrangements needed for successful domestic-led growth. Consequently, the global economy likely faces asymmetric stagnation.

There exits an abundance of empirical studies that have been undertaken on export and growth. Aghion (2009) specifies that the performance of a country's exports is highly dependent on its exchange rate and more specifically the real exchange rate. Since the demand for exports depend on the exchange rate, if the rand appreciates foreign goods become relatively cheaper and South Africans will import more which in turn has a negative impact on domestic labour intensive production and employment which is a problem. Consequently depreciation raises the home price and lowers the foreign currency price of domestic exports. Moreover lower exports mean lower GDP production and employment.

WorldBank (2014a) indicates that alleviating infrastructure bottlenecks, especially in power and removing distortions in access to and pricing of trade logistics in rail, port, and information and communication technologies would reduce overall domestic prices and further enhance competitiveness. It would be especially beneficial for small and medium-size exporters and non-traditional export sectors, which the sectors tend to, hit harder. Economic infrastructure such as transport, communication, power, water and sanitation systems provide the foundation for economic activity within an economy. The provision of infrastructure also has important consequences for an economy's exports performance by lowering the transaction costs associated with exporting.

3 Research method

This study follows Juselius (2006)'s cointegrated vector autoregressive (CVAR) approach which has been applied by studies such as Saluja, et al (2013), Mongale, et al (2013) and Asari, et al (2011). The approach includes the unit root or stationarity tests, cointegration tests and vector error correction model (VECM). The choice of this method is based on its primary purpose of evaluating the relationship between a set of independent variables namely; imports, real exports and infrastructure investment and the dependent variable (real GDP) which is a proxy for a measure economic growth in South Africa.

3.1 Data and model specification

A secondary annual time series data (1973-2013) obtained from the South African Reserve Bank is used and the study adopts the following model:

$$RGPD_t = \alpha + \beta_1 IMP_t + \beta_2 INFRIN_t + \beta_3 EXPT_t + \varepsilon_t \quad (1)$$

where: RGDP = Real Gross Domestic Product.
IMPT = Imports
INFRIN = Infrastructure Investment
EXPT = Exports
β = intercept parameters
ε = A normally distributed error term

4 Empirical results and discussion

4.1 Unit root tests

Most economic series are regarded as nonstationary in their levels such that estimations based on this technique will be meaningless. As a prerequisite for the establishment of the presence of a long run economic relationship among the variables, we begin by implementing the Augmented Dickey-Fuller (ADF) and Phillip-Perron (PP) unit root tests. The purpose of such tests is to determine the order of integration and help to empirically verify the stationarity of our variables. The two tests were implemented by including trend and intercept in the test regression equation and the results are presented in Table 1.

Table 1. Unit root tests results

Variables	*ADF*		*PP*	
	Levels	*1ST Difference*	*Levels*	*1ST Difference*
RGDP	0.075994 (-3.526609)	-4.488729 (-3.529758)	0.075994 (-3.526609)	-4.394867 (-3.529758)
IMP	0.735802 (-3.548490)	-1.775192 (-3.548490)	8.481242 (-2.936942)	-13.58102 (-3.529758)
INFRIN	2.754816 (-3.533083)	-4.832103 (-3533083)	8.212278 (-3.526609)	-2.882294 (-3.529758)
EXPT	5.298341 (-3.544284)	-0.561965 (-3.548490)	2.455561 (-3.526609)	-6.750400 (-3.529758)

Note: Critical values are in parenthesis at 5% significance level

We find evidence from both the ADF and the PP tests that all the four variables of the study are stationary at first difference, therefore they seem to be integrated of order one, that is, they are I(1) variables. This means that they are nonstationary at levels since the null hypothesis of unit root tests is not rejected. Since the order of integration has been determined, the

next step is to estimate the long run equilibrium relationship among the variables in the model.

4.2 Cointegration test

Gujarati and Porter (2009) proposes that cointegration of two or more times series suggest that there is a long run or equilibrium relationship between them. Therefore purpose of the cointegration test is to determine whether the variables in our growth model are cointegrated or not. Their long run relationship is the equilibrium to which the system converges over time. Seemingly, the disturbance term can be interpreted as the disequilibrium error or the distance that the system is away from equilibrium at time *t*. In other words, a cointegrating relationship may also be seen as a long term or equilibrium phenomenon, since it is possible that cointegrating variables may deviate from their relationship in the short run, but their association would return in the long run (Hossain, 2008). The results of the cointegration tests namely trace statistic and maximum eigenvalue statistic are presented in Table 2 as follows:

Table 2. Johansen cointegration tests

Trace test				*Maximum Eigen value test*			
H_0	H_A	*Statistics*	*0.05 Critical value*	H_0	H_A	*Statistics*	*0.05 Critical Value*
r = 0	r ≥ 1	108.9571*	47.85613	r = 0	r = 1	77.71107*	27.58434
r ≤ 1	r ≥ 2	31.24604*	29.79707	r ≤ 1	r = 2	15.13162	21.13162
r ≤ 2	r ≥ 3	16.11446*	15.49471	r ≤ 2	r = 3	14.38047	14.26460
r ≤ 3	r ≥ 4	1.733992	3.841466	r ≤ 3	r = 4	1.733992	3.841466

Note: Asterisk* denotes rejection of the hypothesis at the 0.05 level; r stands for the number of cointegrating vectors

The cointegration test was applied assuming linear deterministic trend in the data and intercept. The overall results indicate that the null hypothesis of no cointegration could be rejected. This is based on the fact that the trace test statistic of the Johansen cointegration in Table 2 indicates the presence of three cointegrating vectors governing the relationship among the variables whereas the maximum eigenvalue shows the presence of one cointegration equation. The implication is that the depended variable and its determinants do have a long run relationship and they are moving together in the long run equation.

4.3 Vector error correction model (VECM)

Subsequently the cointegration tests have established that our variables are cointegrated, it is therefore appropriate to estimate a vector error correction model (VECM) where the short-term dynamics of the variables are estimated. According to Saluja, et al (2013) the main purpose of the VECM is to focus on the short run dynamics while making them consistent with long run solution. The results are presented in Table 3.

Table 3. Vector error correction model estimates

Variables	*Coefficients*	*Standard Error*	*t – statistic*
D(DGDP)	0.331733	0.17954	1.94515
D(DIMP)	-737.2459	1912.96	-0.38540
D(DINFRIN)	0.8710207	2.07692	0.41938
D(DEXPT)	-1608.676	2233.09	-0.72038
EC (-1)	-0.020261	0.05933	-0.34151

Note: the error correction representations imply short run adjustments towards equilibrium

The estimated coefficient of our error correction term (EC) is -0.02. According to Adamopoulos (2010) the EC term indicates the speed of adjustment of any disequilibrium towards a long run state. Our EC is significant with the theoretically correct sign (negative) for equilibrium to be restored. It also confirms that there is no problem in the long run relationship between dependent variable and its regressors. The implication is that the ECM is well specified and confirms the cointegration findings.

As an additional check, the lag structure/AR Roots test was also applied, to test the VEC's stability condition of our model and the results are presented in Table 4. According to Agung (2011) the VEC model imposes a certain number of unit roots, compared to no unit root for the VAR model. Imposing a unit root is a special characteristic of the VEC models and it has been found that the number of unit roots imposed equals to *(k - 1)* where *k* indicates the number of endogenous variables or the dimension of the multivariate independent variables. Our VEC specification imposes 1 unit root, therefore it could be said that the model is an acceptable time series model.

Table 4. VEC stability condition test- AR Roots Table

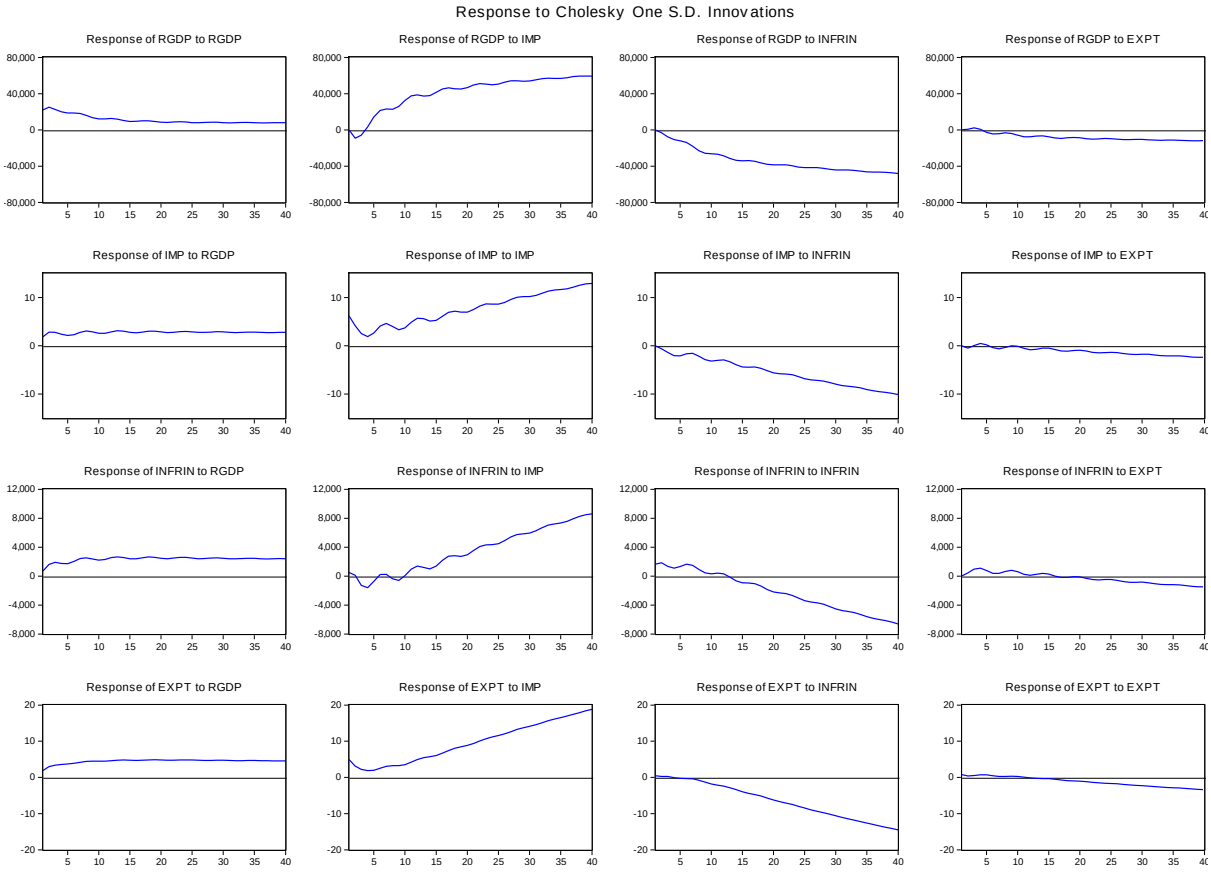
Roots of Characteristic Polynomial	
Endogenous variables: RGDP IMP INFRIN EXPT	
Exogenous variables:	
Lag specification: 1 1	
Date: 07/10/14 Time: 18:36	
Root	Modulus
1.000000	1.000000
0.985346	0.985346
0.355119 - 0.866590i	0.936529
0.355119 + 0.866590i	0.936529
0.829753	0.829753
0.501401	0.501401
-0.056204 - 0.306430i	0.311542
-0.056204 + 0.306430i	0.311542
VEC specification imposes 1 unit root(s).	

Finally, the Impulse Response Function (IRF) is used to explain the response to shock amongst the variables and also as an additional check of the cointegration tests results. Gujarati and Porter (2009) maintain that IRF traces out the response of the dependent varaible in the VAR system to shocks in the error terms. It traces out the impact of such shocks for several periods in the future. The impulse responses in Figure 1 shows that real GDP reponds positively to imports but this is preceeded by a negative response which last for a very short period. Infrastructure investment also repond positively to real GDP and the responses have a long lasting effects and in most cases equlibrium is maintained in the long run.

5 Conclusion

The purpose of this paper was to identify the set of variables that may potentially act as determinants of economic growth in the South Africa through the CVAR estimation. The results indicate that the underlying variables of our model; real GDP, imports, infrastructure investment and real exports are cointegrated. The findings also show that in both the long and short run, there is a relationship between the dependent variable and its regressors. The estimates indicate that all the variables influence the economic growth, albeit positive or negative effects. VECM results in Table 3 shows that the infrastructure investment has a positive and significant in influencing on economic growth.

Figure 1. Impulse responses



This relationship vindicates what the WorldBank (2014a) states about alleviating infrastructure bottlenecks, especially in power and removing distortions in access to and pricing of trade logistics in rail, port and information and communication technologies. The Bank emphasises that this would

reduce overall domestic prices and further enhance competitiveness in the economy. That would in turn be especially beneficial for small and medium-size exporters and non-traditional export sectors, which these costs tend to hit harder in South Africa. The results are also in line with Vijil and Wagner (2010) who showed that infrastructure channel appears to be highly significant as one of determinants of developing countries' exports.

A negative and significant coefficient of exports is a cause for concern in this relationship because as Fallon and de Silva (1994) have indicated, the key to a brighter future for South Africa is a sustained growth which requires an on-going improvement in the supply side of the economy. There is a need for the South African policy maker to come up with proper planning to improve exports because as Shahid (2013) stated that the success of exports depend on the planning and adopting the suitable strategy that could increases profit and economic growth.

These results provide some indication to the policy makers on which variables to focus on in order to stimulate growth promotion. We hope that this study will furthermore contribute to a body of knowledge about the growth suggestions and recommendations that can redesign the South Africa's growth promotion programs that will be helpful to bring about the much needed growth.

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