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The Impact of Oil Price Swings on the Public Budget in Saudi Arabia: An Empirical Study by Using the Johansen Co-Integration and Error Correction Model for the Period (1981-2014)

A. M. Slama Shamon

Department of Economics, Faculty of Commerce, Al-Azhar University - Egypt
Department of Business Administration, Faculty of Administrative and Financial Sciences, King Khalid University - Saudi Arabia

ABSTRACT

The target of this study is to answer the following question: is the swing of price of petrol affects upon the public budget of KSA? The methodology of the study is co-integration approach, error correction model as well as Granger causality test. The result showed that there exist long run relation between prices swing and public budget as percentage of GPD. Also the results revealed that the change in prices of petroleum in the long run by 10% leads to change in the percentage of surplus or deficit by 0.39% in addition any change in petroleum prices in the short run by 10% leads to change in the percentage of surplus or deficit of budget by 2.8%. Furthermore the results revealed that there is direct relationship between real prices of petrol and surplus or might be deficit. More over the result proved one way causal relationship between change in real petroleum prices and surplus or deficit as percentage of GPD. Finally the researcher suggested some points that might contribute in instructing police makers to capture the negative impacts of instability of oil market These suggestions like adopting fiscal policy relay on diversification of return sources by reforming the tax system in KSA, other suggestion is orienting the government expenditure to investment as well as rationalizing the current expenditure.

More over researcher suggest the necessity of manipulating the structure disturbances in KSA economy through altering the contribution of KSA sectors in GPD which grantee the diversification of the economy and stopping the hegemony of petroleum sector.

Keywords: oil price Swings, public budget, co-integration, error correction model

INTRODUCTION

The petrol is classified as main sources of energy more over one of the important factors for economic growth since 1960s. Normally the market of petroleum is unstable as result of swing of its prices during near periods which causes negative impacts upon macro-economic indicators (RascheandTatom, 1977, p2-12). The market of oil witnessed since 1970s until 2015 at least six crises in the years 1973,1979,1986,1997 more over in 2008 when the prices of oil reached 130 dollar per barrel, finally in 2014 the prices decreased beyond 50 dollar per barrel. The instability of oil prices attributed to many factors such as external reason concern with growth in economics and its consequences increasing demand, other factors concern with supply side like the sub-capability of investment growth to match the growing demand of oil. Furthermore there are more economic factors have geo-politic, and security nature, i.e. destruction behaviour or even the monopolistic behaviours of working companies (Biga, 2013, p1-2).

Through phases and crises which oil market experienced, it is clear that any disturbances in the market leads to negative impact upon countries' economies and it is development programmes. In the presence of acute oil prices swing in the international market we can say that; in countries with undiversified economic structure which depends on oil sector, its public budget will be unstable as result of public return fluctuations.

Study Problem

The problem of the study focuses around the following main question

Address for correspondence:

Drahmed_slama@yahoo.com

Is oil prices swing affects the public budget of KSA?

From the main question there are subsidiary questions which are

- What are the concept of oil prices swing risk and its impacts on the imported and exported oil countries?
- What is the strategic impotency of oil in KSA?
- Is the oil prices swing affecting the public budget of KSA in the short run?
- Is the oil prices swing affecting the public budget in KSA in the long run?
- What is the suggest measures that must be taken from the economic authorities, which are study contribution to capture the negative impacts of oil market instability.

Study Objectives

At the aim of answering the former question the study seeks to realize the following objectives

- Indentifying the concept of oil price swing risk and consequently it is impact upon imported and exporting countries.
- Indentifying the strategic importance of oil to KSA.
- Acknowledging the impacts of oil prices swing on KSA public budget in short run.
- Acknowledging the impacts of oil prices swing on KSA public in the long run.
- Introducing a collection of suggested measures which should be taken in order to capture the negative impacts of oil prices instability.

THEORETICAL APPROACH

Oil prices swings are the main reason for disturbances in macro-economic aspects and indicators in oil produced countries. The great depression which came after the oil price shock in 1973 was caused in emerging many studies that attempted to analysis the mutual relation between the economic variables and the changes in oil prices, example the study of Rasche and Tatom which explained the inverse relationship between the oil prices increase and macro-economic activates (Rasche and Tatom,1972,2-12), other study tackled by Jones and Kaul which deducted the relations of stock markets to oil prices change, this through present and future changes in real money flows or changes on real return, the finding of the study is that ; the response of financial markets prices in USA & Canada to swings in oil prices responsible from real money flow as opposite to UK & Japan the results have not the same power (Jones&kaul,1992). The study of Hamilton had taken the stability of Regression relation between nominal oil prices changes and the logarithm of real gross domestic products in addition to the causal relationship between oil prices changes and macro-economic indicators. Hamilton divided the period of this study to two phases (1948 to 1972) & (1973 to 1980). Both of phases experienced significant relation between oil prices and gross domestic products.

Romerand Romer introduced in their study evidences supported the hypothesis which state that the fiscal policy explains and causes many changes in economic activities in the period from 1947 to 1987.thier methodology distinct between financial shock and oil prices one. More over oil prices shock can be resulted from the same result of financial shock. Dotseyand Reid were studied Romer hypothesis from different aspects in time series to USA between1954-1991. In mind the causal relationship between GDP and unemployment in addition to usage of positive and negative changes in oil prices and monetary policy indicators the researchers were found significant evidences to asymmetric response for GDP and unemployment to oil prices, while insignificant response to financial shock, more over the positive changes in oil response from (5-6%) the changes in gross domestic products.

Kumar tackled study to (G7) countries he studied the relation between energy consumption and GPD during the period (1972-2002)using unit root and co-integration test he founded the existence of co-integration relation between the variables, as increase 1% in energy consumption leads to increase in GDP by 0.12-0.39% (kumar,2007). Other study (wankeum, 2003) the researcher founded mutual

relationship between energy and GDP for Korea during the same period in the long run, but in the short run there exist one way relation from energy consumption to GDP. The researcher recommended by monthly or quarterly study to the data in order to obtain accurate results. The study of (Lee, 2005) used the statistics of 18th developing countries during (1975-2001); he studied the relationship between energy consumption as well as prices of oil production and GDP, with the usage of regression and co-integration equation. The most important result of this study is the existence of one way short run and long run relation between energy consumption and GDP which means that energy consumption increase leads to GDP increase while the opposite is not hold.

Study Hypothesis

Here below the study hypothesis

- None existence of long run equilibrium relationship between changes in real oil prices and changes in surplus or deficit percentage of public budget.
- None existence of positive as well as significant relationship between changes in real oil prices and change in surplus as well deficit percentage of public relative to GDP in the long run.
- None existence of any impact for the swings of real oil prices in short run with respect to public budget of KSA.
- None existence of causal relationship between the swing of real oil prices and change in public budget positions in the long run.

Study Methodology

In this study the researcher shall analyse the relationship between the swing of oil prices and change in public budget positions in KSA by applying Johansen co-integration test, beside error connection model, more over the application of Granger causality test in order to determine and measure the relationship between the swing in oil prices and the changes in public budget position in short run as well as long run in KSA by using the econometric package [E views.7] depending on time series data concerning annual international oil prices (Real) in addition to the data of public budget of KSA during the period (1981-2014) published by institution of Saudi Arab Monetary.

Study Structure

The study is divided to the following parts

- The concept of oil price swing risk and its impacts upon the imported and exported countries.
- The strategic importance of oil in KSA economy.
- Models &Methodology.
- The analysis and test results.
- Findings.
- Recommendations.

The Concept of Oil Price Swing Risk

The oil price swing risk emerge from rapid, acute and unexpected swing in the global oil prices which create unbalance in the economics policy for countries which affected by (Daniel,2001,3).This risk was happened in early seventeenth which made new impacts in Plans and political decisions, as result it became the main means which had closed relationship with national security and international, political as well as military relations, the risk evolved later on to oil and energy globalization beside hegemony upon the productive countries.

The line of price proceeds through two main directions which are

- The risk of decreasing of oil price upon exported countries

This risk is the probability of unexpected collapse in the general rate of oil price which lead to sudden decrease in the petroleum returns to the productive and exported countries specifically to rental

countries in which GDP depends heavily on oil returns i.e. some time the percentage reaches 99%such risk latent in the impact on public financial positions if it continue to long period (Satyanary and Somer, 1997).

The impact of oil prices upon exported countries differs from country to other according to its economic capabilities; it is international reserves as well as the percentage of oil sector contribution in export. As the oil returns decrease and consequently the government expenditure will decrease in addition to overall recession in economic growth. Also it exist possibility of crises incidences to the banks in the exported countries like lack of liquidity, defaults in payments of loans and their interest rate to the debtors. In these cases the countries might enforced to rescheduling their debits. In this study we shall attempt to study and measure the impact of oil prices decrease upon public budget of KSA in order to capture the negative impact of oil rate instability upon KSA

- The risk of oil price increase upon imported countries

This risk is the probability of happening sudden and severe leaps for long period in the international oil prices rates which lead to disturbance in carrying out public expenditure plan and increasing the budget deficit in these countries, which experienced in UK, Japan and non-exported oil developing countries in 1974. In Japan which classified from main exported countries to the oil, the government announced emergency state to face energy cries and oil price increase. In these case the Japanese economic relayed that the GDP growth will not exceed 2% instead of expected 11% as result of oil price increase. The government resorted to interest rate rising beside butting tight restriction upon new loans, in addition to cancelling the construction projects, more over closing fuel stations in Saturday and Sunday weekly in target of reducing public expenditure. In Uk as a result of oil price increase the national economy experienced dangerous cries since second world war where government enforced to reduce its annual budget by 1.2 billion sterling, furthermore a reduction in public expenditure by 20% beside more austerity procedures to reduce oil consumption i.e. reduction in electricity consumption by 25%(Rasche&atom,1997,2-12).

In oil unproductive developing countries the governments resorted to external borrowing to overcome payment balance deficit where the circumstances had been favourable to those countries to borrow from the international institutions as result to the reason behind growth and inflation in liquidity is what so called euro dollar market and the decreasing of capitalist countries demand to these monetary resources as result to stagflation. The euro dollar market associated with two main factors which are:

- Increase in USA payment balance deficit after Vietnam War this lead to more dollar printing which remain under European commercial bank control
- Appearance of what so called petro dollar which is huge monetary resources emerged as result of oil price increase in the international market. These resources later recycled and in flowed to west banks under market rates pressure.

At the same time debit crise of none oil productive developed countries had aggravated, where the percentage of external debits relative to GDP had been increased, in contrast to industrial countries which have capabilities to face the growing payment for oil in real term. These countries could able to per save their financial positions as result of growing purchases of OBEC countries from them as investments monetary reserves. We conclude from above mentioned the oil price risk is a product of the summing of the former two risks.

Oil price risk = Export risk + Import risk

The two sides of risk affect public budget of exported as well as imported countries which rationalize the building of precaution strategies in exported and imported countries. (Marbo, 2005, 7). there are three dimensions to oil price risk and its accompanied risk in each country which called country compound risk.

Country compound risk=political risk+economical risk+financial risk; the weight of political risk is 50% while 25% weight to each economic and financial risk (Howek, 2004, 44). from above discussion we can conclude that the oil price risk had still and shall be 'as far as the oil is main source of energy' the more affective in economic policy represents the high relative weight in public return and expenditure to exported and imported countries such pictures disturbed the public budget to all countries involved in exporting and importing the oil as result of crude oil price swing.

THE IMPORTANCE STRATEGIC OF OIL TO KSA

The oil has strategic importance in KSA economy since its commercial importance in twentieth with respect to its contribution in GDP, national income, total public export, public budget and development as oil returns constitutes the main source of financing the intensive development program. So the KSA economy is oil base economy from first class in which the oil returns feed the public budget by large percentage in addition to its contribution in building monetary reserve. The importance of oil to KSA can be outlined in the following aspects (ElBasam and others,2012)

The Percentage of Oil in GDP

The relative importance of oil in GDP is one of economic diversification degree measure. Increasing in this percentage reflects decreasing in economic diversification degree and at the same time it means decreasing of other sectors contribution in GDP. According to 49th annual report (SAMA)the contribution of oil sector in GDP reached approximately 40% as general average from 1981 to 2013 which is high percentage to some extent that reflects the decreasing degree of the economic diversification in KSA,(figure1-table 1 in annex).

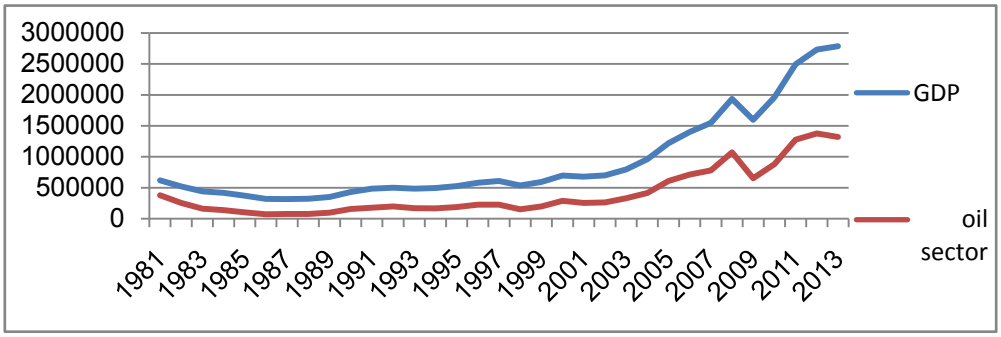

Figure1. *GDP at current prices and the contribution of the oil sector in the period (1981-2013)*

Source: *Prepared by the author based on the data period (1981-2013) and table.1 in study appendices.*

The Percentage Contribution of Oil Exports in Total Exports

This percentage is very high in KSA which indicate low degree of economic diversification in export structure which amounted to 99.2%, 98.7%, 97.7% for the years 1983, 1982, 1981, respectively, more over for the period (1981-2013) the percentage amounted to 89.6% as general average. This make the KSA depends heavily upon oil exports in providing hard currency, as result to such indicator some economic problems might happen specially the close connection of KSA economy with oil money income,(figure2-table 2 in annex).

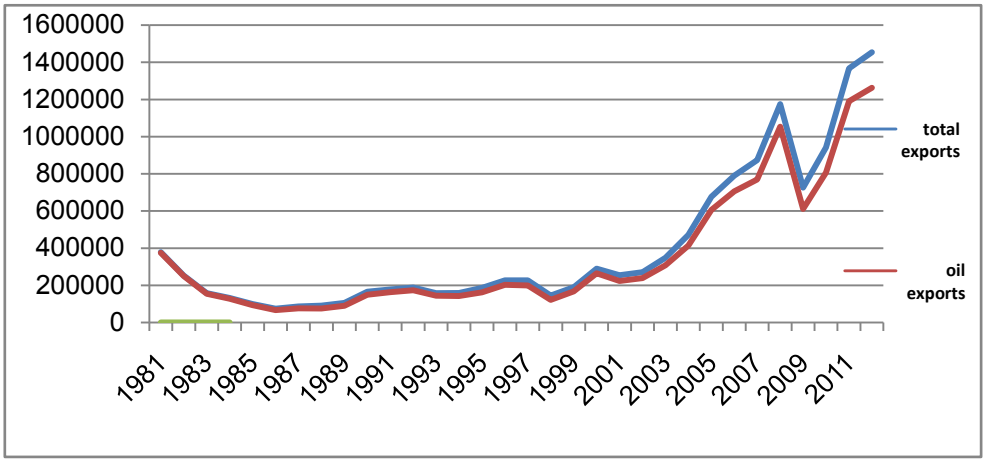

Figure2. *Total merchandise exports and total oil exports in the period (1981-2012)*

Source: *Prepared by the author based on the data period (1981-2012) and table.2 in study appendices.*

Contribution of Oil Returns in Public Returns

The public budget of KSA depends significantly in oil returns since its commercial founding and till now.The budget data of 2011 showed that the contribution of oil returns to public returns amounted to

92-54%.For period from 1981 to 2013 amounted to 77.565 which is high percentage. The reason attributed to the aggravating problem which the other sectors suffere.g. Industrial and agricultural sectors which have low contribution in a Levying public returns. The above mentioned high KSA oil exports have large effects in the relative importance of oil returns in public returns,this beside the increasing in international oil prices since 2004 which lead to increase in KSA oil returns,(figure3-table 3 in annex).

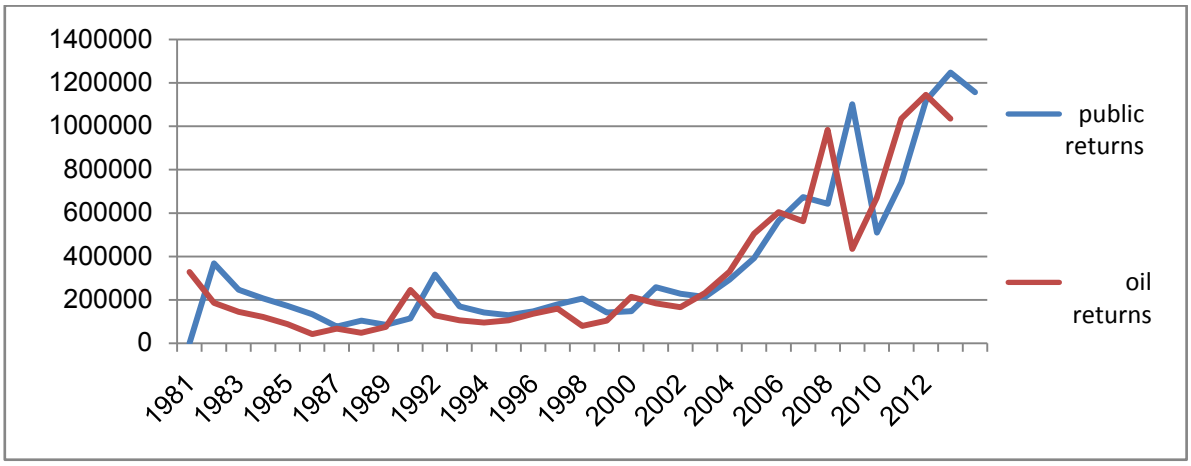

Figure3. *Total public returns and oil returns in the period (1981-2013)*

Source: *Prepared by the author based on the data period (1981-2013) and table.3 in study appendices.*

The Financial Risk of Oil Price Swings on the Public Budget

The market of oil witnessed during study period many price crises in 1986,1997 infected oil price reached 130 dollar per barrel and eventually went down to 50 dollar in 2014. In this acute swing of international oil prices we can say that the developing countries with universal economic structure which depends on oil sector, in this cases their public returns fluctuation coming from oil price swings, (figure4-table 4 in annex).

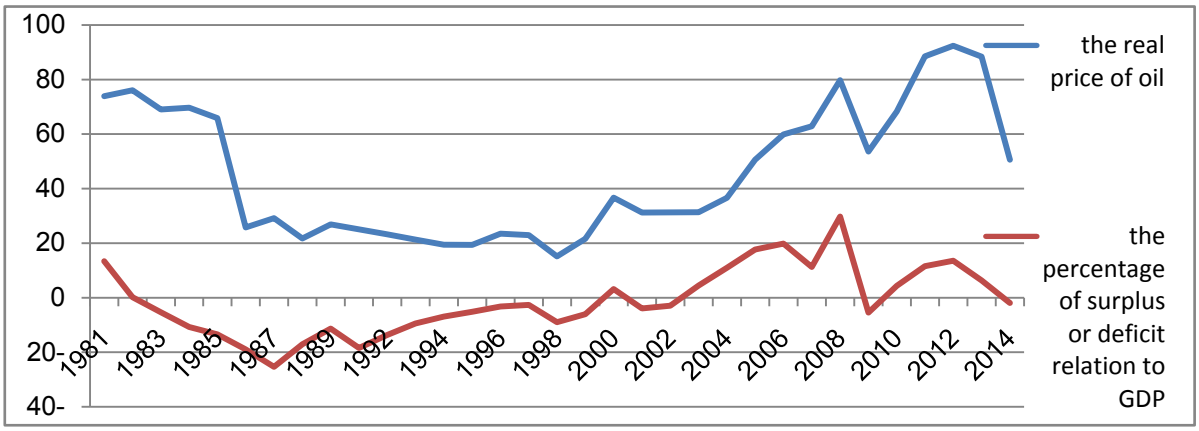

Figure4. *The real price of oil based on the year2005 and the percentage of surplus or deficit relative to GDP (SDB/GDP) in the period (1981-2014)*

Source: *Prepared by the author based on the data period (1981-2014) and table.4 in study appendices.*

From many decades KSA faced more challenges in management of financial risks, this because of hegemony of oil sector to macroeconomic and financial accounts of the state. At the same time oil returns experienced huge swings with none trustable state compare to tax returns. Furthermore these returns are un-renewable which raises importance financial issues across time. The high oil prices and huge financial surplus during last year's imposed restrictions on the domain of none oil returns diversification. Moreover the none oil tax system in KSA is so limited to some extent because there is no income personal tax, in addition to none existence of value added tax. In this position the government made substantial efforts to diversify the tax system specifically for companies as well as started operating of intensive labour law for public returns in 2005 which amended in 2010. Even with these reform it is difficult for the authority to explain the increasing in none tax returns at a time of

achieving surplus in public macro financial shocks and oil price continuing rising. in addition rising none oil returns might abuse partially the other goals of policies i.e. Economic diversification and increasing employment in the private sector (IMF, selective issues 2013,p25)

The oil prices swing imposed more difficulties to KSA authorities. Short run decrease in oil prices 2009 which leaded to total deficit amounted to 5.4% from GDP highlighted the financial risk which connected with oil prices shocks. Also the returns swing interacted with extended period of oil prices deteriorating which complicated the process of Faisal policy managements. During eighteenth and ninetieth era the oil prices were being low while the government debts raise significantly (IMF, selective issue, 2013, p-26)

The other short run continuous financial challenge is the protection KSA public expenditure from oil returns swing, here the KSA authorities attempted to find mechanism for reducing financial risk moreover avoiding expending cycles which pushed by oil prices. As result of these cycles payments were accelerated during the period when oil is high, consequently there exist structural financial problem when prices deteriorated. For facing these problems the KSA budget around last year's depend partially on loans sensitive to oil prices and expenditure. With UN covering in positions in financial year along with steady rise in actual returns performance compare to the plan one. More expenditure were added, accordingly the KSA budget witnessed continuous decrease in actual performance by high margin. Since 2006 the actual expenditure were increased in average by 26% above the expenditure included in the budget. Such strategy is characterized by reservation in preparing the budget in seizing expending swing.

But actually government expenditure increase in KSA is oriented to current consumption not to investment where the later leads to long run effect on economy besides helping in finding effective as well as productive economy. Despite this importance the current expenditure provisions in KSA formed huge share compare to total expenditure. In 2013 current expenditure reached in KSA 68% from total expenditure. Often large part from expenditure is allocated to face salary payments, increase wages in public sector and other owes items.

MODELS & METHODOLOGY

To study the relationship between oil price swings and changes in public budget positions in KSA we depend upon the following qualitative tools:

- As far as the independent variable it is the real price of oil where the base year in 2005
- As far as the development variable it is the percentage of surplus or deficit relation to GDP (SDB/GDP).
- Testing the co-integration relationship(Johansen)along with error correction model in order to test short run relationship between oil price swing and budget positions in KSA this can be done after existence of co-integration relationship between the variables. Co-integration analysis determines the real relationship between the variables in the long run. The concept of co-integration state that even if the two series were not at stationary state separately they co integrated jointly and they have fixed relation in the long run. Firstly we test the stationary of the variables separately through unit root test (Elsharif, 2009,p131),there are many types of unit root test like Augmented Dickey-fuller (ADF),Philips Perron (PP) and Kwiatkowski, Philips, Schmidt, Skin (KPSS) if the variable are stationary in the level then the OLS results are not spurious. But if the variable are stationary after the first difference we can go to the second step by test the co-integration incidence if it existed we move then to the last stage which is error correction model to estimate short run as well as long run relationship between the variables and the finding result will not be spurious.(William, 2003,p654)

The step of methodology to case study data were

Unit Root Test

To determine none-stationary characteristics of the variables in the two time series separately in the level and first difference we use (DF) test or (ADF),where this test can be used with time trend or without it. The mathematical formula of this test is:

$$\Delta Z_t = \chi + (\rho - 1)Z_{t-1} + \gamma T + e_{1t}$$

The ADF is a development to (DF) test by adding lagged values to the dependant variable and the mathematical formula to this test is

$$\Delta Z_t = \chi + (\rho - 1)Z_{t-1} + \gamma T + \delta \Delta Z_{t-1} + e_{2t}$$

Despite the spread usage of this test but itnot consider the problem of hetroscadasticitiy and normality test which exist in some time series. So the more efficient test in this case is Philip Peron (PP) test. This test is more suitable for small sample and when (DF) results are contradicted. The mathematical formula to (PP) is

$$\Delta Z_t = \phi + (\rho - 1)Z_{t-1} + \gamma(t - \frac{T}{2}) + \psi \Delta Z_{t-i} + e_{3t}$$

Where:

Δ stands for the first difference

The crucial value t for testing the nullhypothesis for all former tests depend on Mackinnon values (Patterson, 2002, p265). In the unit root tests in general (PP) & (ADF) are used which start from the following basic relation (Patterson, 2002, p267)

$$Z_t = \alpha_{t-1} + \beta + \eta_t + \varsigma_t$$

Johansenco-Integrationtest

This test is much reliable than EnglGranger test because it is suitable for small sample beside when the independent variables more than one, more over this test discover the existence of unique co-integration i.e. The co-integration exist only in case of regressing the dependant variable on the independent variable. This is crucible because none existence of unique co-integration the equilibrium long run relationship between the variables will be suspected (Elsharif 200, p.5).

Existence of long run equilibrium test is done between the stationary two series from the same rank even with disturbance existed in short run –such test can be done via Johansen method and Johansen & Juselius method which they apply to models with more than two variables because it permit the studding the mutual trace across variables under study, such advantage is not existed in Engle – Granger two steps test.

Johansen and Johansen & juselius test consider as test for matrix rank. the existence of co-integration between time series requires amatrix with none full rank.(ocr(π)=rcn)

In order to determine the number of co integrating vectors two statistical tests must be used particularly trace test (λ race) maximum eigenvalues test (λ max)

The trace tests defined as:

$$\lambda_{trace} = -T \sum_{i=r+1}^{n} \log(\hat{\lambda}_i)$$

The null hypothesis is that the number of co-integration vectors is ≤ r against alternative hypothesis co-integration vectors =r (where r =0, 1, 2).

The maximum eignvalues test is define as

$$\lambda_{max} = -T \log(1 - \hat{\lambda}_i)$$

In which the null hypothesis is co-integration vectors equal r against the alternative hypothesis the co-integration vectors equal r+1 (Elgadir 1425,p198)

Error Correction Model

If X_t and Y_t were co-integrated as define $u_t \sim I(0)$ hence the relationship between X_t and Y_t can be expressed in the following error correction model:

$$\Delta Y_t = a_0 + b_1 \Delta X_t - \pi \hat{u}_{t-1} + e_t$$

The advantage of the above model is that it contained all information about long run and short run relationship. In this model b_1, measure the short run impact of X_t on $Y_t$imediatly, the π measure the reaction impact or adaptation impact which explain how much from disturbance will be correct from time period to other in Y_t Of course

$$\grave{u}_{t-1} = Y_{t-1} - \acute{\beta}_1 - \acute{\beta}_2 X_{t-1}$$

Where $\acute{\beta}_2$ is the long run response?

Error correction model is preferred to the Engle Granger model because it separates the long relationship from the short run one. Moreover it has better characteristics in case of small sample.The parameter estimated in this model is more consistent than Engle Granger 1987 and Johansen 1988. To test the extend of co-integration existence between the variables in (ECM)(Persoran, 2001) introduced modern method to test such equilibrium short run and long run relationship between the variable in the presence of (ECM)which can be implemented if the independent variables integrates at zero degree or one degree or there is co-integration between them from the same degree, more over it can be implemented in case of small sample in contrast to classical method (William, 2003,p654).In effect this method can be implemented only if the Johansen co-integration test is succeed.

Granger Causality Test

Granger 1988 referred if there are two series characterised by co-integration there exist one way causal relation at least. According to Granger change in (X_t) must cause change in other variables (Y_t) i.e. (X_t—Y_t) that when the current expectation of X_t values exceeds the changes in Y_t. In order to measure the causality in the short run between oil prices swing and percentage of budget deficit surplus or deficit the following formula is appropriate:

$$Y_t = \Sigma\alpha_i Y_{t-i} + \Sigma\beta_j X_{t-j} + U_t$$

Ho : $\beta_j = o$ (X ➔Y)

H1 : $\beta_j \neq o$ (X ➔Y)

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ANALYSIS & RESULT OF TEST

Here below the type of tests used along with their results:

Stationary Test for Series of Independent and Dependent Variables

First Augment Dichyfollar Test

As far as independent variable (oil price)it is clear for table (1) in which we test the unit bot of (PO)in its level, the test reveals the existence of unit root as the t calculated value (-1.897516) is less than the tabulated values (2.9591) at 5% level of significance. This means acceptance of null hypothesis. But after we take the first difference the tabulated value become (-3.273245) which is greater than the tabulated value (-2.9627) and hence we reject the null hypothesis and consequently the variable is stationary.

Table1. *(ADF) result*

	ADF test					
Variables	At the level			The first difference		
	ADF Test Statistic	5% Critical Value	Decision	ADF Test Statistic	5% Critical Value	Decision
(PO)	-1.847516	-2.9591	Accept the nullhypothesis H_0	-3.273245	-2.9627	Rejected the nullhypothesis H_0
(SDB/GDP)	-1.586166	-2.9591	Accept the nullhypothesis H_0	-4.821693	-2.9627	Rejected the nullhypothesis H_0

Source: *prepared by the author based on Eviews.7*

As far as the dependent variable (SDB/GDP) from table (1) the variable series has unit root i the level because the calculated value -1.586166) is less than tabulated one (-2.9591) and 5% significant level

i.e. acceptance the null hypothesis, but after we take the first difference the series is stationary because the calculated value (-4.82169) is greater than tabulated one (-2.9627) at 5% level of significant and hence we reject the null hypothesis

Secondly (PP) Test

As far as the independent variable (PO) from table (2) the result showed that existence of unit root in the level because the calculated value (-2.9558) at 5% level of significance and hence we accepted the null hypothesis but after we take the first deference the unit root was disappeared because the calculated value is (-4.733732)is greater than the tabulated one (-2.9591) 5% level of significant and hence we rejected the null hypothesis which confirmed (ADF) test result.

As far as the dependent variable (SDB/GDP) from table (2) there exist unit root in the level because the calculated value (-2.436124) is less than tabulated one (-2.9558) at 5% level of confidence and hence we accept the null hypothesis.But after we take the first difference the unit root value disappeared from the series because the calculated value (-7.997628) is greater than the tabulated one (-2.9591) at 5% level of confidence and hence we reject the null hypothesis which confirmed (ADF)test results.

Table2. *(pp) result*

	test PP					
Variables	At the level			The first difference		
	PP Test Statistic	5% Critical Value	Decision	PP Test Statistic	5% Critical Value	Decision
(PO)	-1.805011	-2.9558	Accept the null hypothesis H_0	-4.733732	-2.9591	Rejected the null hypothesis H_0
(SDB/GDP)	-2.436124	-2.9558	Accept the null hypothesis H_0	-7.997628	-2.9591	Rejected the null hypothesis H_0

Source: *prepared by the author based on Eviews.7*

Johansenco-Integrationtest

This test is done after the stationary of variable in the first difference, from the results in table(3) we state that in the first row the null hypothesis is none existence of any co-integration vector as the calculation of trace (18.13239) is greater than the calculated one (15.49476) at 5% level of significance then we reject the null hypothesis, and from the second row in which the null hypothesis is existence of at one co integrating vector, the calculated trace value (7.758423) is greater than the tabulated value (3.841466) which indicate the rejection of the null hypothesis. So the overall teat indicates two co-integration equations.

We conclude from above the existence of long run relationship between oil price swing and the percentage of surplus, deficit relative to GDP in KSA. These result reflect the low degree of diversification in KSA economy beside they reflect the decreasing contribution of other sector in GDP. And so the hegemony of oil sector is confirmed upon the macroeconomic as well as financial accounts in KSA. More over the result reflect none diversification of none oil returns as the tax system of none oil items is very little to some extent i.e. no income tax and no value added tax on KSA. These result agreed with Hamilton study (1983) about the stationary of regression relationship between changes in nominal oil prices and the logarithm of real gross domestic product also Hamilton reached to significant statistical relationship between oil prices changes and GDP. More over the result were in accordance with (Romerand Romer,1989) study as the researches distinct between the financial shock and oil prices shock where the oil prices shock can be product of some financial outcomes and causes many changes in economic activities.(Dotsey and Romer,1989)were studied Romer hypothesis from different aspects to USA time series from 1954 to 1991 by taking the causal relation between GDP and unemployment rate in addition to the usage of positive and negative separate in oil prices after monetary indicators found, they found significance evidence of a symmetric response for GDP and unemployment rate to price shock and insignificant response financial shock. More over the positive changes in oil prices responsible from 5-6% in GDP

Table3. *Johansenco-integration test*

Sample (adjusted): 1983 2013				
Included observations: 31 after adjustments				
Trend assumption: Linear deterministic trend				
Series: (SDB/GDP) (PO)				
Lags interval (in first differences): 1 to 1				
Unrestricted Co-integration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.284407	18.13239	15.49471	0.0196
At most 1 *	0.221411	7.758423	3.841466	0.0053
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				

The Error Correction Model

The third step after unit root and co-integration tests is error correction model; from table (4) the following results are outlined:

The adjusted $R^2$of the model is 19.5% which indicate how much the independent variable explains the dependent variable –furthermore the value of F is significant at 1% level (4.635 which reflect the overall significant of the model.

The elasticity of oil prices in long run equals to 0.039% change in percentage surplus,deficit with respect to GDP.

The elasticity of oil in short run equals to 0.289 which means 10% change in real oil prices leads to 2.8% change in SDB/GDP.

The results reveal that the relation which connect between real oil price and SDB/GDP is direct one (positive coefficient) i.e. increase in price increases the surplus ratio likewise decrease in price decreases the surplus ratio or may be deficit as it happened in many separate years during the study periods.

The lagged dependent variable y_{t-1} co efficient equals to (-0.396) which indicates that dependent variable affect negatively by itself (past year) determine the current years which confirm the existence of automatic mechanism for error correction in the model.

The coefficient of error term(adaptive mode) equals to (-0.316) this means that if disturbance is happens in equilibrium relationship between dependent and independent variable,during approximately three years the variables return back to their equilibrium state.

The researcher interpret the above results to the strategic importance of oil sector to the macroeconomic and financial accounts in KSA as well as the dependence of public budget in KSA on oil return which contribute to 77.56% from final return of budget. This percentage is average to the years 1981 until 2013, which is high percentage in our perception. The reason of this high percentage is the aggravated problems which the economic sector suffers from i.e. industrial and agriculture sectors which lead to decrease in their contribution to public returns. Such results agreed with what is said in Hamilton study 1983 that reached to significant statistical relationship between changes in oil prices and GDP, also they were in accordance with Dotseyand Reid, 1992 as they used separate positive and negative changes in oil price and other monetary policy indicators. The researcher found significant evidences of asymmetric response for either GDP and unemployment to oil price shock. Also these results in accordance with what is mentioned by Satyanary and Somer Satt,1997 about the risk of oil price decreasing upon exported countries which is the risk of total collapse in oil prices beyond what is expected. This leads to sudden decrease in oil returns of oil exported and productive countries what so called rental countries in which the national income and product depend on oil returns. Such risk of price collapse it has serious impact on financial positions if it continue for long period.

Table4. *Equation of co-integration and error correction model*

Vector Error Correction Estimates		
Sample (adjusted): 1983 2013		
Included observations: 31 after adjustments		
Standard errors in ( ) & t-statistics in [ ]		
CointegratingEq:	CointEq1	
(SDB/GDP) (-1)	1.000000	
PO (-1)	0.039008	
	(0.06616)	
	[0.58961]	
Error Correction:	D (SDB/GDP)	D(PO)
CointEq1	-0.316400	0.005495
	(0.14049)	(0.23565)
	[-2.25216]	[0.02332]
D((SDB/GDP) (-1))	-0.396743	-0.097388
	(0.20763)	(0.34826)
	[-1.91084]	[-0.27964]
D(PO (-1))	0.284056	0.014178
	(0.19308)	(0.32387)
	[1.47118]	[0.04378]
R-squared	0.248744	-0.000180
Adj. R-squared	0.195083	-0.071621
Sum sq. resids	1955.104	5500.720
S.E. equation	8.356145	14.01622
F-statistic	4.635458	-0.002513
Log likelihood	-108.2224	-124.2561
Akaike AIC	7.175637	8.210073
Schwarz SC	7.314410	8.348845
Mean dependent	-0.067742	-0.820968
S.D. dependent	9.313874	13.53973
Determinant resid covariance (dof adj.)		6480.799
Determinant resid covariance		5287.145
Log likelihood		-220.8562
Akaike information criterion		14.76492
Schwarz criterion		15.13498

Granger Causality Test

The last step in econometric analysis is Granger causality test which seek about causal relationship connect change in real oil price change to percentage change in surplus, deficit of budget relative to GDP. The results are as follows

1-rejection of null hypothesis which is the change in real oil price do not cause the change in percentage of surplus, deficit of public budget relative to GDP[first row]

2- Accepting the null hypothesis in second row which in change in (SDB/GDP) do not cause oil price.

3- There is one way causal relationship from (PO) to (SDB/GDP)

These result agreed with Hamilton, 1988 about the stationary of regression relationship between changes in nominal oil prices and logarithm of real GDP in addition to the casual relation between oil prices changes and macroeconomic indicators. Hamilton reached to the existence of significant relation between oil price changes and GDP. More over these result were in accordance with Romer, 1989 study, the researcher proved that oil price shock can be product of the same results from financial shock and causes many changes in economic activities. Also the results agreed with Dotsey and Reid, 1992 study, in which they proved that the changes positive in oil prices responsible from or causes (5-6%) of the changes in GDP. More over the results agreed with what was mentioned by Howell 2004 by considering the oil is a good cause of economic and financial risk. Howell deducted that the oil price swing risk had been and shall be existed as far the oil is big determinant of the

economic policies in general and financial policies in particular as it represents the high relative weight in public return and expenditure of oil developing exported countries.

Table5. *Pairwise Granger Causality Tests*

Sample: 1981 2014			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
(PO) does not Granger Cause (SDB/GDP)	31	3.44505	0.0471
(SDB/GDP) does not Granger Cause(PO)		2.00019	0.1556

RESULTS

Johansenco-integration tests assured that existence of long run equilibrium relation between real oil prices swing and the change that is happen in the percentage of surplus or deficit of public budget to GDP in KSA. These results reflect the degree of low economic diversification in KSA furthermore they reflect the low contribution of other sector in GDP. The design of error correction model revealed that the explanatory power of the independent variable is 19.5% beside the significance of overall model as f equal 4.635 at 1% level of significance. Oil price elasticity coefficient in long run 0.039 which means 10% in (PO) leads to 0.39% change in(SDB/GDP) more over the elasticity coefficient in the short run is 0.284 which means 10% change in(PO) leads to 2.8% change in (SDB/GDP) furthermore the relation which link between the change in real oil price and the percentage change in budget surplus or deficit to GDP is direct one i.e. increase in oil price increase the surplus and decrease in oil prices reduces this surplus and might be connected to deficit which was happened in many separated years during study period. Granger causality tests revealed that rejection of null hypothesis of oil prices do not causes (SDB/GDP)and acceptance of null hypothesis (SDB/GDP) do not cause (OP) which means the existence of one causal relationship from (PO) to (SDB/GDP).

The researcher attributed the above results to strategic importance of oil sector in KSA which has hegemony on macro economy and financial accounts, also the result can be attributed to the dependence of public budget upon oil returns which reached 77.56% as average to years 1981 to 2013 which is high percentage in our perception. The reason behind this high percentage back to the aggravated problem which the economic sectors suffer from i.e. industrial and agriculture sectors, which lead to their low contribution in levying the public return. These results were in accordance with Hamilton study 1983 where in which there is significant statistical relationship between oil prices and GDP beside the causal relationship between oil prices changes and macroeconomic indicators. The results also in accordance with what mentioned by Satyanary and SomerSatt,1997 about the risk of oil price decrease on the exported countries which is the risk of the collapse in general oil prices beyond the expected one which leads to sudden decrease in return of exported and imported countries particularly in the rental countries in which the national income and product depend heavily upon oil return. Such risk is very serious in public finance position if the deterioration continues to long period. Also the results agreed with the work of Dotsey and Reid 1992 where they proved that the positive changes in oil prices responsible and cause 5-6% from the changes in GDP more over the results agreed with what was mentioned by Howell 2004 by considering oil as a good causing either the economic and finical risk.

RECOMMENDATIONS

- Policy makers in KSA must take the issue of oil price swing risk seriously when preparing the budget along with putting special precaution policies that might cure budget disturbances.
- The structural disturbances must be cured through changing the contribution of economic sectors in GDP which grantee economic diversification and seized the hegemony of oil sector favour to the productive sector (agricultural industrial, services).
- Indorsing financial policies lead to diversification state of financial returns sources which require a real reforms on tax system as the none oil system in KSA is very narrow in which the income personal tax and value added tax are absent.
- The necessary of orienting the government expenditure in KSA to more investment expending along with rationalizing the current spending, this because that the capital investment leads to long run impacts on economy and helps in creating effective and productive economy.

- Oil prices swing must be managed in budget planning process which make total planed expending compact with the evaluation of oil returns. Such procedure constitute base for clear strategy to the expending in the middle run which consolidate spending efficiency.
- Policy makers in KSA must prepare clear and strict economic goals in the plans to serve current and future generation as well as building base for long run investment because oil is un-renewable national wealth.

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Annex

Table1. *Oil's contribution to GDP at current prices for the period (1981-2013) Real mn*

year	GDP	Oil sector	Non-oil sector	The Percentage of%oil sector
1981	620730	380798	239932	61.35
1982	522086	254737	267349	48.79
1983	442611	163118	279493	36.85
1984	417585	140671	276914	33.69
1985	372408	104451	267957	28.05
1986	318775	72666	246109	22.80
1987	317478	78775	238703	24.81
1988	322283	76738	245545	23.81
1989	350325	98652	251672	28.16
1990	430334	158693	271641	36.88
1991	484853	179572	305281	37.04
1992	501359	199856	301503	39.86
1993	485630	170012	315617	35.01
1994	494766	169438	325328	34.25
1995	526004	187718	338285	35.69
1996	581873	226476	355397	38.92
1997	608802	228250	380552	37.49
1998	536635	152829	383805	28.48
1999	593955	198988	394967	33.50
2000	697007	289165	407842	41.49
2001	679163	255509	423654	37.62
2002	699680	263511	436169	37.66
2003	796561	330389	466172	41.48
2004	961458	416734	544725	43.34
2005	1220656	610392	610265	50.01
2006	1400466	712219	688246	50.86
2007	1547026	779672	767354	50.40
2008	1934298	1071590	862707	55.40
2009	1596222	652762	943459	40.89
2010	1960874	881820	1079053	44.97
2011	2493365	1276416	1216949	51.19
2012	2730840	1376576	1354264	50.41
2013	2785481	1320248	1465233	47.40
The arithmetic average of the percentage contribution of oil to the GDP of the Kingdom during the period (1981-2013)(				**40**

Source: *Saudi Arabian Monetary Agency, the annual report of the forty-ninth, 2013*

(*) prepared by the researcher

Table2. *The contribution of oil exports in total exports for the period (1981-2012) Real mn*

year	Total merchandise exports	Oil exports	Non-oil exports	The Percentage(*) oil exportsof %
1981	378274	375320	2954	99.22
1982	253256	249978	3278	98.71
1983	157743	154178	3565	97.74
1984	131873	127423	4450	96.63
1985	99224	93623	5601	94.36
1986	74529	66665	7864	89.45
1987	86650	76271	10379	88.02
1988	91060	75440	15620	82.85
1989	105970	89965	16005	84.90
1990	165705	149649	16056	90.31
1991	178081	162764	15317	91.40
1992	187834	173752	14082	92.50
1993	158336	144202	14134	91.07
1994	159162	142401	16761	89.47
1995	186913	162593	24320	86.99
1996	226819	202638	24181	89.34
1997	226844	199172	27672	87.80
1998	145023	121607	23416	83.85
1999	189579	167793	21786	88.51

2000	289756	264951	24805	91.44
2001	254225	223532	30693	87.93
2002	271023	238587	32436	88.03
2003	348739	307591	41148	88.20
2004	471245	414059	57186	87.86
2005	676481	605881	70600	89.56
2006	790738	705811	84927	89.26
2007	874010	769933	104077	88.09
2008	1175066	1053860	121206	89.69
2009	726174	611490	114684	84.21
2010	941785	807176	134609	85.71
2011	1367619	1191051	176568	87.09
2012	1454507	1263555	190952	86.88
The arithmetic average of the share of oil exports in total merchandise exports of the kingdom during the period (1981-2012)(				**89.6**

Source: *Saudi Arabian Monetary Agency, the annual report of the forty-ninth, 2013*

(*) prepared by the researcher

Table3. *The contribution of oil returns in public returns for the period (1981-2013) Real mn*

year	**Totalpublic returns**			**(*)The percentage of oil returns** %
	oil returns	**other returns**	**Total**	
1981	328594	39412	368006	89.29
1982	186006	60176	246182	75.56
1983	145123	61296	206419	70.31
1984	121348	50161	171509	70.75
1985	88425	45140	133565	66.20
1986	42464	34034	76498	55.51
1987	67405	36406	103811	64.93
1988	48400	36200	84600	57.21
1989	75900	38700	114600	66.23
**1991	246297	70342	316639	77.78
1992	128790	40857	169647	75.92
1993	105976	35469	141445	74.92
1994	95505	33486	128991	74.04
1995	105728	40772	146500	72.17
1996	135982	43103	179085	75.93
1997	159985	45515	205500	77.85
1998	79998	61610	141608	56.49
1999	104447	43007	147454	70.83
2000	214424	43641	258065	83.09
2001	183915	44244	228159	80.61
2002	166100	46900	213000	77.98
2003	231000	62000	293000	78.84
2004	330000	62291	392291	84.12
2005	504540	59795	564335	89.40
2006	604470	69212	673682	89.73
2007	562186	80614	642800	87.46
2008	983369	117624	1100993	89.32
2009	434420	75385	509805	85.21
2010	670265	71351	741616	90.38
2011	1034360	83432	1117792	92.54
2012	1144818	102580	1247398	91.78
2013	1035046	121315	1156361	89.51
The arithmetic average of the share of oil returns in the total returns of the kingdom during the period (1981-2013)				**77.56**

Source: *Saudi Arabian Monetary Agency, the annual report of the forty-ninth, 2013*

(*) prepared by the researcher

(* *)*The budget was merging in 1990 with a budget in 1991where the budget has not issued for fiscal year 1991*

Table4. *The real price of oil where the base year in 2005 and the percentage of surplus or deficit relation to GDP (SDB/GDP) %for the period (1981-2014)*

year	the real price of oil where the base year in 2005	The actual surplus or deficit in public budget Real mn	the percentage of surplus or deficit relation to GDP (SDB/GDP) %
1981	73.90	83356	13.4
1982	76.09	1270	0.2
1983	69.06	-23767	-5.3
1984	69.72	-44854	-10.7
1985	65.86	-50439	-13.4
1986	25.83	-60924	-18.9
1987	29.20	-81108	-25.3
1988	21.74	-56256	-17.0
1989	26.91	-40270	-11.3
*1991	25.10	-170786	-18.4
1992	23.27	-69340	-13.6
1993	21.36	-46445	-9.4
1994	19.48	-34785	-6.9
1995	19.39	-27443	-5.1
1996	23.52	-19032	-3.2
1997	22.99	-15772	-2.6
1998	15.18	-48452	-8.9
1999	21.63	-36387	-6.0
2000	36.69	22743	3.2
2001	31.23	-26981	-3.9
2002	31.32	-20500	-2.9
2003	31.37	36000	4.5
2004	36.68	107091	11.0
2005	50.64	217861	17.7
2006	59.92	280360	19.9
2007	62.89	176552	11.3
2008	79.78	580924	29.8
2009	53.61	-86629	-5.4
2010	68.27	87731	4.4
2011	88.50	291092	11.6
2012	92.40	374093	13.6
2013	88.40	180347	6.4
2014	50.64	-54000	-1.9

Source: *Saudi Arabian Monetary Agency, the annual report of the forty-ninth, 2013*

(*)*The budget was merging in 1990 with a budget in 1991where the budget has not issued for fiscal year 1991*