Empirical Investigation of the Twin Deficits Hypothesis: The Egyptian Case (1990-2012)

El-Baz, Osama

The Egyptian Center for Economic Studies (ECES)

5 February 2014

Empirical Investigation of the Twin Deficits Hypothesis: The Egyptian Case (1990-2012)

Osama El-Baz

Economic Research Analyst- The Egyptian Center for Economic Studies (ECES)

osamaeces@gmail.com, Tel: 01208375315

Abstract

This paper investigates the relationship between current account and government budget balances. We tested the validity of the *Twin Deficits Hypothesis (TDH)*in Egypt, using annual time series data for the period (1990-2012). We rejected the TDH, as granger causality tests proved a reverse causal relationship running from the current account deficit to the budget deficit. A *"twin divergence"* was found to exist between the two deficits in the short run, also the Vector Error Correction Model (VECM) proved the existence of a negative long run equilibrium relationship between both current account and government budget balances, with a relatively high speed of adjustment toward the equilibrium position; as it takes about one year and 4 months to restore the equilibrium position after divergence occurs.

1. Introduction

Governments in many developing and developed countries depend on the fiscal policy to achieve goals of economic stabilization and growth; this is usually accompanied, in most of cases, with large fiscal deficits. Consequently, the existence of large public budget deficit can have negative impacts on both real exchange rate and the current account balance, these potential impacts became a source of economic debates in the literature. The analysis of the mechanism of the relationship among budget deficit, current account deficit and exchange rate movements are of great empirical importance for policy purposes.

Form a theoretical viewpoint, the link between budget deficit and current account deficit is usually referred to as the *Twin Deficits Hypothesis* (TDH), which first emerged in the 1980s, when a significant deterioration in the U.S. current account balance was accompanied by a sharp rise in the federal budget deficit (Merza et al

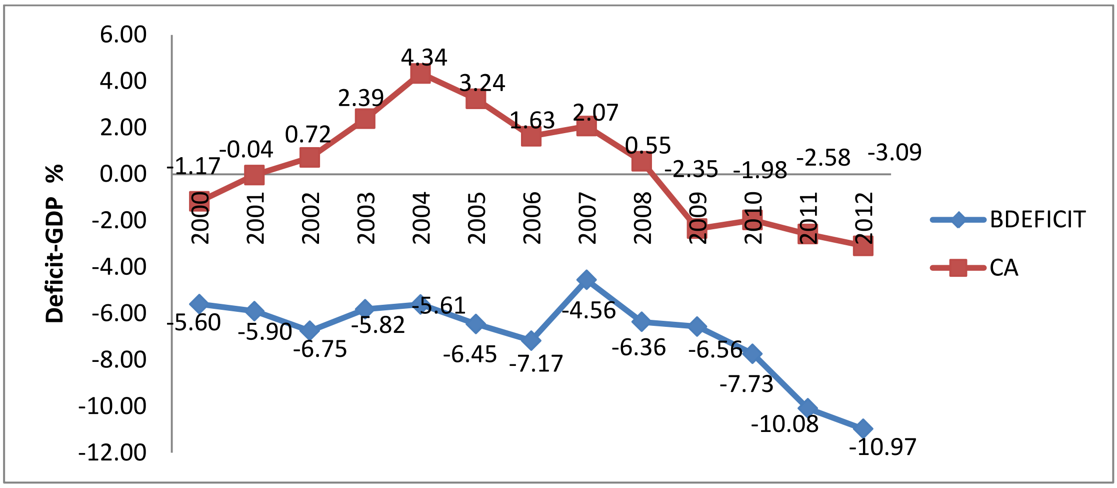
2012), it means that the budget deficit will be associated with a current account deficit. According to the accounting approach to the balance of payments, the current account balance equals saving (including both household and national savings) minus investment, hence a reduction in national saving as a result of an increase in budget deficit may lead to a deterioration in the current account balance. The response of the current account balance to a positive shock "increase" in government budget deficit will depend on the behavior of the household sector; the behavior of the private sector can either expand or offset the impact of the fiscal expansion on the current account balance. Some empirical studies found that higher budget deficits can lead to highercurrent account deficits; others prove the opposite or show no significant impact at all (Nickel and Vansteenkiste,2008), interest in the theory rises and declines with the status of a nation's deficits; it will be crucial for countries that used to have a large budget deficit to exert effort to keep it under control if data supports the twin deficits in order to avoid external imbalances.

There are two main strands of models that analyses the relationship or the link between budget deficit and current account deficit. The first model that analyses the link between budget deficit and current account deficit is the Mundell- Fleming model, which supports the twin deficits hypothesis. According to this model- an expansionary fiscal shock in an open economy, under a flexible exchange rate regime will lead to an increase in the current account deficit, because the existence of higher disposable incomes will lead to higher demand and imports, also the increase in demand in the domestic market will lead to an increase in the domestic price level, which will result in a real exchange rate appreciation and a reduction in exports. These two channels may cause a deterioration in the current account balance. However, the resulting external deficit may be eased if fiscal deficit led to an increase in the interest rate, which can discourage domestic investment or if the crowding out effect existed(Nazier and Essam 2012).

The second model that analyses the link between budget deficit and current account deficit is the *Recardian Equivalence Hypothesis* (REH), in contrast to the Mundell-Fleming model which supports the twin deficits hypothesis, the (REH) postulates that an expansionary fiscal policy will not have impact on the current account balance, as the increase in disposable incomes resulting from the reduction in government saving "the increase in budget deficit" will not be interpreted as an increase in aggregate demand, but rational households will save these additional transitory incomes to be able to pay taxes in the future, as they expect that the increase in government expenditure or a tax cut today means higher taxes in the future; hence private saving will increase by an amount which is equivalent to the reduction in government saving. That's why government expenditures will have no effect on the real interest rate, exchange rate, or the current account balance (Abbas et al 2010 and Corestti and Muller 2006).

For the Egyptian economy, it has been suffering a large budget deficit, the government budget deficit-GDP%,measured by the cash deficit,has increased significantly after 2010 from 7.73% to 10.97 % in 2012. Recently, the government announced that they are going to take certain measures to ensure fiscal discipline and that the targeted cash deficit-GDP% is 9.5%, as it is expected to reach 15.2% if these measures are not going to be executed. The current account is also suffering deficit, which has increased after 2010 from 1.98% to 3.09% in 2012 (See figure 1 below).Alshorbagy (2011) tested the sustainability of the current account for the Egyptian economy using data for the period (1960-2008), he concluded that the current account deficit in Egypt will not be sustainable in the long run; which means that there is a fear that the Egyptian economy may not be able to fulfill its intertemporal budget constraint in the long run due to possible exchange rate depreciation, this in turn is expected to result in the increase in debt burden in the long run. That's why the relationship between current account deficit and government budget deficit should be taken into consideration for policy purposes.

Figure 1: Current Account and Government Cash Deficits in The Egyptian Economy (2000-2012):



Source: Data for current account deficit is obtained from the IMF world economic outlook database and data for cash deficit is obtained from the World Bank World Development Indicators database.

This paper consists of five sections: section two: is the analytical frame work and literature review, section three: explains data and methodology which will be used in econometric analysis, section four: indicates model estimation and empirical results, and section five: includes conclusions and policy implications.

2. Analytical Framework and literature review:

The analytical framework is mainly based on the national income identity in the context of an open economy (Saeed and Khan 2012).

$\because$ **Y= C + I + G + (X-M)**

$$\therefore\ (X\text{-}M) = Y - C - I - G$$

$$,\therefore (X\text{-}M) = Y - (C + G) - I$$

$$,\therefore (X\text{-}M) = S - I$$

$$,\because\ S = Sg + Sp$$

$$Sg = T - G \because,$$

$$,\ \boxed{\therefore\ (X\text{-}M) = Sp + (T - G) - I}$$

Where: (Y) is the gross domestic product, (C) is household consumption, (I) is investment, (G) is government expenditure, (X-M) is the current account balance approximated by the trade balance, (S) is national saving, (S^g) is government saving and (S^p)refers to private saving.

The response of the current account balance to a positive shock "increase" in government budget deficit will depend on the behavior of the household sector; as the behavior of the private sector can either expand or offset the impact of the fiscal expansion on the current account balance. When households spend additional disposable incomes resulting from an expansionary fiscal policy, this will lead to an increase in imports and a real exchange rate appreciation, hence it will lead to the deterioration of the current account balance; which supports the Twin Deficits Hypothesis. On the other hand, when households save additional disposable incomes, private saving will increase by an equivalent amount to the reduction in government saving, hence leaving the current account unaffected; which supports the Recardian Equivalence Hypothesis.

So far, The TDH postulates that there is a *unidirectional causality* relationship between budget deficit and current account deficit, which runs from the first to the later; or budget deficit granger causes current account deficit, the REH postulated that there is *no causal relationship (independence)* between budget deficit and current account deficit. There are two other possibilities. A *revere causation* from the current account deficit to the budget deficit may exist, which is known as *current account targeting*, this happens when the deterioration in the current account lead to a diminished economic growth and raise the budget deficit (Marinheiro 2006).A *bi-directional causality*mightexist between the two deficits or there is a *feedback relationship* between them, in this case putting the government budget deficit under control will not be sufficient to eliminate the external deficit, but the exchange rate policy should be taken into consideration (Marinheiro 2006).

Regarding the empirical literature examining the existence of the twin deficits, it has been far from conclusive. Studies reached no clear cut conclusion concerning the relationship between budget deficit and current account deficit.

Studies that confirmed the existence of a unidirectional causality running from the budget deficit to the current account deficit are numerous. Ratha (2010) used monthly data over (1998-2009)for the Indian economy and proved the existence of a unidirectional causality relationship running from the budget deficit to the current account deficit only in the short run.Akbostancı and Tunç (2002) tested the relationship between the budget deficit and trade deficit for Turkey between (1987–2001) and showed that there is a unidirectional causal relationship running from the budget deficit to the current account deficit both in the short run and in the long run.Zubaidi et al., (2005) confirmed this hypothesisfor Thailand.

Other empirical studies confirmed a bi-directional causality between the two deficits.Lau and Baharumshah (2004) tested the validity of the twin deficits hypothesis for Malaysia, using data for the period (1975-2000), they found a bi-directional causality between the two deficits in Malaysia and suggested the existence of the current account targeting phenomenon, which was also confirmed by Zubaidi et al., (2005). Mukhtaret. al (2007) used the Error Correction Model (ECM) and Granger causality tests to empirically test the twin deficit hypothesis in Pakistan using quarterly time-series data for the period (1975-2005) and confirmed the existence of long-run relationship between the two deficits, and that there is a bi-directional causality between them. In addition, Mehrara and Zamanzadeh(2011) examined the relationship between government current budget deficit and non-oil current account deficit for Iranian economy during the period 1959-2007 based on cointegration analysis and vector error correction model (VECM), they proved the existence of a positive relationship between government current budget deficit and non-oil current account deficit and Granger causality tests showed the existence of a bidirectional causal relationship between the two variables.

Empirical studies that found no evidence for the (TDH). Marinheiro (2006) used cointegration analysis to examine the validity of the twin deficit hypothesis for Egypt. He concluded the presence of a weak long-run relationship between the budget deficit and the current account deficit, but rejected the twin-deficits hypothesis as he found a reverse Granger causality running fromthe external deficit to the budget deficit, which is called current account targeting, he justified it by the reliance of Egyptian fiscal authorities on Suez Canal Dues, which enters into government revenues; hence, a decline in such revenues can have a negative impact on the current account, whose negative impact will show in the budget deficit. Hence, the deterioration in the external balance will be accompanied by a decrease in government's revenues, and hence by a deterioration in the budget balance.Hashemzadeh and Wilson (2006) investigated the relationship between the two deficits using data for Egypt, Iran, Jordan, Kuwait, Morocoo, Oman, Syria, Turkey and Yemen and concluded that the twin deficits hypothesis is not universally supported.(Nazier and Essam 2012) tested the validity of the (TDH) for Egypt using annual data for the period (1992 -2010) and confirmed a twin divergence instead of twin deficits, that is, when fiscal accounts worsen, the current account improves and exchange rate depreciates.

Several empirical studies have addressed the link between budget deficit and current account deficit using a single equation approach or panel regression techniques. Within this strand of the literature, there is no conclusive opinion concerning the impact of fiscal deficit on the trade balance. Some studies confirmed a statistically significant impact of fiscal variables on external imbalances (Summers, 1986; Bernheim, 1988; Roubini, 1988; Miller and Russek 1989; Lane and Perotti 1998; Chinn and Prasad 2003; Abiad, et al 2009; Mohammadi 2004 and Piersanti 2000). While other studies reported an insignificant effect of the budget deficit on the current account (Dewald and Ulan 1990; Evans 1990; Bussière et al. 2005 and Gruber and Kamin 2005), but the results reached by these studies have limitations becausethe dynamic interactions between variables were not appropriately considered in single equation techniques.

Recently, empirical studies tended to use multivariate time series techniques in analysis such as Vector Auto-Regression (VAR) and Vector Error Correction Models (VECM) to analyze the twin deficits hypothesis, as they allow for dynamic interactions among the variables of concern, which is important to be able to draw conclusions about the relationship in both the short and long run.

The contribution of this paper is that we will test the validity of the twin deficits hypothesis, both in the short and long run, using a Vector Error Correction Model (VECM)in order to have a comprehensive overview concerning the mechanism of the relationship between budget deficit and current account deficit, trying to reach a conclusion concerning the relationship between them due to conflicting conclusions reached by empirical studies ofMarinheiro (2006) and (Nazier and Essam 2012), also I will use Granger causality test to identify the direction of the causal relationship between the variables of concern, and the data used in analysis covers a relatively long time span, compared to that used in other studies tackled the Egyptian case.

3. Econometric Analysis

- **Data :**

We will use annual time series data for the period (1990- 2012) in order to test the validity of the Twin Deficits Hypothesis (TDH) in Egypt. The variables that will be included in the empirical model are:

- **CA:** it refers to the current account balance- GDP ratio, it was obtained from the IMF world economic outlook database.
- **BDEFICIT:** it is the cash deficit- GDP ratio, it was obtained from the World Bank World Development Indicators database.

- **RER:** it is the real exchange rate, it was calculated based on data available for the consumer price indices for both Egypt and the U.S., obtained from the IMF world economic outlook database, and data for the nominal exchange rate of the Egyptian pound against the U.S. dollar, obtained from the World Bank World Development Indicators database.[1]
- **GDPG:**itistheGDP in constant prices annual growth rate, it was obtained from theIMF world economic outlook database.

Both the gross domestic product annual growth rate (GDPG) and the real exchange rate (RER) will be included in the empirical model because they are key macroeconomic variables which can reflect the economic performance of the Egyptian economy throughout the period of study.

• Methodology:

i. Augmented Dickey Fuller Unit Root Test:

We will first test for the stationarity of the variables, to avoid a spurious regression model when inserting nonstationary variables in the model in their level forms. The **Augmented Dickey Fuller Unit Root Test (ADF)** will be used, which takes the following form:

$$\Delta Y_t = \propto + \beta t + \rho Y_{t-1} + \sum_{J=1}^{p} \delta \Delta Y_{t-j} + \varepsilon_t$$

We notice that the first difference of the variable of concern is regressed on a constant term, linear trend and the first lag dependent variable and other lags of the dependent variable, it ensures no autocorrelation in the error term.

ii. Johansen Cointegration test:

It is known that if the variables are nonstationary, they should be differenced before being used in the regression model to avoid a spurious regreesion. If the variables are cointegrated or there is a stable long run equilibrium relationship between them over time, then they could be used in the regression model in the level forms without leading to a spurious regression. There are numerous tests that were acknowledged in the literature for cointegration analysis such as the *Cointegrating regression Durbin-Watson test*, *Engle-Granger Cointegraion test* and *Johansen Cointegration test*. We will use *Johansen test* to test for cointegration between the variables in the empirical

[1]The Real Exchange rate can be calculated as follows:
$\mathbf{RER}_{Egy/U.S.\$} = \mathbf{NER}_{Egy/U.S.\$} \cdot \frac{P\ U.S.}{PEGY}$, where : $RER_{Egy/U.S.\$}$ is the real exchange rate of the Egyptian pound against the U.S. dollar, NER $_{Egy/U.S.\$.\$}$ is the nominal exchange rate of the Egyptian pound against the U.S. dollar, $\frac{P\ U.S.}{P\ EGY}$ is the relative price levels in the united states to those in the domestic market.

model because it has an advantage over other previously mentioned tests as it takes into consideration the possibility of multiple cointegrating vectors.

iii. Granger Causality test:

The regression model indicates only the statistical relationships between the dependent variable of concern and other independent "explanatory" variables, but it does not indicate the causal relationship and the direction of it. There might be a unidirectional causality relationship running from one variable to the other one, a bidirectional relationship, also independence may exist. We will use the *Granger causality test*to know the direction of the causal relationship among the variables in our empirical model. The intuition behind Granger causality tests can be expressed using the following equations:

$$Y_t = \propto_0 + \sum_{i=1}^{p} \propto_{1,i} Y_{t-i} + \sum_{i=1}^{p} \beta_{2,i} X_{t-i} + \varepsilon_{1t} \quad (1)$$

$$X_t = \mu + \sum_{i=1}^{p} \delta_{1,i} X_{t-i} + \sum_{i=1}^{p} \theta_{2,i} Y_{t-i} + \varepsilon_{2t} \quad (2)$$

If a specific variable (Y) can be forecasted by its own lagged values as well as the current and lagged values of another variable (X), (X) is said to Granger-cause (Y). If only βs in equation (1) were significant and θs are insignificant in equation (2), it means that (X) granger causes (Y), and vice versa. If both βsand θswere insignificant, it means that (Y) and (X) are independent from each other, if bothβs and θs were significant, it means that a feedback causal relationship exists between (Y) and (X).

iv. The Empirical Model:

If the variables included in the empirical model are cointegrated, it will be useful to use a **Vector Error Correction Model (VECM)** to understand the relationship between the variables both in the short run and also in the long run, which will be useful to have comprehensive information concerning the dynamic relationship between the variables and how the adjustment toward the equilibrium position occurs after the initial divergence. The VECM could be represented by the following equations:

$$\Delta Y_t = \propto_0 + \sum_{i=1}^{p} \propto_{1,i} Y_{t-i} + \sum_{i=1}^{p} \propto_{2,i} X_{t-i} + \theta_1 ECT_{t-1} + \varepsilon_{1t} \quad (1)$$

$$\Delta X_t = \mu + \sum_{i=1}^{p} \beta_{1,i} X_{t-i} + \sum_{i=1}^{p} \beta_{2,i} Y_{t-i} + \theta_2 ECT_{t-1} + \varepsilon_{2t} \quad (2)$$

In equations **(1) and (2)** the parameters$\propto$ and$\boldsymbol{\beta}$ capture the short run relationship between the variables **(X) and (Y),** the term $\mathbf{ECT}_{t-1}$ refers to the error correction term which indicates the speed convergence to equilibrium and the coefficient $\boldsymbol{\theta}$should be negative and significant.

The lag length of the model should be determined by certain information criteria, we will choose the number of lags that can minimize Akaiakie and Schwartz information criteria. After estimating the model, stability test should be used to guarantee the robustness of the results, also tests of hetroscedasticity, normality and autocorrelation will be used to ensure that the model satisfies the assumptions of homoscedasticity, normality and no serial correlation of the residuals.

4. Model estimation and results:

i. **ADF unit root test:** all the variables were tested for stationarity using the augmented dickey fuller unit root test, all the variables are integrated of order one. (See tables from 2 to 5 in the appendix).

ii. **Johansen Cointegration test:** Johansen cointegration test provided evidence of cointegration between **(CA, BDEFICIT, RER and GDPG).** The trace and the maximum eigen-value tests indicated the existence of only one cointegrating vector (See table 6 and figure 1 in the appendix). It means that these variables could be included in a regression model in their level forms without leading to a spurious regression. It will be useful to use a Vector Error Correction Model (VECM), as we will proceed**.**

iii. **Granger Causality test:**Granger causality test indicated that there is a unidirectional causal relationship running from the current account deficit **(CA)** to the budget deficit **(BDEFICIT)** at both 5% and 10% significance levels; which provides evidence of the current account targeting phenomenon, there is a unidirectional causal relationship running from the real exchange rate **(RER)** to the current account deficit**(CA)** at both 5% and 10% significance levels, and also there is a unidirectional causal relationship running from the real exchange rate **(RER)** to the budget deficit **(BDEFICIT)** at a 10% significance level (See table 7 in the appendix).

iv. **Vector Error Correction Model(VECM):**

a. **The VECM:** The vector Error Correction Model (VECM) was used to have a comprehensive overview on the nature of the relationship between budget deficit and current account deficit in both the short and long run. We included only two lags for each variable to capture the relationship in the short run and akaiakie information criterion was minimized, the model satisfied the stability condition and there are no autocorrelation, hetroscedasticity or normality problems (See tables from 8 to 12 in the appendix).The results of the VECM can be summarized in the following tables(1& 2):

Table 1: Estimates of short runelasticities:

Variable	Short run elasticities(Coefficients)	T-statistic
CA(-1)	-2.02	-6.83
CA (-2)	-0.58	-3.21
RER(-1)	3.48	7
RER (-2)	2.45	5.03
GDPG (-1)	0.28	2.62
C	-1.08	-5.91

Source: Calculated by the researcher(**Only significant coefficients are reported).**

Table 2: Estimates of long run elasticities:

Variable	Long run elasticities (Coefficients)	T-statistic
CA	-2.94	-35.45
RER	4.16	49.85
GDPG	-0.92	-10.96
C	-19.32	-
ECT	-0.73	-6.7

Source: Calculated by the researcher(**Only significant coefficients are reported).**

The short run elasticity of budget deficit to the current account deficit is negative and highly elastic in for close time lags; which means that there is a *twin divergence* existsbetween current account and government budget balances in the short run,this may be because most of our imports are mainly intermediate goods that lead to an increase in the production of final goods in the domestic economy and lower budget deficit, in fact the Egyptian imports of intermediate goods and raw materials witnessed accounted for about 28.3% and 15.1% , respectively, of our merchandise imports in 2012/2013 (CBE. 2012),this relationship is in line with the results reached by Nazier and Essam (2012), but they found a negative statistical relationship between them, without conducting causality tests. The short run elasticity of budget deficit to the real exchange rateis positive and elastic; which means that a real exchange rate appreciation fueled by a nominal appreciation may boost imports and raise the current account deficit, which might reduce budget deficit significantly in the short run due to the increase in imports in the short run due to the increase in tax revenues. The short run elasticity of budget deficit to economic growth is positive and inelastic; which means that economic growth and the expansion in the size of the economy may require government intervention and regulation, which can inflate the budget deficit in the short run slightly as the burden of government expenditure outlays willincrease slightly in the short run, but it is expected to vanish in the long run because the relationship tuned to be negative and significant in the long run.

The long run elasticity of budget deficit to the current account deficit is negative and elastic; which means that a worsening current account balance will lead to a decline in budget deficitdue to expansion in domestic production if most of imports are of intermediate goods to satisfy domestic demand for final goods, this implies a long run *twin divergence* between both types of deficits. The long run elasticity of budget deficit to the real exchange rate is positive and highly elastic;which means that a real exchange rate appreciation fueled by a nominal appreciation may boost imports and raise the current account deficit, which might reduce budget deficit significantly due to the increase in imports. The long run elasticity of budget deficit to economic growth is negative, which means that the increase in domestic production of goods and services will reduce budget deficit due to the increase in tax revenues. It was found that there is a stable long run equilibrium relationship or cointegration among the variables included in the model, the error correction term was negative and significant (-0.73); which means that the speed of adjustment toward the equilibrium position is relatively high, and it takes about one yearand 4 months to restore the equilibrium position after divergence occurs.

5. Conclusion and Policy Implications:

This paper analyzed the validity of the twin deficits hypothesis for Egypt. If the twin deficitshypothesis was valid, the appropriate policy prescription to correct a current accountdeficit could have been a tax increase or improving the efficiency of the taxation system to avoid tax evasion and tax avoidance phenomena which reduce tax revenues significantly.

We have found evidence of a twin divergence in the short run between current account and government budget balances, this may be because an increase in imports of intermediate goods can lead to higher current account deficit, but in the domestic market it can lead to an increase in both domestically produced final goods and tax revenues and a lower budget deficit. Also, a long-run negative equilibrium relationship was found between current account deficit and the budget deficit, running from the former to the later and a modest speed of adjustment toward the long run equilibrium was found, it takes about 1 year and 4 months to restore the equilibrium position after divergence occurs.

Since a negative long run causal relationship was found between the current account and government budget balances, running from the former to the later. It will be useful to adopt policies that can reduce the costs of the trade-off relationship between them, thus a cost-benefit analysis should be done for every policy action,as the reduction in current account deficit, may be through restrictions on imports of certain intermediate goods and raw materials, will be at the expense of the government budget deficit due to the economic slowdown which would be expected to prevail in the national economy. The government should depend on the financial account to finance the inherent deficit in the current account and improve the overall performance of the balance of payments, as a good business and investment environment and the expected appreciation of the domestic currency can attract capital inflows and foreign direct investment (FDI),these capital inflows might finance budget deficit; hence it can reduce the cost of borrowing for government and reduce the overall deficit in the balance of payments and (FDI) can increase tax revenues due to the increase in domestic production of certain commodities of backward and forward industries.

References

1. Abbas, Hagbe, Fatas, and others.2010. " Fiscal Policy and the Current Account". IMF. Working Paper 10/121. Accesed at , available at :
http://www.imf.org/external/pubs/ft/wp/2010/wp10121.pdf

2. Abiad, A., D. Leigh, and A. Mody, 2009. Financial Integration, Capital Mobility, and Income Convergence. Economic Policy, Vol. 24, No. 58: 241–305. Accessed at:, Available at:mannheim.de/fileadmin/user_upload/adam/research/Abiadetal.pdf

3. Ahmed, Mukhtar, and Zakaria. 2007. " AN EMPIRICAL INVESTIGATION FOR THE TWIN DEFICITS HYPOTHESIS IN PAKISTAN". Journal of Economic Cooperation . 28, 4(2007). 63-80. Accessed at , available at :
http://www.sesrtcic.org/jecd/jecd_articles/ART07070103-2.pdf

4. Akbostancı, E. and Tunc, G. 2002. " TURKISH TWIN DEFICITS: AN ERROR CORRECTION MODEL OF TRADE BALANCE". Economic Resaerch Center (ERC) Working Papers in Economics 01/06. Accessed at , available at :
http://www.erc.metu.edu.tr/menu/series01/0106.pdf

5. BAHARUMSHAH, A. and Lau, E. 2004. "On the Twin Deficits Hypothesis: Is Malaysia Different? ".Pertanika Journal of Social Sciences and Humanities , 12(2). 87-100. Accessed at , available at :http://psasir.upm.edu.my/3459/1/On_the_Twin_Deficits_Hypothesis_Is_Malaysia_Different.pdf

6. Bernheim, B. 1988. " BUDGET DEFICITS AND THE BALANCE OF TRADE". NBER. NBER books. p. 1 – 32. Accessed at:, Available at:
http://www.nber.org/chapters/c10935

7. Bussière, M., M. Fratzscher, and G. J. Müller, 2005. Productivity Shocks, Budget Deficits, and the Current Account. *European Central Bank Working Paper*, No. 509. Accessed at:, Available at:
http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp509.pdf

8. Chinn, M. D., and E. S. Prasad. 2000. "Medium-Term Determinants of Current Accounts in Industrial and Developing Countries: An Empirical Exploration". IMF. Working paper No. 46. Accessed at:, Available at:
http://www.imf.org/external/pubs/ft/wp/2000/wp0046.pdf

9. Dewald, W. G., and M. Ulan, 1990. The Twin-Deficit Illusion. Cato Journal, Vol. 9, Winter, No. 3: 689–707. Accessed at:, Available at:http://object.cato.org/sites/cato.org/files/serials/files/cato-journal/1990/1/cj9n3-9.pdf

10. Evans, P., 1990. Do Budget Deficits Affect the Current Account? Ohio State University mimeo. Gruber, J.W. and S.B. Kamin, 2005. Explaining the global pattern of current account imbalances. Board of Governors of the Federal Reserve System, *International Finance Discussion Papers*, No. 846,

November.Accessed at:, Available at:http://www.federalreserve.gov/pubs/ifdp/2005/846/ifdp846.pdf

11. Hashemzadeh, N. and Wilson. 2006. “The Dynamics of Current Account and Budget Deficits in Selected Countries in the Middle East and North Africa.” International Research Journal of Finance and Economics, Issue 5, pp. 111-129.

12. Khan, A. and Saeed, S. 2012. " TWIN DEFICITS HYPOTHESIS: THE CASE OF PAKISTAN (1972-2008)". Journal of Natural & Applied Sciences. Vol.3 No.2, September 2012. Accesed at , available at : http://www.journal-archieves14.webs.com/1432-1446.pdf

13. Lane, P. and Perotti. 1998. "The trade balance and fiscal policy in the OECD". *European Economic Review* 42: 887–95.

14. Marinheiro, C. 2006. "Ricardian Equivalence, Twin Deficits, and the Feldstein Horioka puzzle in Egypt". Grupo de Estudos Monetários e Financeiros (GEMF). Accesed at , available at : http://gemf.fe.uc.pt/workingpapers/pdf/2006/gemf06_07_jan08.pdf

15. Mehrara, M. and Zamanzadeh,A.(2011). "Testing Twin Deficits Hypothesis in Iran". Interdisciplinary Journal of Research in Business, Vol. 1, Issue. 9, pp. 7-11.Accessed at , available at :http://www.idjrb.com/articlepdf/idjrb9n1p2.pdf

16. Merza, Alawin, and Bashayreh. 2012. " The Relationship between Current Account and Government Budget Balance: TheCase of Kuwait". International Journal of Humanities and Social Science. Vol. 2 No. 7; April 2012.Accesed at , available at :http://www.ijhssnet.com/journals/Vol_2_No_7_April_2012/19.pdf

17. Miller, S. and Russek. 1989. "Are the Twin Deficits Really Related?".ContemporaryPolicy Issues 7, October.

18. Mohammadi, H., 2004. Budget Deficits and the Current Account Balance: New Evidence from Panel Data. *Journal of Economics and Finance*, Vol. 28, No. 1, Spring: 39–45.

19. Nazier, H. and Essam, M. 2012. "Empirical Investigation of Twin Deficits Hypothesis in Egypt (1992-2010)". Middle Eastern Finance and Economics Journal. Issue 17 (2012).

20. Nickel,C. and Vansteenkiste,L. 2008. " Fiscal Policies, the current account andricardianequivalence".European Central Bank. Working Paper No 935.Accesedat , available at : http://www.ecb.europa.eu/pub/pdf/scpwps/ecbwp935.pdf

21. Piersanti, G., 2000. Current Account Dynamics and Expected Future Budget Deficits: Some International Evidence. *Journal of International Money and Finance* 19: 255–271.

22. Ratha, A. 2011. " Twin Deficits or Distant Cousins? Evidence from India" St. Cloud State University. Economics Faculty Working Papers. Accessed at , available at : http://repository.stcloudstate.edu/cgi/viewcontent.cgi?article=1004&context=econ_wps

23. Roubini, N. 1988. " Current Account and Budget Deficits in an Intertemporal Model of Consumption and Taxation Smoothing. A Solution to the "Feldstein-Horioka Puzzle". NBER. Working Paper No. 2773. Accessed at:, Available at: http://www.nber.org/papers/w2773.pdf?new_window=1

24. Summers, L. 1986. " DEBT PROBLEMS AND MACROECONOMIC POLICIES". National Bureau of Economic Research (NBER). Working Paper No. 2061. Accessed at , available at :http://www.nber.org/papers/w2061.pdf?new_window=1

25. Zubaidi, Lau, and Khalid. 2006." Testing twin deficits hypothesis using VARs and variance decomposition". Journal of the Asia Pacific economy, 11 (3), 331-354. Available at: http://epublications.bond.edu.au/business_pubs/38

Statistical Appendix

Table 1: Descriptive Statistics:

Date: 10/20/13
Time: 10:19
Sample: 1 23

GDPG	RER	CA	BDEFICIT	
4.403531	7.066087	0.606391	-3.885253	Mean
4.471744	6.870000	0.368000	-5.600000	Median
7.156284	10.00000	8.735000	4.232603	Maximum
1.078838	4.750000	-3.088000	-10.97000	Minimum
1.654576	1.446572	2.963770	4.195290	Std. Dev.
-0.154898	0.553732	0.852186	0.491389	Skewness
2.387059	2.391288	3.530043	2.427218	Kurtosis
0.452017	1.530465	3.053090	1.240019	Jarque-Bera
0.797711	0.465226	0.217285	0.537939	Probability
101.2812	162.5200	13.94700	-89.36082	Sum
60.22766	46.03655	193.2465	387.2102	Sum Sq. Dev.
23	23	23	23	Observations

Table 2: ADF test for BDEFICIT:

Null Hypothesis: D(BDEFICIT) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

Prob.*	t-Statistic		
0.0000	-7.310864	Augmented Dickey-Fuller test statistic	
	-2.679735	1% level	Test critical values:
	-1.958088	5% level	
	-1.607830	10% level	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(BDEFICIT,2)
Method: Least Squares
Date: 10/16/13 Time: 12:49
Sample (adjusted): 1992 2012
Included observations: 21 after adjustments

Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0000	-7.310864	0.186943	-1.366718	D(BDEFICIT(-1))

-0.252860	Mean dependent var	0.726432	R-squared
3.795115	S.D. dependent var	0.726432	Adjusted R-squared
4.255549	Akaike info criterion	1.984987	S.E. of regression
4.305289	Schwarz criterion	78.80345	Sum squared resid
4.266344	Hannan-Quinn criter.	-43.68327	Log likelihood
		1.385778	Durbin-Watson stat

Table 3: ADF test for CA:

Null Hypothesis: D(CA) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

Prob.*	t-Statistic		
0.0002	-4.270737	Augmented Dickey-Fuller test statistic	
	-2.679735	1% level	Test critical values:
	-1.958088	5% level	
	-1.607830	10% level	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(CA,2)
Method: Least Squares
Date: 10/16/13 Time: 12:50
Sample (adjusted): 1992 2012
Included observations: 21 after adjustments

Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0004	-4.270737	0.180054	-0.768964	D(CA(-1))

-0.331143	Mean dependent var	0.469874	R-squared
2.911834	S.D. dependent var	0.469874	Adjusted R-squared
4.387251	Akaike info criterion	2.120099	S.E. of regression
4.436990	Schwarz criterion	89.89641	Sum squared resid
4.398045	Hannan-Quinn criter.	-45.06613	Log likelihood
		2.116444	Durbin-Watson stat

Table 4: ADF test for RER:

Null Hypothesis: D(RER) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

Prob.*	t-Statistic		
0.0000	-6.312192	Augmented Dickey-Fuller test statistic	
	-2.679735	1% level	Test critical values:
	-1.958088	5% level	
	-1.607830	10% level	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RER,2)
Method: Least Squares
Date: 10/16/13 Time: 12:51
Sample (adjusted): 1992 2012
Included observations: 21 after adjustments

Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0000	-6.312192	0.144194	-0.910179	D(RER(-1))

-0.200476	Mean dependent var	0.657360	R-squared
1.292983	S.D. dependent var	0.657360	Adjusted R-squared
2.327153	Akaike info criterion	0.756853	S.E. of regression
2.376892	Schwarz criterion	11.45653	Sum squared resid
2.337947	Hannan-Quinn criter.	-23.43510	Log likelihood
		1.006067	Durbin-Watson stat

Table 5: ADF test for GDPG:

Null Hypothesis: D(GDPG) has a unit root
Exogenous: None
Lag Length: 5 (Automatic - based on SIC, maxlag=6)

Prob.*	t-Statistic		
0.0002	-4.521112	Augmented Dickey-Fuller test statistic	
	-2.717511	1% level	Test critical values:

-1.964418	5% level
-1.605603	10% level

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 16

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDPG,2)
Method: Least Squares
Date: 10/16/13 Time: 12:51
Sample (adjusted): 1997 2012
Included observations: 16 after adjustments

Prob.	t-Statistic	Std. Error	Coefficient	Variable
0.0011	-4.521112	0.739811	-3.344768	D(GDPG(-1))
0.0113	3.096730	0.651569	2.017732	D(GDPG(-1),2)
0.0042	3.680857	0.542689	1.997562	D(GDPG(-2),2)
0.0069	3.388337	0.473501	1.604380	D(GDPG(-3),2)
0.0037	3.759625	0.383493	1.441790	D(GDPG(-4),2)
0.0053	3.542657	0.196879	0.697473	D(GDPG(-5),2)

0.005784	Mean dependent var	0.839474	R-squared
2.344203	S.D. dependent var	0.759211	Adjusted R-squared
3.397929	Akaike info criterion	1.150306	S.E. of regression
3.687650	Schwarz criterion	13.23204	Sum squared resid
3.412765	Hannan-Quinn criter.	-21.18343	Log likelihood
		1.968943	Durbin-Watson stat

Table 6: Johansen Cointegration test:

Date: 10/25/13 Time: 17:54
Sample (adjusted): 1993 2012
Included observations: 20 after adjustments
Trend assumption: Linear deterministic trend
Series: BDEFICIT CA RER GDPG
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Prob.**	0.05 Critical Value	Trace Statistic	Eigenvalue	Hypothesized No. of CE(s)
0.0000	47.85613	101.0804	0.978665	None *
0.1949	29.79707	24.13263	0.473598	At most 1
0.1938	15.49471	11.29885	0.421876	At most 2
0.5601	3.841466	0.339516	0.016833	At most 3

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

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

	0.05	Max-Eigen		Hypothesized

Prob.**	Critical Value	Statistic	Eigenvalue	No. of CE(s)
0.0000	27.58434	76.94773	0.978665	None *
0.4676	21.13162	12.83379	0.473598	At most 1
0.1563	14.26460	10.95933	0.421876	At most 2
0.5601	3.841466	0.339516	0.016833	At most 3

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

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

GDPG	RER	CA	BDEFICIT
0.774269	-3.501615	2.478511	-0.840370
0.277731	0.622877	-1.108163	-0.007200
0.494980	-0.649614	-0.165541	0.176732
1.170511	2.100050	-0.461752	0.543308

Unrestricted Adjustment Coefficients (alpha):

-0.031583	-0.181935	0.084735	0.873250	D(BDEFICIT)
-0.072335	-0.176592	0.457080	-0.079539	D(CA)
-0.064526	0.120636	-0.041086	-0.068598	D(RER)
-0.047120	-0.498589	-0.090502	-0.341059	D(GDPG)

-54.01685 Log likelihood 1 Cointegrating Equation(s):

Normalized cointegrating coefficients (standard error in parentheses)

GDPG	RER	CA	BDEFICIT
-0.921342	4.166752	-2.949308	1.000000
(0.08402)	(0.08358)	(0.08318)	

Adjustment coefficients (standard error in parentheses)

-0.733853	D(BDEFICIT)
(0.10941)	
0.066842	D(CA)
(0.24153)	
0.057648	D(RER)
(0.14200)	
0.286616	D(GDPG)
(0.22876)	

-47.59995 Log likelihood 2 Cointegrating Equation(s):

Normalized cointegrating coefficients (standard error in parentheses)

GDPG	RER	CA	BDEFICIT
-1.629286	2.461830	0.000000	1.000000
(1.13622)	(1.11387)		
-0.240037	-0.578075	1.000000	0.000000
(0.38450)	(0.37693)		

Adjustment coefficients (standard error in parentheses)

2.070458	-0.734463	D(BDEFICIT)
(0.34590)	(0.10707)	
-0.703657	0.063551	D(CA)
(0.67445)	(0.20877)	
-0.124492	0.057944	D(RER)
(0.45740)	(0.14158)	

	-0.745028	0.287268	D(GDPG)
	(0.73495)	(0.22750)	

-42.12029	Log likelihood	3 Cointegrating Equation(s):

Normalized cointegrating coefficients (standard error in parentheses)

GDPG	RER	CA	BDEFICIT
-0.079284	0.000000	0.000000	1.000000
(1.31577)			
-0.604001	0.000000	1.000000	0.000000
(0.50918)			
-0.629613	1.000000	0.000000	0.000000
(0.42444)			

Adjustment coefficients (standard error in parentheses)

-2.886817	2.100576	-0.766617	D(BDEFICIT)
(0.41099)	(0.30920)	(0.09762)	
0.677936	-0.674424	0.032342	D(CA)
(0.87515)	(0.65841)	(0.20788)	
0.136247	-0.144462	0.079264	D(RER)
(0.59328)	(0.44634)	(0.14092)	
1.461777	-0.662491	0.199151	D(GDPG)
(0.79556)	(0.59853)	(0.18897)	

Table 7: Granger causality tests:

Pairwise Granger Causality Tests
Date: 10/16/13 Time: 12:47
Sample: 1990 2012
Lags: 4

Prob.	F-Statistic	Obs	Null Hypothesis:
0.6465	0.63908	19	BDEFICIT does not Granger Cause CA
0.0324	4.08060		CA does not Granger Cause BDEFICIT
0.0199	4.82072	19	RER does not Granger Cause CA
0.9827	0.09225		CA does not Granger Cause RER
0.5372	0.82720	19	GDPG does not Granger Cause CA
0.8775	0.29062		CA does not Granger Cause GDPG
0.0702	3.03678	19	RER does not Granger Cause BDEFICIT
0.9534	0.16089		BDEFICIT does not Granger Cause RER
0.7162	0.53092	19	GDPG does not Granger Cause BDEFICIT
0.9848	0.08618		BDEFICIT does not Granger Cause GDPG
0.8490	0.33402	19	GDPG does not Granger Cause RER
0.7497	0.48081		RER does not Granger Cause GDPG

Table 8: VECM:

Vector Error Correction Estimates
Date: 10/25/13 Time: 18:00
Sample (adjusted): 1993 2012
Included observations: 20 after adjustments
Standard errors in ( ) & t-statistics in [ ]

			CointEq1	CointegratingEq:
			1.000000	BDEFICIT(-1)
			-2.949308 (0.08318) [-35.4588]	CA(-1)
			4.166752 (0.08358) [49.8524]	RER(-1)
			-0.921342 (0.08402) [-10.9657]	GDPG(-1)
			-19.32858	C

D(GDPG)	D(RER)	D(CA)	D(BDEFICIT)	Error Correction:
0.286616 (0.22876) [1.25292]	0.057648 (0.14200) [0.40597]	0.066842 (0.24153) [0.27674]	-0.733853 (0.10941) [-6.70732]	CointEq1
-0.013098 (0.20491) [-0.06392]	-0.016068 (0.12720) [-0.12632]	-0.318610 (0.21635) [-1.47263]	-0.528745 (0.09801) [-5.39502]	D(BDEFICIT(-1))
-0.096609 (0.23609) [-0.40921]	-0.018532 (0.14655) [-0.12646]	0.038514 (0.24927) [0.15451]	-0.262858 (0.11292) [-2.32790]	D(BDEFICIT(-2))
-0.180321 (0.61787) [-0.29184]	0.180933 (0.38353) [0.47175]	-0.068834 (0.65236) [-0.10551]	-2.020773 (0.29551) [-6.83817]	D(CA(-1))
0.278953 (0.38022) [0.73366]	0.113180 (0.23602) [0.47954]	-0.236589 (0.40145) [-0.58933]	-0.585288 (0.18185) [-3.21846]	D(CA(-2))
-0.688493 (1.04163) [-0.66098]	0.141191 (0.64658) [0.21837]	1.418728 (1.09978) [1.29001]	3.487652 (0.49819) [7.00065]	D(RER(-1))
0.672035 (1.01538) [0.66186]	-0.295313 (0.63029) [-0.46854]	0.110081 (1.07207) [0.10268]	2.454273 (0.48564) [5.05372]	D(RER(-2))
0.147964 (0.22837) [0.64793]	-0.154932 (0.14176) [-1.09295]	-0.154940 (0.24112) [-0.64260]	0.287000 (0.10922) [2.62766]	D(GDPG(-1))

0.103363	-0.179805	0.073680	0.181341	D(GDPG(-2))
(0.28276)	(0.17552)	(0.29854)	(0.13524)	
[0.36556]	[-1.02442]	[0.24680]	[1.34091]	
-0.357805	-0.050326	-0.567803	-1.080812	C
(0.38174)	(0.23696)	(0.40306)	(0.18258)	
[-0.93729]	[-0.21238]	[-1.40874]	[-5.91965]	
0.636968	0.461382	0.742114	0.955313	R-squared
0.310239	-0.023375	0.510017	0.915095	Adj. R-squared
14.81979	5.710333	16.52085	3.390069	Sum sq. resids
1.217366	0.755667	1.285334	0.582243	S.E. equation
1.949530	0.951781	3.197429	23.75333	F-statistic
-25.38108	-15.84422	-26.46768	-10.62995	Log likelihood
3.538108	2.584422	3.646768	2.062995	Akaike AIC
4.035974	3.082288	4.144634	2.560861	Schwarz SC
-0.110862	-0.123000	-0.591150	-0.489765	Mean dependent
1.465790	0.746988	1.836224	1.998196	S.D. dependent

0.041701	Determinant resid covariance (dof adj.)
0.002606	Determinant resid covariance
-54.01685	Log likelihood
9.801685	Akaike information criterion
11.99230	Schwarz criterion

Table 9: Stability test for the VECM

Roots of Characteristic Polynomial
Endogenous variables: BDEFICIT CA RER GDPG
Exogenous variables:
Lag specification: 1 2
Date: 10/23/13 Time: 13:58

Modulus	Root
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
0.817506	0.667928 - 0.471369i
0.817506	0.667928 + 0.471369i
0.698903	-0.616705 - 0.328846i
0.698903	-0.616705 + 0.328846i
0.664742	0.090788 - 0.658513i
0.664742	0.090788 + 0.658513i
0.375136	-0.324782 - 0.187734i
0.375136	-0.324782 + 0.187734i
0.102261	0.102261

VEC specification imposes 3 unit root(s).

Table 10: Autocorrelation test for the VECM model:

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 10/23/13 Time: 13:59
Sample: 1990 2012
Included observations: 20

Prob	LM-Stat	Lags
0.3890	16.94806	1
0.6861	12.81642	2
0.9511	7.922485	3
0.8443	10.41165	4
0.1591	21.52793	5
0.4256	16.39731	6
0.2681	19.01093	7
0.3067	18.29791	8
0.6666	13.08366	9
0.0665	25.19263	10
0.8829	9.678634	11
0.0843	24.24445	12

Probs from chi-square with 16 df.

Table 11: Hetroscedasticity test for the VECM model:

VEC Residual Heteroskedasticity Tests: No Cross Terms (only levels and squares)
Date: 10/23/13 Time: 14:00
Sample: 1990 2012
Included observations: 20

Joint test:

Prob.	df	Chi-sq
0.2984	180	189.5382

Individual components:

Prob.	Chi-sq(18)	Prob.	F(18,1)	R-squared	Dependent
0.3367	19.93185	0.1931	16.24866	0.996593	res1*res1
0.4482	18.11354	0.8122	0.533438	0.905677	res2*res2
0.4265	18.44839	0.7656	0.660547	0.922420	res3*res3
0.3864	19.08861	0.6338	1.163584	0.954431	res4*res4
0.3475	19.74169	0.3667	4.245917	0.987085	res2*res1
0.3971	18.91448	0.6771	0.968015	0.945724	res3*res1
0.5025	17.30079	0.8889	0.356088	0.865040	res3*res2
0.3588	19.54890	0.4726	2.407554	0.977445	res4*res1
0.3333	19.99198	0.0668	138.5179	0.999599	res4*res2
0.3345	19.97076	0.1272	37.94027	0.998538	res4*res3

Table 12: Normality test for the VECM:

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 10/23/13 Time: 14:01
Sample: 1990 2012
Included observations: 20

Prob.	df	Chi-sq	Skewness	Component
0.9987	1	2.56E-06	0.000876	1
0.8033	1	0.062052	-0.136439	2
0.1572	1	2.001401	0.774868	3
0.9909	1	0.000129	0.006230	4
0.7241	4	2.063585		Joint

Prob.	df	Chi-sq	Kurtosis	Component
0.5103	1	0.433501	2.278751	1
0.6063	1	0.265630	2.435415	2
0.5000	1	0.454837	3.738785	3
0.3757	1	0.784711	2.029612	4
0.7470	4	1.938678		Joint

Prob.	df	Jarque-Bera	Component
0.8051	2	0.433503	1
0.8489	2	0.327682	2
0.2928	2	2.456238	3
0.6754	2	0.784841	4
0.8569	8	4.002264	Joint

Figure 1: Cointegration: