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THE EFFECT OF THE FLUCTUATIONS IN THE COMPONENTS OF AGGREGATE DEMAND ON THE NON-OIL GDP OF THE KINGDOM OF SAUDI ARABIA: A VECTOR AUTO-REGRESSION ANALYSIS[1]

This study investigates the effect of the fluctuations in the components of aggregate demand on the non-oil GDP (RNOGDP) in the Kingdom of Saudi Arabia (KSA) using Vector Auto Regression analysis(VAR). The cointegration test indicates the existence of a long-term relationship between RNOGDP and the components of aggregate demand. The variance decomposition (VD) suggests that fluctuations in real government expenditure (RGOV) and real net exports (RNEXP) play a major role in explaining the fluctuations of real non-oil GDP, while the Impulse Response Functions (IRFs) indicate that the fluctuations in RGOV and real private consumption (RCONS) have a positive and the greatest influence on fluctuations in RNOGDP in the short run, but that vanishes in the long-term. On the other hand, the IRFs indicate that fluctuations in real investment (RI) and RNEXP have a negative effect on the fluctuations in RNOGDP in the short run, though they decline in the long run.

Keywords: Saudi Arabia, Non-oil GDP components, Vector Auto Regression, variance decomposition, Impulse Response Functions

1. INTRODUCTION

Economic growth, which is defined as the efficient utilization of the available resources in order to achieve a high per capita income, is considered to be the ultimate goal of economic policies. But in order to achieve and maintain a high growth rate, the determinants of economic growth have to be defined as well as the sources of fluctuations in economic growth in the short run. Economists have been long concerned with the major determinants of economic growth. Since World War II, the growth of

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per capita real GDP has become a key policy objective in all countries. That is because economic growth is the key to raising the standard of living, In addition, there is a wide belief that governments can alter the long-term growth path by choosing and implementing the right economic policies (Crafts 2000).

Since the publication of Adam Smith's *Wealth of Nations*, economists have been trying to determine the sources of economic growth. While Smith (1776) stressed the importance of gains from trade, he saw that the division of labor and capital accumulations are the most important determinants of economic development. Capital accumulation determines the wealth of the nation, which in turn, produces economic surplus. However, the increase in capital accumulation raises the demand for labor which increases the variable cost and reduces profits. Ultimately, the economic surplus vanishes in the long run. Schumpeter (1921) stressed that innovation of the entrepreneur, such as introducing new goods or new methods of production, is the engine of the economy that guarantees the continuity of capitalism.

Keynes (1936) believed that investment is the engine of growth. Planned investment does not necessarily equal saving, and income is the equilibrating variable. Building on Keynesian analysis that planned investment does not equal saving in a closed economy, post-Keynesian growth theory presented by Harrod (1939) and Domar (1946) argued that economic growth is related directly to saving and indirectly to the ratio of capital to output, assuming that there is no substitution between the factors of production. According to the Harrod-Domar model, the rate of economic growth is proportional to the rate of investment lagged for one period. If there is a positive saving, investment will expand the production capacity of the economy. The Harrod-Domar model, considered as a part of the Keynesian growth model, asserts that there is no stable balanced growth path in a closed economy due to the constant coefficient production function and the independent investment function. Therefore, there is room for government to intervene through its appropriate economic policies to affect the long-term growth rate.

The neoclassical growth model widely attributed to Solow (1956) and Swan (1956) uses a linear homogeneous production function that allows for the possibility of substitution between capital and labor, instead of the assumption in the Harrod-Domar model of a constant capital/output ratio. In addition, the neoclassical growth model assumes constant returns-to-scale, diminishing marginal productivity of capital, exogenous production technology, and no independent investment function. The neoclassical growth theory assumes that the increase in saving will increase only the per

capita income and will not increase the growth rate permanently. Government policies may affect only the level of per-capita income but have no effect on the long-term growth rate. In general, the neoclassical growth model asserts the importance of the constant growth rate of population to the growth of real per capita income. Also, it emphasizes the primary importance of the technological advancements to compensate for the negative effects of diminishing marginal productivity of capital; and therefore, ultimately determines the long-term growth rate. Therefore, technological developments play an important role in determining the long run growth rate. If there are no technological changes, the growth rate of output would equal the growth rate of population, which means that per capita growth rate would equal zero.

Many economic growth studies focused on the determinants of long-term run economic growth which were derived from standard neoclassical theory, where the growth rate of real gross domestic product (GDP) is a function of the growth rates of capital stock, labor force, and net exports in addition to other variables (Esfhani 1991). Within that scope, Otani and Villanueva (1990) investigated the determinants of the long-term growth of 55 developing countries grouped by income levels. The result shows that the growth rates are explained by a set of macroeconomic variables, including the savings rate, export, expenditure on human capital development, population growth and the real interest rate on external debt. In addition, the results suggest that economic policies would lead to higher long-term growth rates. Sumru et al. (2008) investigated the sources of long-term economic growth for Turkey over the period 1880–2005. The paper established the importance of political and economic variables as well as different structural changes on economic growth in Turkey over the investigated period. Alkhataib (2010) used an OLS to assess the determinants of economic growth in the KSA over the period 1970-2006. The results indicate that private and government investment played an important role in determining the economic growth in non-oil GDP in the Kingdom. Also, government expenditure, government loans, and monetary aggregate had a positive effect on non-oil GDP.

Some studies focus on the direction of causality between economic growth and other major macroeconomic variables. Levine (1997), Beck et al (1999), and Schich and Pelgrin (2002) show that there is a uni-directional causality running from financial developments to economic growth. Rangasamy (2009) investigated the relationship between economic growth and exports for South Africa using Granger causality techniques. The results

show that there is a uni-directional Granger causality running from exports to economic growth in South Africa. Therefore, government policy that stimulates exports will enhance the growth rate of the South African economy.

The Neoclassical Growth Model has been challenged by the Endogenous Growth Theory literature in many aspects. First, the exogenous growth models introduced by Solow and others state that the main source of growth is exogenous technological advancement plus other external factors, but the neoclassical economists did not explain what caused technology to improve over time (Cortright, 2001). In addition, the Neoclassical Growth Model assumed that growth rates will be the same across countries as long as they have equal per capita income. Although their growth rates are different since their relative resources are different, ultimately per capita income will be the same across countries. This is termed the "absolute convergence" hypothesis. This convergence hypothesis was not acceptable to the advocates of endogenous growth theory, in particular, Romer (1986) and Lucas (1988). Romer (1986, 1990) and Barro (1991, 1997, 1999), among others, introduced dynamic growth models that emphasize technological advancements where growth depends also on the stock of physical and human capital as well, and on research and developments (R&D). In particular, the Endogenous Growth Theory puts more emphasis on human capital which is characterized by increasing returns that allow growth to increase infinitely. Since physical capital is subject to diminishing returns, adding more capital will not lead to higher economic growth. According to Barro (1999) "the accumulation of human capital is an important part of the development process, and this accumulation is influenced in major ways by public programs for schooling and health. Equally important are government policies that promote or discourage free markets". Although the new discoveries are essential to economic growth, Romer (1990) concludes that a well skilled labor force generates new products that promote technological advancement. In addition, countries that are characterized by a large and skilled labor force tend to introduce new products and thereby grow faster.

However, Jones (1995) thinks that steady state economic growth is independent of macroeconomic policies. Moreover, institutional theorists believe that institutions are the driving force of the economy. According to North (1994), "Institutions are the incentive structure of a society and therefore the rules, norms, and enforcement characteristics that make up the institutional foundations of a society direct the allocation of resources of that society and economy. Economic growth throughout history could only be

realized by creating an institutional and organizational structure that would induce productivity enhancing activity". Kong (2011) integrates governance quality into the endogenous growth model. His model shows that good governance accelerates economic growth. Governance quality improves the productivity of public investments and, in turn, economic growth. Thus, institutions, through governance quality, enhance economic growth.

Considerable empirical works investigate the effect of the fluctuations in the components of aggregate demand on GDP. McConnell, Mosser, and Quiros (1999) investigated the effects of the changes in the components of GDP on the volatility of growth rates of GDP in the United States over the period 1959-1998. Furthermore, they assessed the impact of these fluctuations in the components of GDP on the stability of aggregate growth. Their overall results showed that since 1984 the growth rates of the components of GDP show that all these have become more stable than the previous period, causing the U.S. economy to grow at a steady pace. They attributed the decline in the volatility of the growth rates of GDP to two major components: inventory investment and consumer spending. Ramaswamy and Rendu (2000) explored the decline in economic growth in Japan during the 1990s. Negative shocks to investment and the fluctuations in government consumption are the major determinants of the decline in growth. However, negative shocks to private consumption played a minimum role in the economic slowdown. Labhard (2003) analyzed shocks to G7 GDP components. The shocks of the GDP components in the G7 are negative. The sources of the shocks are net trade, investment, and private sector consumption. These shocks differ across countries in their pattern and length. Alhoshan (2009) used a Vector Auto-Regression approach (VAR) to analyze the dynamic behavior of the non-oil GDP of Saudi Arabia for the period 1963-2004. The results of the variance decompositions and the impulse response functions show the important role of both private consumption and public investment in determining the fluctuation of the non-oil GDP. Furthermore, they have the same important role in explaining the fluctuation behavior of the other components of aggregate demand.

This paper utilizes a Vector Auto-regression (VAR) model proposed initially by Blanchard (1993) and then used by Catao and Ramaswamy (1995), Ramaswamy and Rendu (2000), Labhard (2003), and Alhoshan (2009) to quantify the effect of shocks in the components of aggregate demand on the fluctuations in non-oil GDP in the KSA. The fluctuation in economic growth in the KSA, measured by real non-oil GDP (RNOGDP), was driven largely by shocks to the different components of aggregate

demand. VAR estimations of these shocks is useful to determine and assess the relative importance of each of the RNOGDP components, for instance, whether shocks to government expenditure were more important than those shocks to private consumption or private investment in inducing fluctuations in economic growth as measured by real non-oil GDP over the period 1970-2008. This technique is important, also, to quantify the role of these components in economic cycles, and then to predict the direction of the economic growth, and design the proper economic policies to stabilize the economy.

The rest of the paper is organized as follows: Section II discusses the methodology used to investigate the relationship between non-oil GDP and the components of aggregate demand and to quantify the dynamic role of aggregate demand components; namely, real private consumption, real private investment, real government expenditure, and real net exports in non-oil GDP's fluctuationsin the KSA. Section III presents the empirical results. Section IV concludes the paper.

2. METHODOLOGY

In order to determine the long run relationship between economic growth measured by real non-oil GDP and the components of aggregate demand, namely private consumption, private investment, government expenditure, and net exports, all in real terms, the following equations are estimated:

$$RNOGDP_t = \alpha_0 + \alpha_1 RCONS_t + \alpha_2 RI_t + \alpha_3 RGOV_t + \alpha_4 RNEXP_t + U_t \quad (1)$$

where:

$RNOGDP_t$ = Real Non-oil Gross Domestic Product
$RCONS_t$ = Real Private Consumption
RI_t = Real Private Investment
$RGOV_t$ = Real Government Expenditure
$RNEXP_t$ = Real Net Exports
U_t = errors of the model

The long term relationship between economic growth measured by non-oil GDP and the components of aggregate demand is investigated using the cointegration technique. The study then investigates the short term dynamics using the Variance Decomposition (VC_S), and Impulse Response Functions (IRF_S), based on the Vector Error-Correction Model (VECM).

Unit Root Tests

Most economic time series are non-stationary as many studies indicated including Nelson and Plosser (1982), and as proved by Stock and Watson (1988) and Campbell and Perron (1991). The presence of a unit root in any time series means that the mean, the variance and/or covariance of the series depend on time. Models that incorrectly assume stationarity produce spurious regressions, despite other good indicators such as high coefficients of determination R^2 and statistics which may simply indicate correlated trends rather than a correct regression relation (Granger and Newbold, 1974).

Phillips (1987) and Phillips and Perron (1988) proposed what has become known as the Phillips-Perron (PP) unit root test, which is a nonparametric method to correct a wide variety of serial correlation and heteroskedasticity forms. Perron (1989, 1990) demonstrated that if a time series exhibits stationary fluctuations around a trend or a level containing a structural break, then unit root tests based on other tests will erroneously conclude that there is a unit root.

The unit root test and the order of integration would be performed on boththe levels and the differences of the series using the PP unit root test.

Cointegration Test

If the time series of RNOGDP, RCONS, RGOV, RI, and RNEXP are non-stationary but with the same order of integration, they would be tested for the existence of a long term relationship using cointegration techniques. The non-stationary time series that have the same order of integration may be cointegrated if there exists some linear combination of the series that can be tested for stationarity i.e. I(0). Cointegration is a test of long term equilibrium of non-stationary series that do not have equilibrium in the short run (Granger and Newbold, 1974, 1977). It implies that there is some adjustment process that does not allow the errors in the long term relationship to expand (Charemza and Deadman, 1992).

Johansen (1988) Johansen and Juselius (1990) proposed an alternative procedure which is considered better than the two step procedure proposed by Engle and Granger (1987), in particular, in more than two time series cases since it allows feedback effects among the variables under investigation. The procedure is based on a likelihood ratio (LR) test. Two test statistics are suggested to determine the number of Cointegrating vectors based on the likelihood ratio (LR) principle: a trace test (λ_{trace}) and a maximum eigenvalue test $(\lambda_{\max})$ statistics.

Short Run Dynamics

If the analysis shows that there is a long term relationship between RNOGDP and the components of aggregate demand, it does not reveal the short term relationship. The next step is to examine the dynamic interactions between the RNOGDP and the components of aggregate demand. The paper adopts the Sims (1980) and (1990) VAR approach. VAR is used to capture the evolution and the interdependencies between multiple time series and also to analyze the dynamic impact of random disturbances on the system of variables. In the VAR model, each equation contains the same variables in the right hand side that include all of the variables and their lags.

The VAR model can be written as:

$$Z_t = \sum_{i=1}^{k} A_i Z_{t-i} + \varepsilon_t .$$

Where:

$$Z_t = \begin{bmatrix} RNEXP_t \\ RGOV_t \\ RI_t \\ RCONS_t \\ RNOGDP_t \end{bmatrix}$$

where,

Z_t = is 5 x 1 vector of endogenous variables containing: real non-oil GDP-RNOGDP, real private consumption-RCONS, real private investment-RI, real government expenditure-RGOV, and real net exports-RNEXP, all at time t. A_i are 5 x 5 matrices of parameters (i.e. coefficients to be estimated)

with i= 1, 2, …,k; ε_t is a column vector of random disturbances. The error terms are assumed to be identically and independently distributed. In case the variables in the above equation are non-stationary, the variables are written in appropriate differences. If the variables in the VAR model are cointegrated, there is an equilibrium process that guarantees the disturbances will not increase in the long term (Engle and Granger, 1987). When the lagged value of the error correction parameter is added to the VAR model, then a Vector Error Correction Model (VECM) is used to estimate the speed of adjustment to the long term equilibrium. The interrelation among the variables and the short term dynamic adjustment of RNOGDP to shocks in the components of aggregate demand are examined by utilizing VCsand IRFs derived from the VECM. VCs analysis helps to determine the proportion of the impact of each variable on the other variables independently of other variables in the VAR model. IRFs, on the other hand, follow up the shock effect of each variable on the others and the length duration of this shock till it vanishes.

3. THE EMPIRICAL RESULTS

The variables of the model are real non-oil GDP (RNOGDP), and the components of aggregate demand, namely: real private consumption (RCONS), real private investment (RI), real government expenditure (RGOV), and real net exports (RNEXP), all in natural log forms for the KSA. The annual data employed in this study covers the period from 1970-2008 obtained from the different annual reports of the Saudi Arabian Monetary Agency.

The results of unit root test, cointegration, and short run dynamic will be presented in the following sections.

Unit Root Test

The analysis of the time series based on the PP unit root test indicates that the null hypothesis cannot be rejected for the levels of the time series of RNOGDP and the components of aggregate demand; namely, RCONS, RGOV, RI, and RNEXP, since their PP values are less than the critical values at the 5% level of significance. However, the results indicate that the null hypothesis is rejected for the first differences since their PP values exceed the critical values at the 5% level of significance. Therefore, the time series are integrated of order one (I(1)).

Table 1

PP Unit Root Test

Variable	Level with intercept and trend	First difference with intercept and trend
RNOGDP	- 1.38	- 11.97
RCONS	- 1.09	-8.54
RI	- 2.78	- 5.82
RGOV	-3.31	- 6.67
RNEXP	-1.75	-5.40

Source: author's computations. The empirical analysis was performed with the Eviews7.2 package.

Critical values:	Intercept and trend
At 1% level of significance	-4.22
At 5% level of significance	-3.54
At 10% level of significance	-3.20

Cointegration

Since the series are non-stationary, but have the same order of integration, i.e. I(1), they may be cointegrated if there exists some linear combination of the series that can be tested for stationarity, i.e. I(0). Table (2) presents the result of the vector autoregressive model (VAR) which includes the results of the trace test (λ_{trace}) and the maximum eignvalue test $(\lambda_{\max})$ statistics for the existence of a long term equilibrium relationship between RNOGDP and the components of aggregate demand, namely, RCONS, RGOV, RI, and RNEXP.

Table 2

Johansen Cointegration Test

Hypothesized No. of CE(s)	Eigen value	$(\lambda_{\max})$	(λ_{trace})	95% critical value for maximum eigenvalue test	95% critical value for trace test
None *	0.659783	42.04873	95.73151	37.52	87.31
At most 1	0.406647	20.35666	53.68277	31.46	62.99
At most 2	0.349449	16.76750	33.32612	25.54	42.44
At most 3	0.238216	10.61158	16.55862	18.96	25.32
At most 4	0.141431	5.947042	5.947042	12.25	12.25

Source: author's computations. The empirical analysis was performed with the Eviews 7.2 package.

The table presents the result of the Johansen test based on both the maximum eigenvalue and the trace tests where the null hypothesis of no cointegration between RNOGDP and the components of aggregate demand is rejected at the (5%) level of significance. However, the null hypothesis of the existence of at most one cointegration equation is accepted at 5% level of significance. This result indicates that there exists one cointegration equation between the RNOGDP and the components of aggregate demand. According to Granger (1988), the existence of cointegration between the time series under consideration suggests that there is a long term relationship between RNOGDP and the components of aggregate demand; namely, RCONS, RGOV, RI, and RNEXP.

Short Run Dynamics

Before proceeding in the presentation of the IRF_S and VD_S, it is worth mentioning that the order of the variables of the model may considerably alter the outcomes of the analysis. Different recursive structures of the VAR correspond to different choices of ordering. Sims (1980 and 1990) emphasizes this point. In particular, variables that are listed earlier in the VAR contemporaneously influence the variables that are listed latter, while the opposite does not hold. Therefore a suitable way of ordering variables is to list the exogenous followed by the endogenous variables. This essentially requires a priori theoretical knowledge of the model that is empirically estimated. The ordering of the variables is, therefore, RNEXP, RGOV, RI, RCONS, and RNOGDP. The time period of the VD_S and IRF_S functions is spread over 10 years, which is long enough to capture the dynamic interactions between RNOGDP and the components of aggregate demand.

The Variance Decomposition

The variance decomposition measures the percentage of variation in RNOGDP induced by shocks originating from itself, RNEXP, RGOV, RI, and RCONS. The estimates of variance decomposition are shown in Table 3 for 10 periods.

Table 3

Variance decomposition of RNOGDP

Horizon	S.E.	RNEXP	RGOV	RI	RCONS	RNOGDP
1	0.126003	29.08453	34.56524	14.19178	8.944955	13.21350
2	0.155530	27.54783	35.96000	10.89602	9.467031	16.12912
3	0.183761	21.66132	43.51637	8.138221	7.015625	19.66847
4	0.200508	19.19553	47.66317	7.098032	5.892941	20.15033
5	0.213450	17.74935	50.48048	6.370483	5.200482	20.19921
6	0.223035	16.77789	52.26955	5.985332	4.763960	20.20327
7	0.230471	16.04498	53.52611	5.723657	4.470544	20.23471
8	0.236021	15.52475	54.37713	5.554011	4.278811	20.26530
9	0.240180	15.15049	54.95722	5.437668	4.148524	20.30610
10	0.243272	14.87916	55.34795	5.359440	4.059146	20.35431

Source: author's computations. The empirical analysis was performed with the Eviews 7.2 package.

The results indicate that 29% of the variations in the RNOGDP are explained by RNEXP one period ahead. The proportion of variance of RNOGDP that originated from RNEXP declines over time to reach its minimum value in the 10th period which accounts for 14.9% of the forecast error in RNOGDP.

Also, the results indicate that almost 34.56% of the variations in the RNOGDP are explained by RGOV one period ahead. The proportion of variance in the RNOGDP that originated from RGOV reaches its peak in the 10th period which accounts for 55.34% of variation in the RNOGDP. The results indicate that the variations in the RGOV heavily influence the changes in RNOGDP in the future.

The results show that 14.19% of the variations in the RNOGDP are explained by RI one period ahead. The proportion of variance of RNOGDP that originated from RI declines over time to reach its minimum value in the 10th period which accounts for only 5.36% of the forecast error in RNOGDP.

Furthermore, the variations in RCONS contribute 8.94% of the forecast error in RNOGDP in the 1st period. The proportion of variance in the RNOGDP that originated from RCONS declines steady over time to reach its lowest value in the 10th period which accounts for 4.6% of variation in RNOGDP.

Finally, the disturbances originating from the RNOGDP itself contribute 13.21% of the forecast error in the 1st period. After 10 periods, the variations in RNOGDP contribute 20.35% of the forecast error in RNOGDP.

The Impulse Response Functions

The variance decompositions give an estimate of the proportion of RNOGDP variance accounted for by the components of aggregate demand, but it cannot indicate whether the impact is positive or negative, or whether it is a temporary jump of long-term persistence. Thus, impulse response functions are computed in order to give an indication of the system's dynamic behavior. In addition, the impulse response functions can be used to predict the responses from RNEXP, RGOV, RI, and RCONS to RNOGDP. An impulse response function shows how a variable in the VECM system responds to a single one percent exogenous change in another variable of interest.

Table 4 shows the IRFs of RNOGDP to shocks of RNEXP, RGOV, RI, and RCONS over a horizon of ten periods.

Table 4

Impulse Response Function of RNOGDP

Horizon	RNEXP	RGOV	RI	RCONS	RNOGDP
1	-0.067954	0.074080	0.047468	0.037685	0.045803
2	-0.045233	0.056664	-0.019558	0.029494	0.042470
3	-0.025512	0.077434	-0.010602	0.008888	0.052346
4	-0.020066	0.066840	-0.010273	-0.000352	0.038203
5	-0.019221	0.061944	-0.006984	0.000456	0.033193
6	-0.016106	0.054791	-0.008657	-0.000667	0.029106
7	-0.013285	0.049296	-0.007927	-0.002190	0.026420
8	-0.011207	0.043126	-0.007327	-0.002989	0.023258
9	-0.009569	0.037571	-0.006548	-0.003096	0.020613
10	-0.008118	0.032447	-0.005915	-0.003020	0.018223

Source: author's computations. The empirical analysis was performed with the Eviews 7.2 package.

A one standard deviation disturbance originating from RNEXP produces a decrease of up to 7% in RNOGDP in the 1st period. The standard deviation disturbance originating from RNEXP on RNOGDP appears to decline in the long term; a one standard deviation disturbance originating from RNEXP produces only 0.04% of the decrease in RNOGDP in 10th period, implying that the current changes in RNEXP have the most effect on RNOGDP in the short term but not in the long term. It has, though, a negative effect on RNOGDP which is unexpected.

A one standard deviation disturbance originating from RGOV produces up to 7% of increase in RNOGDP in the 1st period. The standard deviation

disturbance originating from RGOV on RNOGDP appears to vanish in the long term, implying that the current changes in RGOV have greater effect on RNOGDP in the short term than in the long term. They have a positive effect on RNOGDP as expected implying that government expenditure positively affects the non-oil GDP, and that fiscal policies are successful in promoting economic growth.

In response to a one standard deviation disturbance originating from RI, RNOGDP increases by 5% in the 1st period. The standard deviation disturbance originating from RI on RNOGDP, though, appears to vanish in the long term, implying that current changes in RI have greater effect on RNOGDP in the short term than in the long term. But the signs turned to be negative from the 2nd period, which is unexpected.

Similarly, a one standard deviation disturbance originating from RCONS produce up to a 4% of increase in RNOGDP in the 1st period. The standard deviation disturbance originating from RCONS on RNOGDP appears to decline in the 2nd and 3rd period, but the signs are positive as expected until the 4th period when the signs turned negative till the end of the period.

In response to a one standard deviation disturbance originating from current RNOGDP itself, future RNOGDP increased by 4.0% in the first year. The standard deviation disturbance originating from RNOGDP on itself vanishes in the long term to reach only 1% in the 10th period.

It appears from Table 3that the effects of the components of aggregate demand on RNOGDP are more pronounced in the short term than in the long term.

Graph 1 shows the response of the RNOGDP to the disturbances of the components of aggregate demand; namely, RCONS, RGOV, RI, and RNEXP, where the number of years after the shocks are on the horizontal axis and the response of RNOGDP to a one standard deviation disturbance (positive or negative) originating from any of the components of RNOGDP in addition to itself are on the vertical axis. As is shown, the response of RNOGDP to the fluctuations in RGOV and CONS are positive, while the response of RNOGDP to the fluctuations in RNEXP and RI are negative.

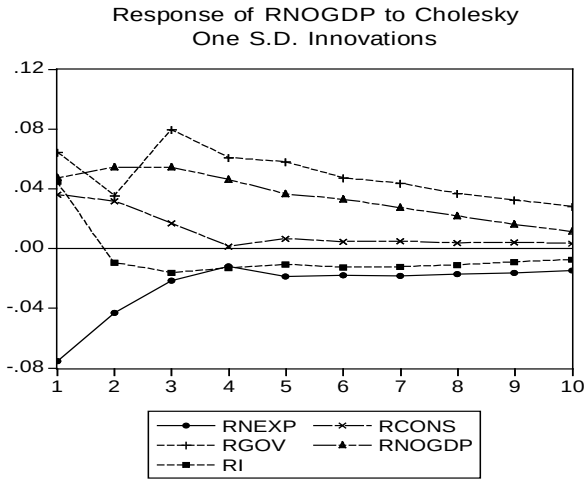

Figure 1. Response of RNOGDP to Cholesky One S.D. Innovations
Source: author's computations. The empirical analysis was performed with the Eviews 7.2 package.

4. CONCLUSION

The aim of this paper is to investigate the long term relationship between real non-oil GDP (RNOGDP) and the components of aggregate demand in the KSA over the period 1970-2008 using Cointegration techniques. In addition to this, the study investigates the short term dynamics using Variance Decomposition (VC), and Impulse Response Functions (IRF) techniques based on the Vector Error-Correction Model (VECM).

The results of the Cointegration technique based on the maximum eigenvalue and trace tests indicate the existence of cointegration between RNOGDP and the components of aggregate demand in KSA.

Variance decompositions suggest that fluctuations in real private consumption (RCONS), real private investment (RI), real government expenditure (RGOV) and real net exports (RNEXP) play a major role in fluctuations of the real non-oil GDP (RNOGDP).

The results indicate that shocks to RGOV and RNEXP are more important than those to RCONS or RI in inducing the fluctuations in economic growth measured by real non-oil GDP over the period of the study.

Impulse Response Functions (IRF) indicate that fluctuations in (RGOV) have a positive and the greatest influence on fluctuations in RNOGDP in the

short term, but that vanishes in the long term. They have a positive effect on RNOGDP, as expected, implying that government expenditure affects positively the non-oil GDP, and that fiscal policies are important in promoting economic growth.

Demand shocks to fiscal policy through government expenditure are seen to be the prime drivers of fluctuations in non-oil GDP (RNOGDP) in the Kingdom over the short-term. The role of government and its public sector in the economy of the Kingdom remains central, despite continuous efforts to increase the share of the private sector. Moves towards more privatization seem to have achieved modest successes judging by the contribution of the private sector in RNOGDP over recent periods. In that regard the stabilization policies undertaken through the use of fiscal expenditure policies remain potent.

A one standard deviation disturbance originating from RCONS on RNOGDP appears to vanish in the long term, implying that current changes have a greater effect on RNOGDP in the short term than in the long term.

Contrary to expectations, shocks to real net exports (RNEXP) affect RNOGDP adversely, but their effect assumes a short-term nature. This is rather surprising but could be due to correlations with the fiscal policy variable since government expenditure is observed to increase with increases in revenue from exports – mainly oil revenue – and recede with reductions in them. This may indicate the vulnerability of the Saudi economy to disturbances originating in its export markets. Another surprising result is the negative impact of real private investment (RI) on RNOGDP, which may raise the possibility of 'crowding-out' effects between public and private investment expenditures. Furthermore, due to the considerable volatility in both RNEXP and RI, the positive correlation with RNOGDP in the short term was confounded and hence the results on a negative impact may not be that surprising. In addition, there are considerable lags on the transmission of RNEXP and RI to RNOGDP which generally further blur the effect in the short-term. For example, net exports first affect oil revenues and these in turn affect the government budget and expenditures and the effect is further transmitted to output with a considerable lag. Investment effects on output are also well-known to work with a lag. Hence again a negative effect of these variables on output may occur.

To minimize the adverse effects of these factors on economic growth in the Kingdom as measured by RNOGDP, it might be necessary to further gear government expenditure to strictly growth-oriented investments like infrastructure and human development which serve to consolidate private investment rather than crowd it out.

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