THE EFFECTS OF FISCAL POLICY ON THE CURRENT ACCOUNT

AN ECONOMETRIC ANALYSIS

DISSERTATION

Submitted for the Degree of Doctor of Philosophy in Economics

BY

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ABSTRACT

This study tests the relationship between the current account and fiscal policy for a group of small open developing economies with fixed exchange rate regime, some of which are oil exporters. Specifically, it tests the viewpoint of a Ricardian infinite-horizon representative agent model in which lower public savings are met by equal increases in private savings, and as a result the current account does not respond to the changes in government spending, against the Keynesian's conventional viewpoint in which a fall in public savings has an adverse effect on the current account balance. Unlike flexible exchange rate economies, the evidence from a panel data analysis of these fixed exchange based countries supports the conventional theory of positive relationship between fiscal and external balances in oil countries, whereas it supports the Ricardian view for non-oil countries.

Moreover, cointegration analyses—based on Johansen's vector error-correction model (VECM)–is employed to investigate each country of the sample. The analysis reveals that there is a positive long or short run relationship—with different causality directions–between the current account balance and taxes in seven countries while it is negative in the other countries contrary to the Keynesian's conventional theory, also there is a long and short run negative relationship, with different causality directions, between the current account balance and government expenditure like both Keynesian's and Ricardian in five countries while it is positive for the other four countries. Given that, the current account balance is proxied by exports minus imports, and exports are determined by other countries income and the relative prices. Pedroni, Kao and Westerlund panel cointegration tests, dynamic fixed-effects, mean-group, pooled mean-group, common correlated effects mean group and augmented mean group techniques have been used to estimate the relationship between aggregate imports and the macroeconomic components of final expenditure including government spending. The empirical evidence indicates that the domestic activities and relative prices are elastic. A lasting increase in government expenditure of one percent will lead to an increase of goods and services imports by 0.22—0.33 percent. This study also highlights some policy implications and possible research extensions in this subject.

Dedicated to:

Allah,

My Mother,

My Beloved Wife,

The Soul of My Father,

The Soul of the Egyptian Revolution Martyrs

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I have had so much helps from many people that I cannot go on without expressing my gratitude.

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I owe very much to many persons that I cannot list them all I should acknowledge. I thank them sincerely.

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Publications

- Eldemerdash H, Metcalf H, Maioli S. Panel Cointegration Analysis of the Effects of Fiscal policy on Current Account. The 12th Annual Doctoral Conference, *Prague 2011*.
- Eldemerdash H, Metcalf H, Maioli S. Twin Deficits New evidence from a Developing Country Perspective. *SSEM Euro-Conference, Turkey 2010*.
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INTRODUCTION

CHAPTER 1: INTRODUCTION

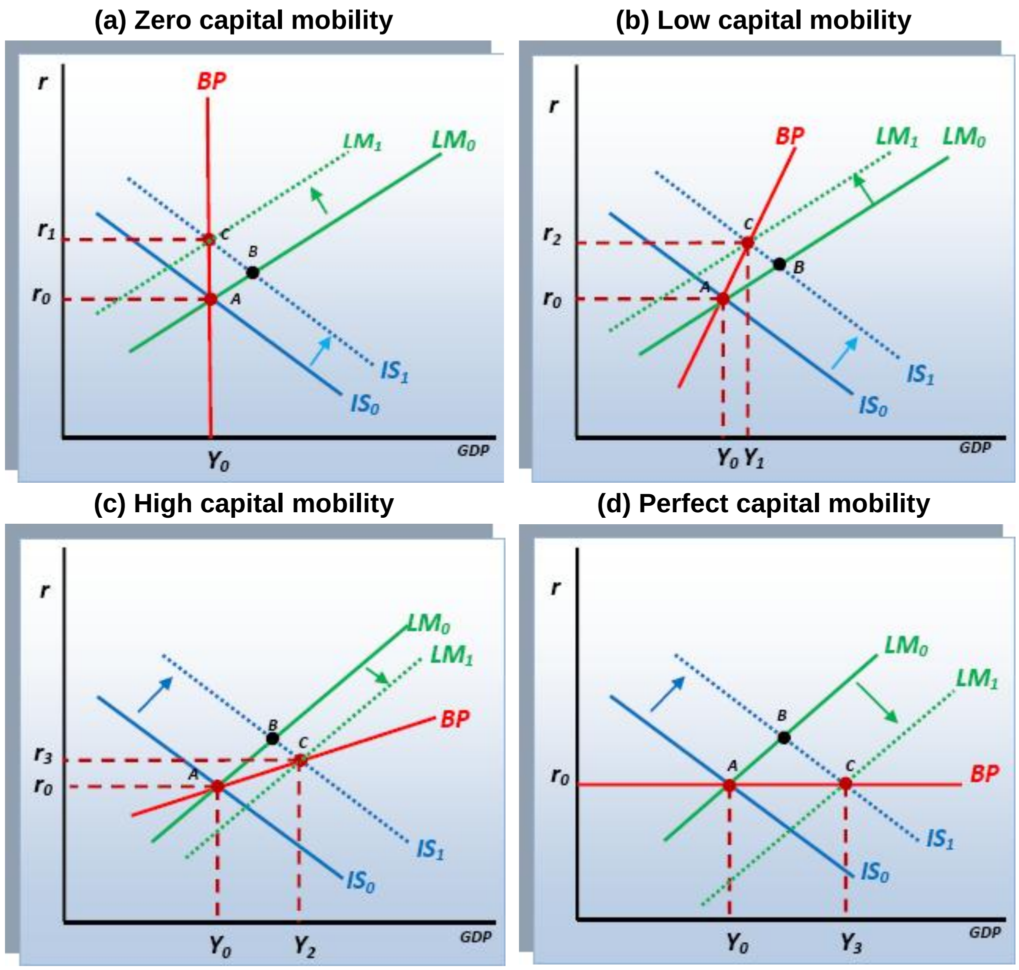
1.1 BACKGROUND

Persistent and large fiscal and current account deficits, as well as a high inflation rate and low output growth, were the main features of imbalances in most of the developing and some developed countries in the last decades. These problems forced the governments in these countries to implement various stabilisation and stimulation policies. Fiscal policy was one of the main tools to attain stabilisation and stimulation objectives. Therefore, the last few years have witnessed government expenditures, taxation, and deficit financing move to the foreground of policy debates worldwide. For instance, in Japan in the 1990s, deflation and short-term interest rates that floated around zero and forced policymakers to rely on fiscal policy to stimulate the country's indolent economy. For somewhat similar reasons, fiscal policy also played an important role in nurturing the US economy's recovery after the 2001 recession (Blinder 2004). Simultaneously, the discussion of fiscal policy has renewed attention to the effects of fiscal policy on national savings, investment, interest rates, and the current account.

To illustrate how national savings, private spending, investment, interest rates, and the current account react to fiscal policies, we consider the use of fiscal policy for stabilization purposes in a small economy in the context of the IS–LM model first developed by Robert Mundell and Marcus Fleming at the start of the 1960s [see Mundell (1963); Fleming (1962)]. The effects of a change in fiscal policy depend on the degree of capital mobility and the type of the existed exchange rate regime. The initial equilibrium in the goods and money markets, and in the balance of payments, occurs at the triple intersection of the IS, LM and BP curves at point A as shown in Figure 1-1. Under a regime of fixed exchange rates, while fiscal expansion will result in an increase in income, it may lead to either an improvement or a deterioration in both the current account and overall balance of payments positions, and vice versa.

The effects of fiscal expansion on the level of income and the current account and the balance of payments are illustrated in the four panels of Figure 1-1. In panel (a) we assume there is no capital mobility therefore the BP curve is vertical, while in panel (b) BP curve steeper than LM curve representing low capital mobility whereas the opposite is true in panel (c), and finally BP is horizontal screening perfect capital mobility. In all panels of Figure 1-1 the economy is initially operating at point A, the triple intersection of the three curves IS_0, LM_0 and BP with equilibrium in the goods and money markets, and in the balance of payments, at r_0 interest rate and Y_0 income.

Figure 1-1 Fiscal Expansion under Fixed Exchange Rates



Source: These graphs are combined— with some author manipulations–from Hanafi (1999) and Snowdon and Vane (2005)

In panel (a), expansionary fiscal policy shifts the IS curve rightwards from IS_0 to IS_1 to intersect with LM_0 curve at point B to the right of BP curve which result in balance of payment deficit and an increase in both the domestic interest rate and income. The increased income increases the aggregate demand and domestic price, so that it brings about current account deterioration, but the higher interest rate will not affect capital account as we assumed no capital mobility. Thus, there is no way for point B to be equilibrium as the overall balance of payments position is deficit. Because the current account deficit result in foreign currencies drain, monetary authorities react by decreasing money supply, then LM curve shifts leftward to LM_1 to intersect with IS_1 and BP at point C at which income returns back to Y_0 with higher interest rate.

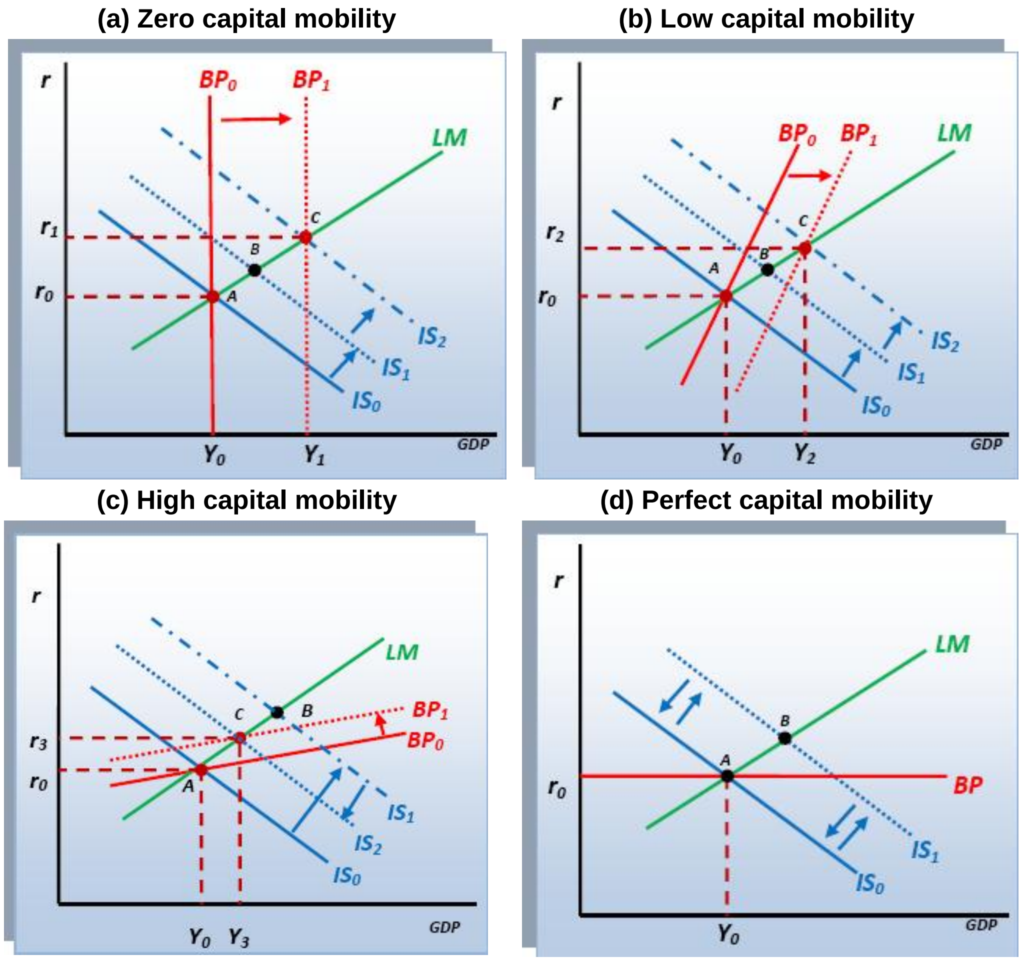
With low capital mobility in panel (b) of Figure 1-1, the higher interest rate at point B attracts capital inflows into the domestic economy which improves capital account by less than the deterioration of the current account because of the low sensitivity of capital inflow to the changes of the interest rate. Then, the net outcome is an overall balance of payments improvement by the same amount as capital account enhancement and the exhaustion of the capital stock continues forcing monetary authorities to decrease money supply shifting LM_0 curve leftward to LM_1 to intersect with IS_1 and BP curves at point C with higher income and interest rate. In panel (c) and (d), expansionary fiscal policy—with high and perfect capital mobility–increases the domestic aggregate demand and deteriorates current account but the higher interest rate attracts capital inflows into the economy offsetting the deterioration in the current account and improving the overall balance of payment. Due to capital inflows, the foreign money stock increases enforcing monetary authorities to increase money supply shifting LM_0 rightward to LM_1 causes interest rate to diminish to be equal the world interest rate which decreases capital inflows to reach the triple intersection of the three curves IS_1, LM_1 and BP at point C at r_0 and Y_3.

At this point it is important to stress that in dissecting the effects of the fiscal policy changes on the balance of payment under fixed exchange rates the Keynesian approach presumes that the authorities can sterilize the effects of a balance of payments surplus or deficit on the money stock in the short run. The results we have been investigating inevitably relate to the short run because in the long run it becomes progressively more difficult to sterilize the effects of a persistent surplus or deficit on the money stock. Long run equilibrium requires a zero balance on the balance of payments. As such the balance of payments deficit/surplus at point B in panels (a), (b), (c) and (d) of Figure 1-1 respectively will cause a contraction/expansion of the domestic money supply following intervention by the authorities to maintain the fixed exchange rate. This causes the LM curve to shift upwards/downwards to the left/right and long run equilibrium will occur at point C in panels (a), (b), (c) and (d) of Figure 1-1 respectively, where the balance of payments is zero and the goods and monetary markets are in equilibrium.

We now consider the effects of fiscal policy changes on the interest rates, income, and current account under a regime of flexible exchange rates. The effects of fiscal expansion on the level of output, interest rates, current account and the exchange rate again depend on the relative slopes of the BP and LM curves (i.e. the degree of capital mobility). This is illustrated for different degrees of capital mobility in panels (a), (b), (c) and (d) of Figure 1-2. In panel (a) of Figure 1-2 where the BP is vertical representing zero capital mobility. Expansionary fiscal policy shifts the IS curve from IS_0 to IS_1. As we have discussed above, under fixed exchange rates fiscal expansion would result in a current account and balance of payments deficit (that is, IS_1 and LM_0 intersect at point B to the right of BP_0). With flexible exchange rates regime, the exchange rate adjusts to correct potential current account and balance of payments disequilibria. An excess supply of domestic currency in the foreign exchange market causes the exchange rate to depreciate, shifting the IS_1 and BP_0 curves to the right until a new equilibrium is reached along the LM curve to the right of point B, for example at point C, the triple intersection of the curves IS_2, LM and BP_1 with an income level of Y_1. In this particular case the exchange rate depreciation reinforces the effects of domestic fiscal expansion on aggregate demand, leading to a higher level of output and interest rates.

Panel (b) of Figure 1-2 depicts the case where the BP curve is not vertical but steeper than the LM curve (i.e. low capital mobility). Fiscal expansion shifts the IS curve outwards from IS_0 to IS_1 with the intersection of curves IS_1 and LM at point B to the right of BP_0. This is equivalent to current account and balance of payments deficit under fixed exchange rates and causes the exchange rate to adjust to eliminate the excess demand for foreign currency. Similar to the situation where the BP curve is vertical, the exchange rate depreciates, causing both the IS_1 and BP_0 curves to shift rightwards. Equilibrium will be established along the LM curve to the right of point B, for example at point C. In this situation fiscal policy will be less effective in influencing output and interest rate as exchange rate depreciation is less than when BP is vertical in panel (a).

Figure 1-2 Fiscal Expansions under Flexible Exchange Rate



Source: These graphs are combined— with some author manipulation–from Hanafi (1999) and Snowdon and Vane (2005).

Figure 1-2 panel (c) sketches the case where the LM curve is steeper than the BP curve (i.e. high capital mobility). The economy is initially in equilibrium at point A, the triple intersection of curves IS_0, LM and BP_0. Fiscal expansion shifts the IS curve rightwards from IS_0 to IS_1 with the intersection of curves IS_1 and LM at point B above BP_0 at higher interest rate. This is counterpart to a balance of payments surplus (because the surplus in capital account due to capital inflows exceeds the current account deficit) under fixed exchange rates and causes the exchange rate to adjust to eliminate the excess demand for domestic currency. In contrast to the situation where the BP curve is steeper than the LM curve, the exchange rate appreciates, causing both the IS_1 and BP_0 curves to shift leftwards. Equilibrium will be established along the LM curve to the left of point B, for example at point C. In this situation fiscal policy will be less effective in influencing output and interest rate as exchange rate appreciation will partly offset the effects of fiscal expansion on aggregate demand.

In the limiting case of perfect capital mobility where BP curve is horizontal as illustrated in panel (d) of Figure 1-2, fiscal policy becomes completely ineffective and is unable to affect output and interest rate. That is, the domestic rate of interest is tied to the rate ruling in the rest of the world at r_0. If the domestic rate of interest were to rise above the given world rate there would be an infinite capital inflow, and vice versa. Fiscal expansion (that is, a shift in the IS curve to the right from IS_0 to IS_1) puts upward pressure on the domestic interest rate. This initial pressure results in an inflow of capital and leads to an appreciation of the exchange rate. As the exchange rate appreciates net exports decrease, causing the IS curve to move back to the left. Equilibrium will be re-established at point A only when the capital inflows are large enough to appreciate the exchange rate sufficiently to shift the IS curve back to its original position. In other words fiscal expansion completely crowds out net exports and there is no change in output and interest rate. At the original income level of Y_0 the current account deficit will have increased by exactly the same amount as the government fiscal deficit.

To sum up, we can conclude that in a small open economy, the country's fiscal deficits—as a tool of fiscal expansion– would have insignificant effects on the real interest rate in the international capital markets. Consequently, in the benchmark analysis, the home country's substitution of fiscal deficit instead of current taxes leads essentially to increased borrowing from abroad, rather than to a higher real interest rate. That is, fiscal deficits lead to current-account deficits. Expected real interest rates rise for the home country only if it is large enough to influence world markets, or if the increased national debt induces foreign lenders to demand higher expected returns on this country's obligations. In any event, there is a weaker tendency for a country's fiscal deficits to crowd out its domestic investment in the short run and its stock of capital in the long run. However, the current account deficits show up in the long run as a lower stock of national wealth and correspondingly higher claims by foreigners (Barro 1989).

Theoretically, the relationship between fiscal policy and the current account is generally centred on two main theories, firstly the Keynesian conventional view—well known as "twin deficit" hypothesis (TDH)–which concludes that the fall in public savings has an adverse effect on the current account balance (i.e. a positive relationship between fiscal and current account balances). Secondly, the Ricardian equivalence hypothesis (REH) deduces that lower public savings are met by equal increases in private savings, and consequently current account does not respond to the changes in government spending and its fiscal deficit. Section 2.2 provides a full explanation of both theories which outline the corner stone for the empirical models in both chapter two and chapter three. In view of that, the main purpose of this study is to analyse empirically the impact of fiscal policy on the current account by investigating the relationship between fiscal and current account balances as well as some other macro control variables and discuss its implications for macroeconomic stability of some developing countries in the context of fixed exchange rate regime. In particular, the study examines the relationship between fiscal policy and the current account balance in the Arab countries[1] which are small but somewhat open developing economies. Section 1.7 provides general description of these economies; also APPENDIX A provides brief information about each country.

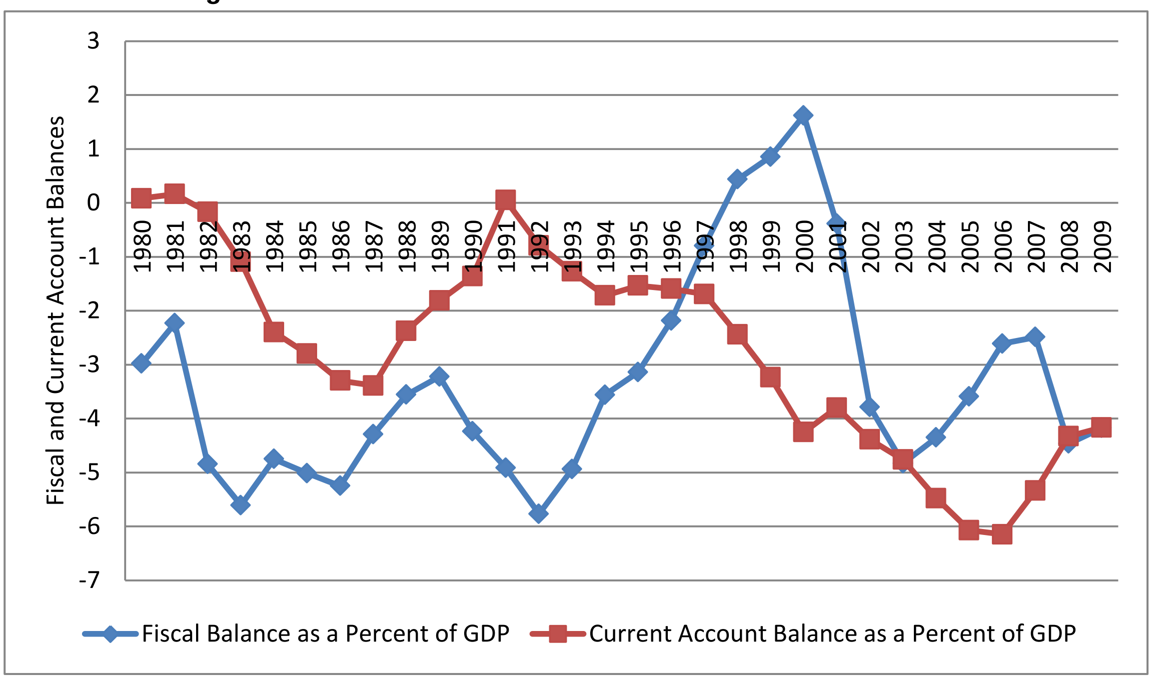
1.2 FISCAL POLICY AND THE CURRENT ACCOUNT IN REALITY

Developed and developing countries' reliance on fiscal policy to achieve economic goals of stabilisation and stimulation has been a common feature of all economies over the past decades. Accordingly, the discussion about the relationship between fiscal policy and the current account attracted much research attention in recent years. This attention has been motivated by the unprecedented US's fiscal and current account deficits as a percentage of GDP in 1980s. As shown in Figure 1-3, it increased dramatically in early 1980s, late 1990s, and all 2000s causing big concern. The absolute figures of both fiscal and the current account balances have been given more attention. According to the International Monetary Fund (IMF), the current account deficit of the US has been steadily worsening in 2000s, reaching $ 614.7 billion in 2008. During the same time period, the fiscal deficit has been increasing, reaching $ 634.2 billion in 2008 a bit down from a record high $ 811.48 billion in 2006.

[1] The sample consists of the following countries: Bahrain, Egypt, Jordan, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, and United Arab Emirates.

Figure 1-3 illustrates that the US current account and fiscal balances have shown huge and simultaneous deficits over different periods which has been supported by many economists. For example, Holmes (2010) found evidence signifying that both the US current account and fiscal deficits moved jointly in a common nonlinear deterministic trend. So, he concluded that the US current account and fiscal deficits are twins. Moreover, it has been noted that most industrial countries incurred large fiscal deficits during the 1970s and early 1980s. Some analysts claimed that, in addition to the sluggish effects on economic growth, fiscal deficit is at least to some extent responsible for some countries' deteriorating current account position. However, to date there has been little agreement on how fiscal policy and current account are related.

Figure 1-3 US Fiscal and Current Account Balances 1980-2009



Source: International Monetary Fund, World Economic Outlook Database 2010

An extensive amount of literature has been published on the relationship between fiscal policy and the current account. Most of these empirical literature have focused on the US and industrial economies, for instance Kasa (1994) found a significant link between trade and fiscal deficits in the US, Japan, and Germany during the post-war period. Also, Ahmed and Ansari (1994) tested the twin deficits hypothesis for Canada in a model in which domestic savings and investment are explicitly considered. Using the cointegration analysis and the error correction model, the major finding of his study is that the current account deficit is related to both the fiscal deficit and the savings-investment gap. Ditto, Tang and Lau (2009) tested the twin deficits hypothesis in a framework includes both private savings and investments for the US in the period over 1973 to 2008 and support the twin deficits hypothesis.

Moreover, Hatemi-J and Shukur (2002) found that the US fiscal deficit Granger causes current account deficit during the period from 1975 to 1989 but the opposite is true for the period from 1990 to 1998. Likewise, Payesteh (2008) concluded that fiscal deficits have contributed to trade deficits, capital inflows, and appreciation of the US dollar. Empirical analysis further indicates that fiscal deficits did not raise interest rates. The fact that interest rates failed to raise in the 1980s, despite the large and persistent government fiscal deficits may be due to capital inflows into the US.

Furthermore, Rault and Afonso (2009) used panel data approach and found that fiscal deficits cause current account deficits in several EU countries: Bulgaria, Czech Republic, Estonia, Finland, France, Italy, Hungary, Lithuania, Poland, and Slovakia supporting the twin deficits hypothesis over the period 1970-2007. Analogously, Bagnai (2006) supported the twin deficits hypothesis in Denmark, Germany, Italy, Spain, Sweden, Switzerland and Turkey. But his results for Austria and the Netherlands show insignificant impact of the fiscal deficit on the current account deficit supporting the Ricardian equivalence hypothesis (REH), whereas he found ambiguous relation for Portugal. Additionally, Fidrmuc (2003) supported twin deficits in several EU countries. Also, Daly and Siddiki (2009) found a long-run relationship between fiscal deficits, real interest rate and current account deficit in 13 out of 23 OECD countries. By the same, Bagnai (2010) found that the government fiscal deficit is a significant—but relatively trivial–source of external imbalances of CEEC economies in which the external indebtedness is sustainable.

On the other hand of the argument, Rahman and Mishra (1992) found no cointegration between the US fiscal and current account deficits for the post war period 1946-1988. Likewise, Kaufmann, Scharler et al. (2002) rejected the twin deficit hypothesis for Austria during the 1980s and 1990s. Also, Kennedy and Slok (2005) pointed out that the impact of relative cyclical positions, government fiscal balances and the real exchange rate on the current account is significant but the contribution of these variables to explain current account positions is quite limited. Similarly, Bussière, Fratzscher et al. (2005) and (2010) analyzed jointly the role of changes in the fiscal balance and productivity shocks in the intertemporal model of the current account for 21 OECD countries in the period from 1960 to 2003 and found little evidence for a contemporaneous effect of fiscal deficits on the current account, while country-specific productivity shocks appear to play a key role.

Furthermore, Bartolini and Lahiri (2006) observed very weak link between fiscal and current account deficits. More recently, Grier and Ye (2009) found only short-run positive relationship between the US fiscal and current account deficits, while there is no common pattern for that relation in the long run. Additionally, Baharumshah and Lau (2009) found no correlation between fiscal and current account deficits in Singapore and Japan and indicated that the investment plays an important role in determining the current account deficits. More freshly, Batdelger and Kandil (2011) supported the Ricardian equivalence hypothesis (REH) for the US for the period from 1960 to 2004.

As significant as this topic is, there has been at most very little empirical thoughtfulness devoted to this debate on the developing and emerging economies. For instance, Baharumshah, Lau et al. (2006) examined the twin deficits hypothesis in the ASEAN countries and found long run relationships between fiscal and current account deficits. Thailand is a Keynesian since the causality runs from fiscal deficit to current account deficit. For Indonesia, the causality runs in an opposite direction while the empirical results indicate that a bidirectional pattern of causality exists for Malaysia and the Philippines. Again, Baharumshah and Lau (2007) confirmed the existence of a long run relationship between fiscal deficit, interest rate, exchange rate, and current account in Thailand where the causality runs from fiscal deficit to current account deficit supporting the twin deficits hypothesis.

Recently, Jayaraman and Choong (2008) strongly supported the twin deficit hypothesis in Vanuatu in the period from 1983 to 2005. Moreover, Hakro (2009) tested the causal link between twin deficits and other macroeconomic variables for Pakistan and found it streams from fiscal deficits to prices to interest rate to capital flows to exchange rates and to trade deficits. Also, Lau and Tang (2009) supported the twin deficits hypothesis for Cambodia in both the short run and the long run the period between 1996 and 2006.

Furthermore, Baharumshah and Lau (2009) found evidences from Indonesia, Korea, the Philippines and Thailand support the twin deficit hypothesis and a feedback relation between the fiscal and current account deficits for Malaysia.

1.3 MOTIVATIONS OF THE STUDY

While the belief about the relationship between fiscal policy and the current account has its theoretical background, it is totally different matter whether that belief is supported by the available empirical evidence. The main purpose of this study is to explore whether the relationship between fiscal and current account balances is a result of a causal relationship or it is just a coincidence without empirical support, in that the current account deficit/surplus may have been due to unrelated changes in other conditions. An experience of one country for a short time period should not be used as a base to conclude any generalization. Therefore, to generalize the relationship between the two balances (i.e. current account and fiscal balances), it seems essential to examine not only the US and developed economies experience but also other countries' experience. Simultaneously, it also seems crucial that a long enough horizon should be considered rather than a small sample period.

Actually, there was a proclivity of looking only at the US experience in early 1980s and more concentration on OECD countries in 1990s and 2000s as well as the US where the flexible exchange rate regime is adopted. Research studies in industrial and developing countries have revealed mixed or conflicting results on the effects of the fiscal policy on the current account.[2] For example, Cuddington and Vinals (1986) explained the short run effects of fiscal policy on the current account in the presence of flexible exchange rate regimes. They reported that a permanent tax-financed increase in government spending has an ambiguous effect on the current account, but a money-financed increase inevitably improves current account position. In contrary, Branson, Buiter et al. (1983) predicted that, under flexible exchange rates, a permanent tax-financed increase in government spending will worsen the current account, while a money-financed increase in government spending

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[2] Many of these empirical researches and the simulation studies are to be mentioned later in the following three chapters.

may worsen or improve the current account. Similarly, Sachs (1982) illustrated that a tax-financed temporary increases in government spending always worsen the current account, but the permanent increase, on the other hand, has an ambiguous effect.

However, far too little attention has been paid to the relationship between fiscal and current account balances in the context of fixed exchange rate regimes and for developing countries as well. Therefore, this study attempts to shed the light on the impact of fiscal policy on the current account in some developing countries in the context of fixed exchange rate as shown in Table 1-1. Specifically, that relationship will be tested for the Arab countries—more or less–open economies and are related geographically, religiously, linguistically, and in terms of stage of economic development, but they differ to the extent of the impact of oil revenues on their fiscal and current account balances.

Table 1-1 Exchange Rate Arrangements in Arab Countries

Country	**Market vs. Official**	**Multiple Exchange rates**	**Type of Exchange rate (IMF)**	**Fixed to**
Egypt	Market/Official	No	Fixed*	USD
Jordan	Official	No	Fixed	USD
Morocco	Official	No	Fixed	Basket
Syria	Official	Yes	Fixed	NA
Tunisia	Market	No	Monetary targeting	
Bahrain	Official	No	Fixed	USD
Kuwait	Official	No	Fixed	Basket
Oman	Official	No	Fixed	USD
Qatar	Official	No	Fixed	USD
Saudi Arabia	Official	No	Fixed	USD
UAE	Official	No	Fixed	USD/SDR

Source: "Monetary Policy and Exchange Rate regimes", The Egyptian Centre for Economic Studies (ECES), 2002.

* Fixed until mid 2000, managed float to Jan. 2001, managed peg from Jan. 2002.

Interestingly, the empirical results regarding the relationship between fiscal and current account balances—especially for the US– have given contradictory conclusions for almost the same period such as Holmes (2010), Lau and Tang (2009) and Batdelger and Kandil (2011). The plausible explanation is the use of different control variables besides fiscal and current account balances and also because of using different econometric techniques. Therefore, in order to get consistent results this study is going to investigate more than one country (11 countries) for quite long period (37 years) by applying several econometric techniques. In chapter two, the panel of these eleven countries is tested for stationarity using (CADF), (MADF) and Fisher type panel unit root tests which reject the null hypothesis of non-stationarity, after that multiple panel data estimation techniques are applied along with the familiar Hausman test to choose the right model as shown in section 2.4. In chapter three, the same empirical model as in chapter two is investigated separately for each country, first for non-stationarity by four unit root tests (KPSS, DF-GLS, ADF, and PP) which conclude that 10 countries, out of eleven, have non-stationary data steering the researcher to apply the vector error correction model (VECM) proposed by Johansen and Juselius (1990) which gives different cointegration rank for each country and then different number of long run cointegration vectors, as illustrated in Table 3-1 and Table 3-2 to Table 3-30, and Granger Non-Causality test for long and short run as shown in sections 3.4.2 and 3.4.3.

As the results from chapters two and three indicate that the government spending has adverse effects on the current account balance (measured by net exports), chapter four estimates the import elasticity of the government spending using Pedroni, Kao and Westerlund panel cointegration tests, dynamic fixed-effects (DFE), mean-group (MG), pooled mean-group (PMG), common correlated effects mean group (CCEMG) and augmented mean group (AMG) estimators because of accepting the null hypothesis of non-stationary data by Levin–Lin–Chu and Breitung panel unit root tests and rejecting the null hypothesis that all panels are stationary by Hadri LM panel unit root test. The results indicate that a lasting increase in government spending of 1 percent will lead to an increase of demand for goods and service imports of 0.22—0.33 percent a as illustrated in section 4.4.

1.4 OBJECTIVES OF THE STUDY

As mentioned above, the main purpose of this study is to discover and investigate the relationship between fiscal policy and the current account and its implications for macroeconomic stability in different adjustment periods in Arab countries. The effects of fiscal policy are examined by analysing the relationship between fiscal and current account balances with some other macroeconomic control variables. The specific research objectives are illustrated below.

1.4.1 OBJECTIVE ONE

To test the Keynesian conventional twin deficit hypothesis (TDH) against the Ricardian equivalence hypothesis (REH) for Arab countries in 1970 to 2007 period using panel data analysis.

The relationship between fiscal policy and current account is generally centred on two main competing theoretical ideologies, the Keynesian conventional approach, well known as twin deficit hypothesis (TDH), which utilizes macroeconomic models that are constructed in form of behavioural relationships, to describe how the economy works in aggregate, ignoring the behaviour of the agents who make up the economy. According to (TDH), a fall in public savings has an adverse effect on the current account balance. On the other hand, Ricardian equivalence hypothesis (REH) extracts the important macroeconomic relationships from the microeconomic foundations of individual optimizing behaviour. Therefore, lower public savings are met by equal increases in private savings, and consequently current account does not respond to the changes in government spending and its general fiscal deficit.

Arab countries implemented miscellaneous policy tactics to attain reasonable rates of growth, unemployment and inflation which affected both the fiscal and current accounting balances in different adjustment periods. Therefore, this study analyses the relationship between fiscal adjustment policies or fiscal deficit and current account position in 1970-2007 periods. Unlike flexible exchange rate regimes, the evidence from the panel data analysis of these fixed exchange based countries supports the conventional theory of positive relationship between fiscal and external balances in oil producing countries, whereas it supports the Ricardian view of no relationship between the two balances for non-oil exporting countries. It is expected that these findings will provide important curriculums for future policies for these countries.

1.4.2 OBJECTIVE TWO

As panel data analysis gives general idea—without determining the causality direction–about the relationship between fiscal policy and current account balance, we use (VECM) and Granger Non-Causality test to determine the dynamic, long run, and the direction of the causality for each country of the investigated panel separately.

Indeed, the analysis of the relationship between fiscal policy and current account has exploited integrative ways, theoretical, empirical, and econometrical in order to examine four alternative sensible directions, each with divergent policy implications. These are that conventional theory in which fiscal deficits cause current account deficits, that current account deficits lead to fiscal deficits, that both variables are causally autonomous, and finally that there is bidirectional causality between these two deficits. In chapter two, the used econometric analysis is panel data technique which gives general idea about the relationship between the variables (i.e. positive or negative) without investigating the direction of causality or the dynamics of that relationship. Accordingly, it is very beneficial to run econometric investigation to do so such as vector error correction model (VECM), long and short run Granger Non-Causality tests and impulse response analysis which implemented in chapter three.

In conformity with theoretical considerations of (TDH), the analysis reveals that there is a positive long run relationship between the current account balance and taxes with causality running directly from the later to the former only in the short run for the UAE and Jordan. On contrary, we found direct short run positive causality running in the opposite direction (i.e. from the current account to taxes) in Syria and Kuwait while there is a short run bidirectional causality with positive effects in both direction in Egypt and Saudi arabia and with negative effects in both directions in Bahrain whereas no evidence for direct short run causality in any direction in Morocco, Qatar and Tunisia[3]. On the other hand, and in contrary to both (TDH) and (REH), the long run causality is running in the from the current account balance with direct negative effect in Bahrain, Morocco, Qatar and UAE while it run with direct positive effects in Tunisia. Furthermore, there is evedince of bidirectional long run causality with negative effects in both directions in Kuwait and Saudi Arabia but

[3] In many cases indirect causality was found between taxes and the current account as explained in chapter 3.

with positive effects in Egypt. On contrary, we found no evidence for any long run direct causality in any direction between the current account balance and taxes in Jordan and Syria which supports the (REH).

Regarding the causality relationship between the current account balance and government expenditure, the analysis finds long run negative effect running directly from government spending to the current account balance in Saudi Arabia which support both (TDH) and (REH), while it finds negative bidirectional relationship in Syria and mixed bidirectional causality in Kuwait and UAE. But we found positive causality running in the opposite direction with positive effects (i.e. current account balance causes government spending) in Bahrain, Egypt and Tunisia. Furthermore, there is no causality in any direction either directly or indirectly in Jordan. However, in the short run, we found weak evidence that these relationships are closely linked.

1.4.3 OBJECTIVE THREE

Both panel data analysis and vector error correction model (VECM) indicate negative relation between current account balance and government spending in many countries, therefore we use cointegration panel data analysis to estimate the import elasticity to government spending.

Inside the current account, imports demand is basically determined by domestic demand factors whereas exports depend on external demand factors. Therefore, the relationship between fiscal policy and the current account can be looked at by analyzing the association between government spending and imports. In contrary to the conventional form of import equation which takes total demand (measured by GDP or national income) as an explanatory variable, this study decomposes GDP to private consumption, government spending, investment, and exports. To illustrate the effects of fiscal policy on current account, it estimates the elasticities of import demand to these disaggregated components of economic activity. The expected finding is that the government spending elasticity is generally positive but lower than the import content of other demand components. This objective is fulfilled in chapter four as the empirical results indicate that the import is elastic to the domestic activity and relative prices. A lasting increase in government expenditure of one percent will lead to an increase of demand for goods and service imports of 0.22—0.33 percent.

1.5 RESEARCH METHODS

This dissertation adopts country-group study approaches and uses quantitative methods to analyze the effects of fiscal policy on the current account and its macroeconomic implications for Arab countries' stability. Fiscal deficit/surplus, total government revenue and government expenditure are used as a proxies for the fiscal position. Government revenue is used as a proxy for taxes due to the lack of data to cover the time span from 1970 to 2007 because most of these countries are new to taxation system. Trade account deficit/surplus is used as a proxy for current account position because trade account deficit/surplus is often at the heart of current account problems. The details of these variables and some other control variables are presented in Chapter two and Chapter four.

Panel data and panel unit root econometric method is used to determine the impact of fiscal policy changes on the current account for a group of eleven Arab countries investigated as a whole and then as two categories—oil and non-oil–exporting countries, detailed examination of this method is presented in chapter two section 2.4. In order to examine the impact of fiscal policy on current account more deeply by investigating it for each country separately using the econometrics of multivariate time series on the significant variables from the model in chapter two. Accordingly, Vector Error-Correction Model (VECM), long and short run Granger Non-Causality tests and impulse response analysis are applied after running many time series unit root tests on all variables which provided evidence that all of these variables are nonstationarty, except for Oman, in its level but stationary in its first difference i.e. $I(1)$. Detailed explanation of this econometric model is provided in chapter three section 3.3.

As export is determined by exogenous factors (i.e. out of the investigated countries' control), dynamic effects of fiscal policy on import demand is provided by using Pedroni, Kao and Westerlund panel cointegration tests, dynamic fixed-effects (DFE), mean-group (MG), pooled mean-group (PMG), common correlated effects mean group estimator (CCEMG) and augmented mean group (AMG) econometric techniques. Using the relationship between aggregate imports and the macroeconomic components of final expenditure (i.e. private and government consumption, investment, and export), chapter four provides empirical evidence that these components of overall demand have an impact on the magnitude of the aggregate import. The conventional specification for the import demand function reveals that the volume of imports demanded responds to domestic activity and relative prices.

1.6 DATA SOURCES AND LIMITAIONS OF THE STUDY

The data required for this study comes in two data sets, one of which is provided in details in chapter two and will be used for the empirical examinations in chapters two and three, and it includes current account balance, government fiscal balance, taxes, government expenditure, gross domestic saving, gross investment, growth rate of money and quasi money, trade openness, capital mobility, terms of trade and GDP growth rate. The other data set is presented in chapter four Table 4-1 which includes imports, private and government consumption, investment, exports, relative prices and national income.

The main data sources were the International Financial Statistics (IFS) and Government Finance Statistics (GFS) of the International Monetary Fund (IMF), United Nations Common Database (UNCD), World Bank World Development Indicators (WBWDI), World Bank Africa Development Indicators (WBADI), and Statistical Economic and Social Research and Training Centre for Islamic Countries (SESRIC) excluding the data of fiscal deficits for Saudi Arabia and Qatar were taken from local institutions such as Qatar Planning Council and the central bank of the Kingdom of Saudi Arabia.

The data have a number of limitations. Firstly, time series data in developing countries are unreliable because of divergence of data values from different sources. It is also difficult to identify data that are unauthentic. Data deficiencies affect the reliability of results. Additionally, unreliable data cause difficulties in policy recommendations because various data sources could result in different policy solutions. In this regard, Arab countries are not exception, so in this thesis all variables are measured as a percent of GDP rather than absolute numbers. Another data problem is with regard to time period in which various data series refers to. On one hand, data on tax revenue is proxed by total revenue which may not reflect the exact true measure, but at least it gives acceptable indication to judge the relationship. On the other hand, there are some missing data in the middle of some series which prevent from applying some econometric methods such as VECM; these data have been estimated using STATA econometric software (details provided in section 3.4.4).

1.7 BRIEF DESCRIPTION OF THE INVESTIGATED ECONOMIES

The foremost aim of this study is to investigate empirically the effects of fiscal policy on the current account in the Arab states as developing countries. Therefore, it is favourable; in that case, to provide a brief description of these countries' economic situation during the period under investigation (i.e. from 1970 to 2007). Generally, the performance of the Arab economies was unsatisfactory during that period. Specifically, its per capita income fell in the 1980s by an average annual rate of one percent, a worse performance than in any other part of the world. In the 1990s, GDP per capita grew by one percent a year, an improvement over the previous decade but still very weak compared with most other parts of the world. Since 2000, as a result of the increased price of oil, growth has accelerated in much of the region (i.e. the oil exporting countries).

Eleven Arab countries, including Egypt, Kuwait, Morocco, Saudi Arabia, Syria, Tunisia, and the UAE, accounted for 0.9 percent of the value added in world manufacturing industry in 1990. Moreover, fourteen Arab states (Algeria, Egypt, Iraq, Jordan, Kuwait, Lebanon, Morocco, Libya, Oman, Qatar, Morocco, Saudi Arabia, Syria, and Tunisia) exported $137 billion of merchandise, equal to 3.9 percent of world merchandise trade. In 2001, they exported $274 billion or 3.5 percent of world merchandise trade. Between 1990 and 2001, world merchandise exports rose by 121 percent and that of the fourteen Arab states by 100 percent, most of which was due to the rise in the price of oil. In 1990, the fourteen Arab states exported only $23 billion or 0.7 percent of world merchandise exports, excluding oil, gas, and minerals. In 2003, non-oil exports of the fourteen Arab states came to $47 billion, about 0.7 percent of the world's total. In 2000 the Arab world accounted for 0.6 percent of world manufactured exports. By 2005, this had increased to 1.3 percent. If the UAE is excluded, then the shares were 0.3 percent and 0.6 percent, respectively.

In many Arab countries, manufacturing value added per capita and as a share of GDP was lower than the developing country average. The only non-oil country to exceed the developing countries average was Tunisia. This was also true of the share of manufacturing in the economy. From 1995 to 2005, the share of manufacturing value added decreased in Bahrain, Kuwait, Qatar, and Tunisia. One of the consequences of the lack of industrialization is that Arab countries have relatively little to sell. In 2005, intraregional sales accounted for only 10 percent of total exports in the Arab countries compared with 51 percent in Asia, and 73 percent in the European Union. In that year, the Arab world relied on imports from outside the region for 92 percent of total imports while only 8 percent came from within the region. The main causes of the limited industrialization and poor performance in the Arab countries are low productivity, the lack of political and institutional reforms, inefficient and inequitable educational systems, underdeveloped financial markets, restrictive and inappropriate foreign trade policies, large and inefficient public sectors. The fact that the public sector is so large and inefficient not only crowds out credit for the private sector but imposes large costs on the country budget.

There was a severe lack of trained local personnel to run and maintain the new industries and so reliance on foreign sources was endemic. For many years, governments in the region followed an inward looking economic policy that relied on public investment to lead economic growth. Since public enterprises were considered to be the main instrument of growth, most governments did not focus on creating a business environment encouraging to private sector activity. Through countries owned firms, governments invested directly in manufacturing capacity, financial institutions, and infrastructure, and dominated commercial activities. In oil producing countries, investments were financed by the high oil revenues of the 1970s and 1980s, and in non oil producing countries, by inflows of capital and remittances.

From the 1980s, most region' governments encouraged the growth of a private sector that was carefully protected from external and internal competition. They put up high trade barriers around the companies in this sector, subsidized their interest rates, favoured them through purchase policies and allowed them a high degree of market concentration. The larger country-owned firms that coexisted with their smaller private counterparts also benefited greatly from this strategy. Although liberalization programs and trade agreements meant that tariffs and quotas on imports were reduced in the late 1990s, they remained high in many Arab countries. Customs procedures and other forms of red tape took the place of tariffs and quotas as the main obstacles to imports. In 2000, the simple average tariff in these countries was 19.4 percent, compared with 10.7 percent in East Asia and the Pacific, and 13.4 percent in South America and the Caribbean. Restrictions on imports made inputs expensive. This discouraged exports and limited the region's ability to take advantage of globalization.

The performance of the private sector has also been disappointing. The desire of various governments to influence the direction and structure of economic activity, along with their distrust of private companies, resulted in a highly controlled business environment with a mass of regulations and restrictions. Although the informal private sector has often generated a large portion of the region's growth and employment, it has had little access to formal sector markets, sources of finance, or government support programs to help it expand. The net results were deteriorating productivity, a large and inefficient public enterprise sector, and underdeveloped financial markets. The fall in the productivity of overall investments discouraged the private sector. The rate of growth of GDP per worker declined and in some cases became negative in the years after the 1970s. Egypt's share of world trade has not grown during the last thirty years.

In the Gulf Cooperation Council (GCC) countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE), oil revenues financed investment in many unproductive projects and permitted large scale public sector employment. These developments interfered with the growth of the private sector and made it harder for these economies to diversify away from oil. This, in turn, limited employment growth and resulted in the paradoxical coincidence of wealth and unemployment. In other countries in the region, poor institutional quality—in terms of large and inefficient bureaucracies, corruption, and inappropriate laws–has impeded growth. Another important factor that has hindered growth has been armed conflict in the region. The Arab countries spend a disproportionate share of their income on the military: in 2006, defence spending came to about $62 billion. This was 5.3 percent of world military spending, but Arab countries had only an estimated 1.9 percent of world GDP.

Savings rates have been low because the high proportion of children in the population meant that the dependency ratio per household was high. This limited the amount of income that remained after consumption. The low incomes of country employees, except GCC countries, also acted as a constraint. The lack of development of financial markets meant that savings instruments were limited. Low savings rates were one of the causes of low investment rates: over the last twenty years, governments have reduced their involvement in the economy and have reduced public sector investment. The private sector has not made up for these cuts and so, in many countries in the region, total investment levels are lower than they were twenty years ago. Overvalued exchange rates coupled with taxes and nontariff barriers on imports have restricted exports because the latter are often reliant on imports, given the shallowness of the economy [for more details about these countries see Rivlin (2009), Russell (2006), Wilson (1995) and Pack (Pack 2007)].

1.8 CONCLUSION

In this introduction we have used IS-LM model to clarify how interest rates, GDP, and the current account react, in general, to the changes in fiscal policy. Based on that model, and concentrating only on the relationship between fiscal policy and the current account, the precise exposition of that relation in the macroeconomic theory is centred in two ideologies; the twin deficits hypothesis (TDH) and the Ricardian equivalence hypothesis (REH). Each one of these theories has been tested empirically for many economies, but most of these studies, as shown in section 1.2, focused only on the US and developed economies in the context of flexible exchange rate, whereas much less attention has been devoted to investigate these theories in developing countries. Moreover, the empirical results of the previous researches regarding that relationship are inconsistent according to the used econometric methodology and the investigated period. Consequently, this study contributes to the existing literature by investigating that relationship in some developing countries, some of which are oil exporters, in the context of fixed exchange rate regime using more than one econometric methodology for quite long period. Also in this introduction, summary description about these countries is provided.

1.9 APPENDIX A

Bahrain has become one of the Persian Gulf's most advanced economies and most progressive political systems since gaining its independence from Great Britain in 1971. Under a constitution promulgated by Sheikh Hamad bin Isa al-Khalifa, the country became a constitutional monarchy in 2002, and the government has sought to reduce dependence on declining oil reserves and encourage foreign investment by diversifying the economy. Because of its communications and transportation infrastructure, regulatory structure, and cosmopolitan outlook, Bahrain is home to many multinational firms that do business in the region. In 2005, the U.S. and Bahrain ratified a free trade agreement. Historically, Bahrain has imposed no taxes on personal income. However, in 2006, for the first time, the government announced that it would levy a 1 percent tax on Bahraini nationals' salaries to fund an unemployment scheme. Most companies are not subject to corporate tax, but a 46 percent corporate tax rate is levied on oil companies. In the most recent year, overall tax revenue as a percentage of GDP was 5.5 percent.

Egypt is the most populous Arab country and a major force in Middle Eastern affairs. Although President Hosni Mubarak's government has undertaken incremental reforms to liberalize the socialist economic system that has hampered economic growth since the 1950s, the government continues to maintain heavy subsidies on food, energy, and other key commodities. In 2005, the government reduced personal and corporate tax rates, cut energy subsidies, and privatized several enterprises. Egypt has low personal income and corporate tax rates. Both the top income tax rate and the top corporate tax rate are 20 percent. Other taxes include a value-added tax (Salvatore) and a property tax. In the most recent year, overall tax revenue as a percentage of GDP was 10.8 percent.

Jordan gained its independence from Britain in 1946 and is a constitutional monarchy with relatively few natural resources and an economy that is supported by foreign loans, international aid, and remittances from expatriate workers, many of whom work in the Persian Gulf oil kingdoms. King Abdullah II has undertaken political, economic, and regulatory reforms since coming to power in 1999. Jordan joined the World Trade Organization in 2000, signed a free trade agreement with the United States in 2000, and signed an association agreement with the European Union in 2001. The country suffers from high unemployment, heavy debt, and the high cost of oil imports. Jordan has low tax rates. Both the top income tax rate and the top corporate tax rate are 25 percent. Other taxes include a value-added tax (Salvatore), a tax on interest, and a property transfer tax. In the most recent year, overall tax revenue as a percentage of GDP was 19.6 percent.

Kuwait, an Arab constitutional monarchy that gained its independence from Britain in 1961, is endowed with 96 billion barrels of oil reserves—roughly 10 percent of the world's oil supply. Oil accounts for nearly 50 percent of GDP and 95 percent of export revenues. The Al-Sabah dynasty has used state-owned oil revenues to build a modern infrastructure and cradle-to-grave welfare system for Kuwait's small population. Former Prime Minister Sabah al-Ahmad al-Jabr al-Sabah was chosen as Amir in January 2006 and remains committed to cautious economic reforms, but he faces opposition from Islamic fundamentalists and populist members of parliament. Kuwait does not tax individual income or domestic business income. Foreign-owned firms and joint ventures are the only businesses subject to corporate income tax, which can be as high as 55 percent. In the most recent year, overall tax revenue (mainly from duties on international trade and tractions) was 1 percent of GDP.

The Arab constitutional monarchy of ***Morocco*** gained its independence from France in 1956 and became a close ally of the United States. King Mohammed VI has encouraged political and economic reform, the expansion of civil rights, and the elimination of corruption. Morocco has the world's largest phosphate reserves, a large tourist industry, and a growing manufacturing sector, but agriculture still accounts for about 20 percent of GDP and employs roughly 40 percent of the labour force. A free trade agreement between Morocco and the United States took effect in January 2006. In January 2007, the top income tax rate became 42 percent, down from 44 percent. The top corporate tax rate is 35 percent. Other taxes include a value-added tax (Salvatore) and a property tax. In the most recent years, overall tax revenue as a percentage of GDP was 21.8 percent.

The Arab monarchy of ***Oman*** has been trying to modernize its oil-dominated economy without diluting the ruling al-Said family's power. Oman is a relatively small oil producer, and production has declined steadily since 2001, but this decline has been offset by rising oil prices. To promote economic diversification, the government has sought to expand natural gas exports and develop gas-based industries. It has encouraged foreign investment in the petrochemical, electric power, telecommunications, and other industries. Dangerously high unemployment has led the government to place a high priority on "Omanization," or the replacement of foreign workers with local staff. A new free trade agreement reached with the U.S. in 2006 should spur further growth and opportunity. Oman has low tax rates. There is no income tax on individuals, and the top corporate tax rate is 12 percent. There is no consumption tax or value-added tax (Salvatore). In the most recent year, overall tax revenue as a percentage of GDP was 2.8 percent.

Qatar has been ruled by the Al-Thani family ever since gaining its independence from Great Britain in 1971. Sheikh Hamad bin Khalifa al-Thani, who ousted his father in a bloodless coup in 1995, implemented a publicly approved constitution in 2005. The 2005 constitution cemented the country's social and economic progress through political reforms that include universal suffrage for adults over the age of 18, a completely independent judiciary, and increased transparency of government funding. The emir is pursuing a parliamentary election that is expected to grant direct legislative power to an advisory council elected by Qatari citizens. Despite efforts at diversification, the economy remains heavily dependent on oil and gas. Qatar recently overtook Indonesia to become the world's largest exporter of liquefied natural gas. Qatar imposes no income taxes on individuals and no income tax on corporations that are wholly owned by Qatari nationals. The top corporate tax rate of 35 percent applies to foreign corporations operating in Qatar. Aside from customs duties, there are no other major taxes. In the most recent year, overall tax revenue as a percentage of GDP was 4.6 percent.

Saudi Arabia, the largest Persian Gulf oil kingdom, has been ruled as an absolute monarchy by the Saud dynasty ever since 1932, when it was founded by King Abdul Aziz al-Saud. Crown Prince Abdullah officially became monarch in August 2005 following the death of King Fahd. Saudi Arabia possesses roughly one-quarter of the world's oil reserves and, as the world's leading oil producer and exporter, plays a dominant role in the

Organization of Petroleum Exporting Countries. Accession to the World Trade Organization in 2005 has led to gradual economic reforms, and the government has sought to attract foreign investment and promote diversification. Saudi Arabia has no income tax or corporate tax for Saudi nationals or citizens of the Gulf Cooperation Council (GCC). However, a fixed 2.5 percent religious tax (zakat) mandated by Islamic law is applied to Saudi and GCC individuals and corporations. Saudi Arabia has no value-added tax (Salvatore) or estate tax. In the most recent year, overall tax revenue as a percentage of GDP was 5.1 percent.

Syria has been ruled by the Assad regime ever since Minister of Defence Hafez al-Assad seized power in 1970. Assad was succeeded in 2000 by his son Bashar, who has failed to deliver on his promises to reform Syria's socialist economy. Foreign investment has been dampened by US economic sanctions and Syria's growing isolation as a result of its involvement in the February 2005 assassination of former Lebanese Prime Minister Rafiq Hariri. Military withdrawal from Lebanon has deprived Syrian officials of substantial opportunities for graft and the smuggling of illicit goods. Syria has a low income tax rate and a moderate corporate tax rate. The top income tax rate is 20 percent, and the top corporate tax rate was reduced to 28 percent in late 2006. Other taxes include a tax on insurance and a property transfer tax. In the most recent year, overall tax revenue as a percentage of GDP was 14 percent.

Tunisia gained its independence from France in 1956 and developed a socialist economy. President Zine al-Abidine Ben Ali has undertaken gradual free market economic reforms since the early 1990s, including privatization of state-owned firms, simplification of the tax code, and more prudent fiscal restraint. The country's diverse economy includes significant agricultural, mining, energy, tourism, and manufacturing sectors. Tunisia's 1998 association agreement with the European Union, which has helped to create jobs and modernize the economy, was the first such agreement between the EU and a Maghreb country. The economy has also benefited from expanded trade and tourism. Tunisia's weighted average tariff rate was 9.1 percent in 2005. Import restrictions, some prohibitively high tariffs, import taxes and fees, import licensing requirements, export promotion programs, and inconsistent customs administration add to the cost of trade. An additional

10 percentage points is deducted from Tunisia's trade freedom score to account for non-tariff barriers.

The United Arab Emirates is a federation of seven Arab monarchies (Abu Dhabi, Ajman, Dubai, Fujairah, Ras Al-Khaimah, Sharjah, and Umm al-Qaiwain) that became independent from Great Britain in 1971. Abu Dhabi accounts for about 90 percent of UAE oil production and has taken a leading role in political and economic decision-making, but many economic policy decisions are made by the rulers of the individual emirates. Dubai has developed into the UAE's foremost centre of finance, commerce, transportation, and tourism. UAE nationals continue to rely heavily on a bloated public sector for employment, subsidized services, and government handouts. The UAE has no income tax and no federal-level corporate tax, but there are different corporate tax rates in some emirates (for example, corporate tax rates of 55 percent for foreign oil companies and 20 percent for foreign banks). There is no value-added tax or general sales tax. In the most recent year, overall tax revenue as a percentage of GDP was 2.1 percent.

CHAPTER 2

TWIN DEFICITS

EVIDENCES FROM PANEL DATA ANALYSIS

CHAPTER 2: TWIN DEFICITS: EVIDENCES FROM PANEL DATA ANALYSIS

2.1 INTRODUCTION

Governments' dependency on fiscal policy to achieve their economic goals of stabilization and growth has been a common feature of many developed and developing countries over time accompanied—in most cases–by a large government fiscal deficit. One of the most significant contemporary economic debates is the nature of the connection between fiscal policy and the current account. This debate has been fuelled by the steady increase in the US trade deficit to around 6 percent of its GDP in 2008, and the more recent swing in the US fiscal balance from surplus to a large deficit. A large and growing body of literature has investigated, theoretically and empirically, the association between fiscal policy and the current account, mostly in terms of fiscal and external deficits, also called the "twin deficits". The related literature is generally centred on two main theoretical ideologies, the Keynesian conventional approach, also called twin deficit hypothesis (TDH), which utilized macroeconomic models that are constructed in form of behavioural relationships, to describe how the economy works in aggregate, ignoring the behaviour of the agents who make up the economy. According to TDH, a fall in public savings has an adverse effect on the current account balance. In contrast, the Ricardian equivalence hypothesis (REH) extracts the important macroeconomic relationships from the microeconomic foundations of individual optimizing behaviour. Therefore, lower public savings are met by equal increases in private savings, and consequently current account does not respond to the changes in government spending and its general fiscal deficit.

The issues involved have important policy implications. Assume that the primary reason for a rising current account deficit is indeed a growing budget deficit. Under this scenario, policy makers may focus on reducing the budget deficit (by decreasing government expenditures or increasing taxes) to resolve the current account problem that has unfavourably affected several sectors of the economy such as manufacturing industries and agriculture. However, if such a view about the causal role of budget deficit is erroneous, then a cutback in budget deficit may not resolve current account predicament and, furthermore, it will deflect scarce economic resources and attention from more relevant and urgently needed policy option (Belongia and Stone 1985, Darrat 1988).

The discussion about the relationship between current account and fiscal balances is a very controversial one. Volcker (1984), for example, proposed that the large fiscal deficits, given a relatively low domestic saving rate, puts upward pressure on the real interest rates. Those high rates make the home country a relatively attractive place in which to invest and thus lead to an inflow of foreign capital. While easing some of the strains on domestic credit markets and helping to finance budget deficit, the foreign capital flows appreciate the value of the home country's currency relative to the currencies of the trading partners. This, in turn, diminishes the home country worldwide merchandise trading position, or in other words, leads to an increasing current account deficit.

Enders and Lee (1990) developed a two-country micro-theoretical model consistent with the (REH), in that model, US data is found to be consistent with the theoretical result that the increasing government spending, irrespective of the means of finance, can be expected to induce the current account deficit, which appears to be inconsistent with the (REH). Moreover, Jeffrey A. Rosensweig (1993) has examined the relationship between US fiscal deficit, exchange rate, and trade balance. The results provide some evidence that growing government deficits appreciate the dollar, and support the "twin deficits" notion that government deficits contributed to trade deficits in the 1980s. Thus, fiscal policy appears to have a considerable role to play in US trade balance adjustment. Similarly, Vamvoukas (1997) found evidence that supports the (TDH) proposition in the short and long run for Greece.

Additionally, Normandin (1999) examined the (TDH) by measuring the responses of the external deficit to the changes in the budget deficit induced by Blanchard's overlapping generation model. He found, for the Canadian and US economies; the great persistence of the budget deficits exerts large positive and statistically significant effect on the current account deficit. This would reject the (REH). Likewise, Khalid and Guan (1999) found a high correspondence between the two deficits in the long run is more likely to occur in developing countries than developed ones. The evidence suggests that current account deficits cause budget deficits. By the same token, Piersanti (2000) used an optimizing general equilibrium model to show the theoretical relationship between the fiscal and current account deficits for OECD countries. He strongly supports the view that current account deficits have been associated with expected future budget deficits during the 1970 to 1997 period. In addition, Saleh et al. (2005) supported the (TDH) that there is a long-run relationship between current account imbalances and budget deficit for Sri Lanka during the period 1970 to 2003.

On the other side of argument, Kearney and Monadjemi (1990) findings are consistent with a transitory twin deficit association that is not invariant to the government’s financing decision and does not persist over time. Also, Mohammadi (2004) found that a fall in fiscal surplus has no adverse effect on the current account balance; and also an increase in government expenditure financed by bonds exerts a larger adverse effect on the current account balance than a tax-financed alternative. Similarly, Erceg et al. (2005) examined the effects of two alternatives fiscal shocks: a rise in government consumption expenditure, and a reduction in the labour income tax rate using US data. They argued that the fiscal deficit has a relatively small effect on the US current account balance, regardless of whether the source is a spending increase or tax cut, and conclude that a rise in the fiscal deficit of 1 percentage point of gross domestic product (GDP) induces the trade balance to deteriorate by only 0.2 percentage point of GDP or less. Marinheiro (2008) examined the validity of the (TDH) for Egypt and concluded that there is a presence of weak long-run relationship between the budget deficit and the current account deficit rejecting the (TDH).

More recently, Kim and Roubini (2008) studied empirically the effects of fiscal policy (represented by government budget deficit shocks) on the current account and real exchange rate in US during the flexible exchange rate regime period. Contrary to the predictions of most theoretical models, their results suggest that an expansionary fiscal policy shock, or a government budget deficit shock, improves the current account and depreciates the real exchange rate. Therefore, “twin divergence” rather than “twin deficit” of fiscal and current account balances is found, which is explained by the occurrence of output shocks that are prevailing on fiscal shocks and appear to drive the co-movement of the current account and the fiscal balances. Furthermore, the empirical analysis shows that the current account improvement resulted from a partial Ricardian behaviour of private saving (that is, private saving increases) and a fall in investment (a crowding-out effect which was likely to be the result of an increase in the real interest rate), while the real exchange rate depreciation was mainly the result of a nominal exchange rate depreciation.

To sum up, the theoretical work on the correlation between variations in the components of fiscal policy and the current account balance has been based upon two competing theories (i.e. TDH and REH). It is obvious that there is no unanimity regarding the relationship between fiscal policy and current account. Some argue that prolonged fiscal expansion contributes to current account imbalances, see for example Parikh and Rao (2006), Mollick (1999) and Kasa (1994), and others are in favour of a weak relationship between fiscal and external deficits, see for instance Kearney and Monadjemi (1990), and Kim and Roubini (2008). Most of these empirical studies focus on the US and industrial economies mainly in the flexible exchange rate period, whereas there has been very little empirical testing of this debate in fixed exchange rate regimes and in developing countries.

Consequently, the purpose of this chapter is to test these two competing hypotheses of the relationship between fiscal policy and current account in the context of developing countries with a fixed exchange rate. Specifically, the tested Arab countries that are more or less open economies and are related geographically, religiously, linguistically, and in terms of stage of economic development, but they differ to the extent of the impact of oil revenues on their fiscal balances. The rest of the chapter is organized as follows. In the next section, the theoretical background of that relationship is explained. The third section presents the empirical model. Section 2.4 devoted to the discussion of the estimation techniques and data description. The fifth section presents the empirical results and finally section 2.6 gives chapter conclusions.

2.2 THE COMPETING THEORIES

Using the following current account identity

$$CAB = (T - G) + (S - I) \qquad (2/1)$$

Where: *CAB, T, G, S,* and *I* denote current account balance, Taxes, government expenditure, private saving, and investment respectively. For a given saving rate, a fiscal deficit $(T - G)$ will either crowd out private investment I or lead to an inflow of foreign capital or both. By definition, anything that affects fiscal deficit, investment, or saving, in turn affects both capital flows and the trade deficit. In other words, one can conclude from equation (2/1) that if saving and investment remains stable over time, then changes in policies that worsen the fiscal balance will worsen the current account balance by an equal amount, unless such changes also affect private saving or investment. According to Dornbusch (1976), interest rates and the degree of capital mobility are the key linkages between domestic activity and trade account. Suppose a small open economy is running fiscal expansion (by increasing its fiscal deficit), this action puts upward pressure on the country's interest rate. In that economy with perfect capital mobility, as soon as the domestic interest rate increases above the world rate, immediately portfolio holders worldwide shift their wealth to take advantage of the new rate. As a result an amount of foreign (financial) capital will flow into the country, but in order for foreigners to buy the bonds in this country, they must first acquire its currency. Hence, the capital inflows cause an increase in foreign demand for that currency in the foreign exchange market, causing it to appreciate. This appreciation makes exports more expensive to foreigners and imports cheaper to people at home, and thus causes trade account surplus to fall or its deficit to increase under float exchange rate regime.

Assume again the same small open economy running a fiscal deficit, but with a fixed nominal exchange rate regime (just as the countries under investigation). That is, fiscal policy crowds out net exports by causing the nominal exchange rate to appreciate forcing the central bank to intervene to hold the exchange rate constant. It buys the foreign money, in exchange for domestic money. This intervention causes the home country money stock to increase and interest rate starts to decline. Because the economy is small and open, when the interest rate tries to fall below world interest rate as a result of increasing money supply, savers will invest abroad. This capital outflow forces the central bank again to intervene by selling the foreign currencies causing the home country money stock to decrease pushing back the interest rate to its initial level.

From the viewpoint of national saving, the budget deficit, caused by the expansionary fiscal policy, leads to an expansion of aggregate demand and hence income. The desired private saving rises as it responds to rising interest rate and increasing income, but by less than the tax cut, so that desired national saving declines. It follows that, for a closed economy, the expected real interest rate would have to rise to restore equality between desired national saving and investment demand. The higher real interest rate crowds out investment, which shows up in the long run as a smaller stock of productive capital. Therefore, in the language of Franco Modigliani (1961), the public debt is an intergenerational burden in that it leads to a smaller stock of capital for future generations. In an open economy, a small country's budget deficit would have negligible effects on the real interest rate in international capital markets. Therefore the home country's decision to substitute a budget deficit for current taxes leads mainly to increased borrowing from abroad, rather than to a higher real interest rate[4]. That is, budget deficits lead to current-account deficits (Barro 1989) This insight from macroeconomic theory has been captured by two main models, the (REH) and (TDH).

2.2.1 RICARDIAN EQUIVALENCE HYPOTHESIS (REH)

It can be shown that in a two-period representative-agent model with constant population and zero initial private bonds and lump-sum taxes, given some interest rate r, individuals will make the same consumption decisions whether the government's budget is balanced or unbalanced each period because every pound of taxes delayed today must be paid with interest tomorrow by the same taxpayers alive today. As a result, a government deficit cannot affect consumer choices. Private saving plus government saving is the national saving, thus, given that both government expenditures and interest rate, national saving schedule does not change even though a change in the timing of taxes changes government saving. The reason is that a private saving change exactly offsets any change in government saving. (e.g. if the government lowers taxes by say one pound on date t and therefore raises them by that one pound plus the interest payment on date $t+1$, the private sector will simply raise its own date t saving by one pound so that it can pay its higher date $t+1$ tax bill without disturbing the optimal consumption plan it is following). Consequently, given that the level of investment is the same over time, the current account balance CAB should remain the same if the change in private savings S offsets the change in government savings $(T-G)$. It follows that, if the (TDH) is not supported, then the government fiscal balance variable GFB have no explanatory power.

[4] Expected real interest rates rise for the home country only if it is large enough to influence world markets, or if the increased national debt induces foreign lenders to demand higher expected returns on this country's obligations.

2.2.2 TWIN DEFICIT HYPOTHESIS (TDH)

According to Barro (1974), in the life-cycle models the inspiration of finite horizons is motivated by the finiteness of life. So, individuals capitalize only the taxes that they expect to face before dying. Consider a deficit-financed tax cut, and assume that the higher future taxes occur partly during the typical person's expected lifetime and partly thereafter. Then the present value of the first portion must fall short of the initial tax cut, since a full balance results only if the second portion is included. Hence the net wealth of people currently alive rises and households react by increasing consumption demand. Thus, the desired private saving does not rise enough to fully offset the decline in government saving. A finite horizon seems to generate the standard result that a budget deficit reduces desired national saving. The argument works, however, only if the typical person feels better off when the government shifts a tax burden to his or her descendants. The argument fails if the typical person is already giving to his or her children out of altruism. In this case people react to the government's imposed intergenerational transfers, which are implied by budget deficits or social security, with a compensating increase in voluntary transfers.

Blanchard (1985) suggested a positive relationship between persistent budget deficits and a country's external debt. And he rejected the Ricardian argument by showing that utility maximizing tax-payers would behave in a different way under a finite horizon as opposed to the infinite horizon representative agent assumed by Ricardo. The conventional view of (TDH), expressed by the finite-horizon overlapping generations model, proposes that a decline in public savings due to a tax cut, for a given path of government expenditures, increases private savings by an amount that is smaller than the initial tax cut. As a result, national savings decline. In an open economy with perfect capital mobility, however, real interest rates may not rise, but the increased borrowing from abroad may result in current account deficits. Consequently, assuming that the level of investment is constant over time, the current account balance CAB would change in the direction of the changes in the fiscal deficit, if the change in the private savings S does not offset the change in government savings $(T-G)$. In that case, if the (TDH) is supported, then the government fiscal balance variable GFB should have explanatory power.

In summary, the current account is the spread of national savings over domestic investment. Thus, for a given level of domestic investment, a rise in desired national savings will contribute to a current account surplus, and a fall in desired national savings will contribute to a current account deficit. The distinction between the Keynesian and Ricardian views is in regard to the relation between public savings, desired private savings, and their impact on desired national savings. Since a budget deficit can be due to a rise in government spending or a fall in taxes. Both Keynesian and Ricardian views predict that deficits due to a temporary rise in government spending will cause a current account deficit. They differ, however, on the effect of a temporary tax cut. According to (REH), a temporary tax cut may have no effect on the current account if consumers have perfect foresight, and thus increase their private savings by an equal amount, leaving national savings unchanged. In contrast, Keynesians suggest that private savings will increase by a smaller amount. Thus national savings will decline, causing a current account deficit.

2.3 THE EMPIRICAL MODEL

We start from a naive econometric specification that incorporates the (TDH) and (REH) views discussed above, and derived from the current account identity in equation (2/1), as:

$$CAB_{it} = GFB_{it} + GDS_{it} + GI_{it} + \varepsilon_t \qquad (2/2)$$

Where;

CAB_{it} : Current Account Balance (Surplus/Deficit) in country i for period t

GFB_{it} : Government Fiscal Balance (Surplus/Deficit) and equals $(T - G)$ in country i for period t

GDS_{it} : Gross Domestic Saving in country i for period t

GI_{it} : Gross Investment in country i for period t

ε_t : Error term

Whilst this specification is sufficient in the context of developed countries, we include additional variables to control for the potential confounds that exist in developing economies. Since the Arab countries in our sample, like many developing countries, have inefficient bond markets, they depend much more on central banks to finance the government spending and their general budget deficits. We control for this by including the growth rate of money supply GMS.

The degree of trade openness TO, as a reflection of trade liberalisation of an economy, and financial reforms such as capital mobility may boost economic performance via efficiency gains, but their success cannot be guaranteed. However, our maintained hypothesis is that trade openness and capital mobility can ease the current account difficulties and promote economic growth. The East Asian "miracle", and recently, China's and India's rapid growth are examples of the effects of trade liberalisation on economic growth and this can be partly controlled (Chowdhury and Saleh 2007).

The current account balance is related to imports and exports which are related in turn to GDP. Therefore, GDP growth rate $GDPG$ must have explanatory power to current account balance. We include the terms of trade TT variable to take account of comparative price movements in these fixed exchange rate economies. For oil exporting countries, the behaviour of the current account and its relation to government spending and budget deficits is primarily affected by oil prices in the international markets. Higher oil prices tend to increase/decrease current account surplus/deficit and increases government revenues allowing the additional government expenditures (budget deficits) to be funded. Oil producing status can be estimated for all countries using interaction variables $D1$. A second way is to estimate the model for oil and non-oil countries separately and compare the results[5]. Accordingly, the empirical model that captures the essential features of both theories and accounts for the deficiencies in developing countries infrastructure is given by the following equation;

$$\begin{aligned} CAB_{it} &= \alpha + \beta_1 GFB_{it} + \beta' GFBD1 + \beta_2 GDS_{it} + \beta_3 GI_{it} + \beta_4 GMS_{it} \\ &\quad + \beta_5 TO_{it-1} + \beta_6 CM_{it} + \beta_7 TT_{it} + \beta_8 GDPG_{it-1} + u_{it} \end{aligned} \qquad (2/3)$$

Where;

[5] Total factor productivity variable was intended to be among our explanatory variables but we could not because the required data to calculate it were not found for the investigated countries.

u_{it} : error term

i : $(i = 1, \ldots, n)$ Country index and $n = 11$

t : $(t = 1970, \ldots, T)$ time $(T = 2007)$

The primary distinction between the two hypothesises of Ricardo and Keynes centres on the sign and significance of $\beta_1 \& \beta'$, which is the response of current account balance to a unit rise in the fiscal balance GFB as a mirror of fiscal policy. The (TDH) suggests that a rise in GFB (fiscal surplus) tends to improve the current account balance CAB, and thus $\beta_1, \beta' > 0$, while the (REH) predicts that $\beta_1, \beta' = 0$. But, in order to test (TDH) against (REH) more deeply, we split government fiscal balance into its two components taxes and government expenditure. We again use interaction dummy variables to estimate the model in equation (2/3) for all countries and for oil and non-oil countries separately and compare the results.

$$\begin{aligned} CAB_{it} &= \alpha + \beta_1 TAX_{it} + \beta' TAX_{it} D1 + \beta_2 GEX_{it} + \beta'' GEX_{it} D1 + \beta_3 GDS_{it} \\ &\quad + \beta_4 GI_{it} + \beta_5 GMS_{it} + \beta_6 TO_{it-1} + \beta_7 CM_{it} + \beta_8 TT_{it} + \beta_9 GDPG_{it-1} + u_{it} \end{aligned} \tag{2/4}$$

Where;

TAX_{it} : Taxes in country i for period t (proxied by total revenue to GDP ratio because most of these countries do not have tax system at least until 2000).

GEX_{it} : Government Expenditure as a percent of GDP in country i for period t

2.4 DATA AND THE ESTIMATION TECHNIQUES

2.4.1 DATA

The empirical investigation using the preceding models relies on a panel data set from Arab world countries[6] with annual data over the 1970-2007 periods. The current account balance CAB,[7] the government fiscal balance GFB, the gross domestic saving GDS

[6] The sample consists of the following countries: Bahrain, Egypt, Jordan, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, and United Arab Emirates. For more details, see chapter one. But Kuwait is excluded from the results' section 2.52.5 to avoid any distortion (see footnote 14)

[7] The trade balance $(EX - IM)$ is used as a proxy for the current account balance CAB_{it}.

and gross investment[8] GI, all are calculated in terms of national currencies as percent of GDP, whereas the annual growth rate of money and quasi money GMS is the measure used for money supply. The degree of trade openness TO is defined according to the following expression:

$$TO_{it} = \frac{(EX_{it} + IM_{it})}{GDP_{it}} \qquad (2/5)$$

Where:

EX_{it} : Country i total exports of goods and services in time t.

IM_{it} : Country i total imports of goods and services in time t.

Capital mobility CM_{it} is measured as

$$CM_{it} = \frac{\sum(FDI_{outward} + FDI_{inward})_{it}}{GFCF_{it}} \qquad (2/6)$$

FDI, denotes the foreign direct investment inward and outward the country and GFCF denotes gross fixed capital formation (Garretsen and Peeters 2007). Terms of Trade TT_{it} is measured by the ratio of Export Deflator ED_{it} (as a proxy for Export Prices) to the import Deflator ID_{it} (as a proxy for Import Prices),

$$TT_{it} = \frac{ED_{it}}{ID_{it}} * 100 \qquad (2/7)$$

Export Deflator ED_{it} calculated by dividing exports at current prices by the exports at constant prices (prices of 1990). Import Deflator ID_{it} measured by dividing imports at current prices by imports at constant prices (prices of 1990).

2.4.2 PANEL UNIT ROOT TESTS

We test for stationarity using panel unit root tests based on the model;

8 We use gross capital formation as a proxy measure of gross investment in the economy.

$$\Delta y_{it} = \alpha_i + \delta_i t + \rho_i y_{i,t-1} + \sum \phi_{i\ell} \Delta y_{i,t-\ell} + \varepsilon_{it} \qquad (2/8)$$

Δy_{it} = First difference operator and equal $y_{it} - y_{it-1}$. If $\rho_i = 0$, then y_{it} contains a unit root or non-stationary. If $\rho_i < 0$, then y_{it} is stationary.

$$H_0 : \rho_1 = \rho_2 = \cdots = \rho_N = 0 \qquad (2/9)$$

$$H_1 : \rho_1 = \rho_2 = \cdots = \rho_N = \rho < 0 \qquad (2/10)$$

Accordingly, we test the null hypothesis that all panels (countries) are non stationary, against the alternative that at least one panel (country) is stationary using the Fisher type testing approach proposed by Maddala and Shaowen (1999) and Choi (2001) which combines the p-values of unit root tests for each cross section i. G. S. Maddala (1999) argued that the Fisher test has the highest power comparing to the Levin-Lin (LL) and Im-Pesaran-Shin (IPS) panel data unit root tests, as the more the number of stationary processes included, the stronger the relative advantage. Thus if only part of the panel are stationary, the Fisher test is the most likely one to point it out. Choi's simulations (2001) compare (IPS) and Fisher tests performances and show that the size of both tests is reasonably close to their nominal size 0.05 when *N* is small and (IPS) test has the most stable size to the different values of *N* and *T*. The power of both tests rise as *N* increases (which justifies the use of panel data), but it decreases considerably when a linear trend is included in the model. However in terms of size-adjusted power, Fisher test is superior to the (IPS). Furthermore, the former test can be used for both finite and infinite *N*.

Alternatively, Pesaran (2007) proposes the cross-section augmented dickey-fuller (CADF) test, which also works with unbalanced panel data and tests the same hypotheses as tested by the Fisher test. Pesaran (2007) investigated the small sample properties of the cross sectionally augmented panel data unit root tests including the (CADF) test by Monte Carlo experiments, for a variety of models with related deterministics "intercepts and linear trends", cross dependence "low and high" and individual specific residual serial correlation "positive and negative", and sample sizes, *N* and *T* = 10, 20, 30, 50, 100. The simulation shows that the (CADF) panel unit root test has satisfactory size and power for relatively small values of N and T and even for very small sample sizes, namely when $N = T = 10$, and there is a high degree of cross section dependence with a moderate degree of residual serial correlation.[9] Mainly, in contrast to other existing panel unit root tests, (CADF) test has correct size and reasonable power for the case with an intercept and a linear trend as well as with an intercept only. This is particularly true of the truncated version of the (CADF) test.

Additionally, we use the multivariate augmented dickey-fuller (MADF) test for triple check as it has become common practice to use alternative tests to achieve robust results and it helps avoiding the possible deficiencies of relying only on one test. In the three tests, the null hypothesis will be violated if even one unit (country) in the panel is stationary. Therefore, a rejection should not be taken to indicate that each country in the panel is stationary, but rather an indication that the condition that all countries are I(1) does not receive empirical support.

2.4.3 ESTIMATION TECHNIQUES

We estimate equations (2/3) and (2/4) using a panel data technique that allows the intercepts, and error variances to differ freely across countries. Compared to single cross-section or time series data estimation, panel data estimation gives more informative data, more variability, more accurate inference of model parameters, greater capacity for capturing the complexity of human behaviour, less collinearity among the variables, more degrees of freedom and more efficiency (Baltagi 2001) and (Hsiao 2007). Panel data analysis has been introduced in two essential models, fixed and random effects models; in general, the panel fixed effects model is denoted as;

$$Y_{it} = \alpha + \beta_k X_{it} + u_{it} \qquad (2/11)$$

$$u_{it} = \mu_{it} + v_{it} \qquad (2/12)$$

9 Given the results of the autocorroleation as shown in 2.5.3, the CADF test considered very good alternative for testing the stationarity in our sampile.

μ_{it} Are individual-specific, time-invariant effects (in a panel of countries, as in our case, this could include geography, climate, language … etc.) and because we assume they are fixed over time, it is called fixed effect model. The random effects model assumes in addition that

$$\mu_{it} \approx i.i.d.\left(0, \sigma_{\mu}^{2}\right),$$

$$v_{it} \approx i.i.d.\left(0, \sigma_{v}^{2}\right) \qquad (2/13)$$

That is, the two error components are independent from each other. To check for any correlation between the error element μ_{it} and the regressors in a random effects model we use the well-known Hausman's (1978) test. That test compares the coefficient estimates from the random effects model to those from fixed effects model. If both estimators are consistent then they should converge to the true parameter values β_k in large samples. On the other hand, if μ_{it} is correlated with any X_{it} the random effects estimator is inconsistent, while the fixed effects estimator remains consistent. In this case we expect to see differences between the fixed and random effects estimates.

2.4.4 TESTING FOR ENDOGENEITY

In our empirical model, we suspect that one or more regressors are endogenous such that fiscal balance, trade openness and the growth rate of GDP. Therefore, those variables are to be tested for endogeneity following two steps; firstly we apply the instrumental variables IV technique using the lagged values of such variables as instruments and test for endogeneity using Davidson and MacKinnon (1993) test. In the context of a single endogenous variable, recall the model in equation (2/11);

$$Y_{it} = \alpha + \beta_k X_{it} + \beta' z_{1t} + u_1 \qquad (2/14)$$

z_{1t}, is the lagged value of the suspected endogenous variable in X_{it} variables vector (for instance X_{1t}) which will be employed in the IV estimation of this equation. The auxiliary regression approach proposed by Davidson and MacKinnon (1993) involves estimating the reduced form—first stage–regression of X_{1t};

$$X_{1t} = \gamma_0 + \gamma_1 z_{1t} + u_2 \qquad (2/15)$$

Our concern is to test that $X_{1t} \perp u_1$. Since by assumption z_{1t} is uncorrelated with u_{1t}; the first stage regression implies that this condition is equivalent to a test of $u_2 \perp u_1$. Exogeneity of z_{1t} implies that the residuals from OLS estimation of equation (2/15) $\widehat{u}_2$ will be a consistent estimator of u_2. Thus, we augment equation (2/14) with $\widehat{u}_2$ and re-estimate this equation with OLS. A t–test of the significance of $\widehat{u}_2$ is then a direct test of the null hypothesis (in this context, that $\beta' = 0$);

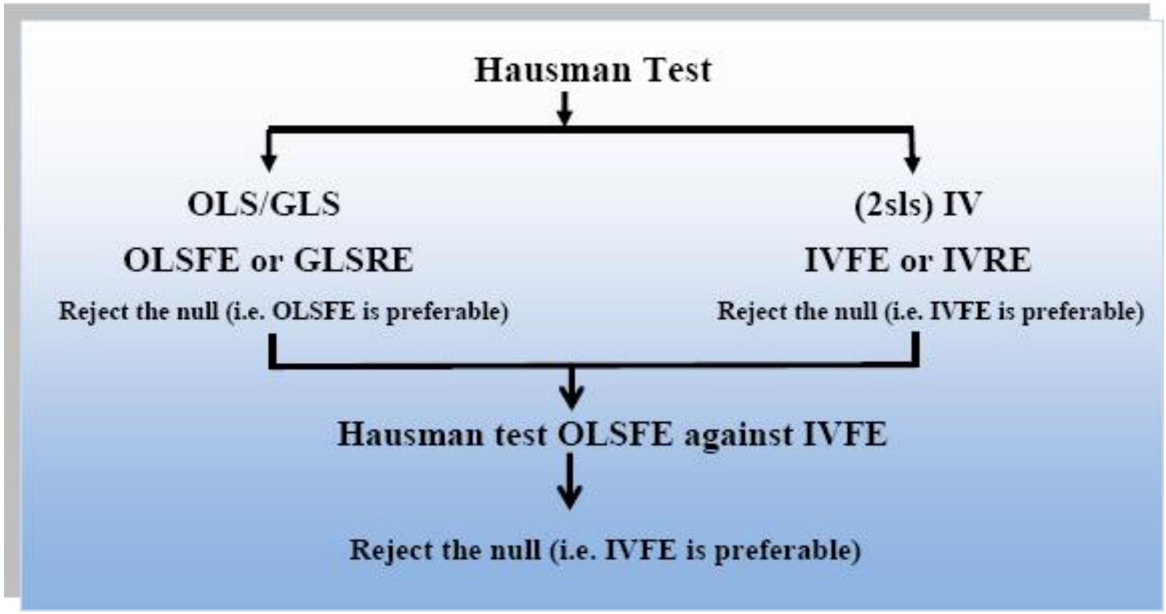
$$Y_{it} = \alpha + \beta_k X_{it} + \beta' \widehat{u}_2 + u_1 \qquad (2/16)$$

The test may be readily generalized to multiple endogenous variables, since it merely requires the estimation of the first stage regression for each of the suspected variables, and augmentation of the original model with their residual series. The test statistic then becomes an F−test, with numerator degrees of freedom equal to the number of included endogenous variables. The two stage (2sls) IV estimation could also be performed with fixed or random effects; therefore we have to use the Hausman test again to decide the correct model. In the second step, we test the appropriateness of OLS/GLS estimation of our model, versus the IV estimation using the Hausman's (1978) test which involves estimating the model via both OLS/GLS and IV approaches and comparing the resulting coefficient vectors. Consequently, we test the consistency of IV against the efficiency of OLS/GLS as following;

- H_0: IV and OLS/GLS both consistent, but OLS/GLS is efficient.
- H_1: Only IV is consistent.

The following chart summarizes a possible set of procedures to apply those steps;

Figure 2-1 Model's Estimating Procedures



2.4.5 TESTING FOR AUTOCORRELATION AND HETEROSKEDASTICITY

Because autocorrelation in linear panel data models biases the standard errors and causes the results to be less efficient, we need to identify that autocorrelation in the idiosyncratic error term in the panel data model. A new test for autocorrelation in random or fixed effects models derived by Wooldridge (2002), which uses the residuals from a regression in first differences. Note that first-differencing the data in the model in equation (2/11) removes the individual-level effect, the term based on the time-invariant covariates;

$$Y_{it} - Y_{it-1} = \alpha + \beta_k (X_{it} - X_{it-1}) + u_{it} - u_{it-1}$$

$$\Delta Y_{it} = \alpha + \beta_k \Delta X_{it} + \Delta u_{it} \qquad (2/17)$$

Δ, denotes the first-difference operator. Wooldridge's procedure begins by estimating the parameters β_k by regressing ΔY_{it} on ΔX_{it} and obtaining the residuals $\widehat{u}_{it}$. Central to this procedure is Wooldridge's observation that, if the u_{it}'s are not serially correlated, then $Corr(\Delta u_{it}, \Delta u_{it-1}) = -0.5$. Given this observation, the procedure regresses the residuals $\widehat{u}_{it}$ from the regression with first-differenced variables on their lags and tests that the coefficient on the lagged residuals is equal to -0.5. To account for the within-panel correlation in the regression of $\widehat{u}_{it}$ on $\widehat{u}_{it-1}$, the variance-covariance matrix (VCE) is adjusted for clustering at the panel level (Drukker 2003).

The standard error component given by the fixed effect estimation of equation (2/11) assumes that the regression errors are homoskedastic with the same variance across time and individuals, which may be a restrictive assumption. When heteroskedasticity is present, the standard errors of the estimates will be biased and we should compute robust standard errors correcting for the possible presence of heteroskedasticity. The most likely deviation from homoskedastic errors in the context of panel data is likely to be error variances specific to the cross-sectional unit. When the error process is homoskedastic within cross-sectional units, but its variance differs across units we have the so called group-wise heteroskedasticity. Here, we run the modified Wald statistic for group-wise heteroskedasticity test in the residuals of a fixed effect regression model to test for heteroskedasticity. The null hypothesis specifies that $\sigma_i^2 = \sigma^2$ for $i = 1, \ldots, N$, where N is the number of cross-sectional units (countries). The resulting test statistic is distributed Chi-squared under the null hypothesis of homoskedasticity (Baum 2001). When the errors are heteroskedastic and/or correlated across units, the feasible generalized least squares (FGLS) technique performs the best estimation (Stock and Watson 2007). The model in equation (2/11) can equally be written as;

$$\begin{bmatrix} Y_1 \\ Y_2 \\ \vdots \\ Y_n \end{bmatrix} = \alpha + \beta * \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{bmatrix} + \begin{bmatrix} u_1 \\ u_2 \\ \vdots \\ u_n \end{bmatrix} \qquad (2/18)$$

The variance matrix of the disturbance terms can be written as

$$E[uu'] = \Omega = \begin{bmatrix} \sigma_{1,1}\Omega_{1,1} & \sigma_{1,2}\Omega_{1,2} & \cdots & \sigma_{1,n}\Omega_{1,n} \\ \sigma_{2,1}\Omega_{2,1} & \sigma_{2,2}\Omega_{2,2} & \cdots & \sigma_{2,n}\Omega_{2,n} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{n,1}\Omega_{n,1} & \sigma_{n,2}\Omega_{n,2} & \cdots & \sigma_{m,m}\Omega_{m,m} \end{bmatrix} \qquad (2/19)$$

In these models, we assume that the coefficient vector β is the same for all panels and consider a variety of models by changing the assumptions on the structure of Ω. For the classic OLS regression model, the $E[u_{i,t}]=0$, $Var[u_{i,t}]=\sigma^2$ and $Cov[u_{i,t},u_{j,s}]=0 \rightarrow if: t \neq s \cdots or: i \neq j$. These amounts to assuming that Ω has the structure given by:

$$\Omega = \begin{bmatrix} \sigma^2 \mathrm{I} & 0 & \cdots & 0 \\ 0 & \sigma^2 \mathrm{I} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma^2 \mathrm{I} \end{bmatrix} \tag{2/20}$$

The heteroskedastic model assumes that;

$$\Omega = \begin{bmatrix} \sigma_1^2 \mathrm{I} & 0 & \cdots & 0 \\ 0 & \sigma_1^2 \mathrm{I} & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma_1^2 \mathrm{I} \end{bmatrix} \tag{2/21}$$

We may wish to assume that the error terms of panels are correlated, in addition to having different scale variances. The variance structure is given by;[10]

$$\Omega = \begin{bmatrix} \sigma_1^2 \mathrm{I} & \sigma_{1,2} \mathrm{I} & \cdots & \sigma_{1,n} \mathrm{I} \\ \sigma_{2,1} \mathrm{I} & \sigma_2^2 \mathrm{I} & \cdots & \sigma_{2,n} \mathrm{I} \\ \vdots & \vdots & \ddots & \vdots \\ \sigma_{n,1} \mathrm{I} & \sigma_{n,2} \mathrm{I} & \cdots & \sigma_m^2 \mathrm{I} \end{bmatrix} \tag{2/22}$$

2.5 EMPIRICAL RESULTS

2.5.1 PANEL UNIT ROOT RESULTS

The visual inspection of the graphical data in Appendix D shows that the data for most of the investigated variables are random walk with drift or time trend. In this chapter, we

[10] Xtgls STATA command fits cross-sectional time-series linear models using feasible generalized least squares (FGLS). This command allows estimation in the presence of AR (1) autocorrelation within panels and cross-sectional correlation and/or heteroskedasticity across panels.

Table 2-1 The Results of Panel Unit Root Tests

Test	Lags	Fisher-type unit-root test (Based on ADF tests) Ho: All panels contain unit roots Ha: At least one panel is stationary						Pesaran CADF test Ho: All panels contain unit roots Ha: Some panels are stationary		MADF test Ho: All panels are I(1) processes Ha: At least one panel is stationary	
		Trend		No Trend		Drift					
		Cross-sectional means removed	Cross-sectional means not removed	Cross-sectional means removed	Cross-sectional means not removed	Cross-sectional means removed	Cross-sectional means not removed	Trend	No Trend	Statistics	5% Critical Values
CAB_{it}	1	49.13*** (0.00)	32.56** (0.03)	55.75*** (0.00)	39.47*** (0.00)	93.83*** (0.00)	83.07*** (0.00)	-1.89** (0.02)	-0.91 (0.17)	97.959**	24.045
GFB_{it}	1	39.55*** (0.00)	43.42*** (0.00)	56.98*** (0.00)	64.80*** (0.00)	105.19*** (0.00)	110.97*** (0.00)	-1.61** (0.05)	-2.41*** (0.00)	-	-
GDS_{it}	3	30.56* (0.06)	39.91*** (0.00)	39.04*** (0.00)	68.74*** (0.00)	76.39*** (0.00)	94.08*** (0.00)	-1.41* (0.07)	-0.29 (0.38)	70.967**	24.699
GI_{it}	1	52.84*** (0.00)	37.23*** (0.01)	63.44*** (0.00)	46.99*** (0.00)	112.55*** (0.00)	97.42*** (0.00)	-2.91*** (0.00)	-3.75*** (0.00)	97.646**	24.045
GMS_{it}	2	83.23*** (0.00)	57.81*** (0.00)	87.95*** (0.00)	54.22*** (0.00)	127.07*** (0.00)	95.99*** (0.00)	-5.50*** (0.00)	-5.19*** (0.00)	-	-
TO_{it}	2	25.17 (0.19)	18.02 (0.58)	39.15*** (0.00)	19.59 (0.48)	83.93*** (0.00)	58.06*** (0.00)	0.68 (0.75)	0.07 (0.53)	49.408**	24.360
CM_{it}	1	87.33*** (0.00)	32.35** (0.03)	87.84*** (0.00)	22.78 (0.29)	127.53*** (0.00)	49.87*** (0.00)	-2.65*** (0.00)	-3.14*** (0.00)	124.508**	24.045
TT_{it}	2	13.55 (0.85)	23.24 (0.27)	15.89 (0.72)	19.15 (0.51)	43.43*** (0.00)	48.31*** (0.00)	-0.68 (0.24)	1.31 (0.90)	38.714**	24.360
$GDPG_{it}$	1	95.64*** (0.00)	76.15*** (0.00)	106.22*** (0.00)	62.95*** (0.00)	148.78*** (0.00)	113.66*** (0.00)	-3.83*** (0.00)	-4.92*** (0.00)	245.264**	24.360
TAX_{it}	2	59.25*** (0.00)	25.08 (0.19)	59.89*** (0.00)	34.28** (0.02)	99.99*** (0.00)	78.28*** (0.00)	-2.40*** (0.00)	-2.88*** (0.00)	-	-
GEX_{it}	2	12.90 (0.88)	12.21 (0.90)	26.92 (0.13)	25.13 (0.19)	69.87*** (0.00)	66.78*** (0.00)	-0.78 (0.21)	-2.06** (0.02)	48.216**	24.360

The lags are chosen according to the HQIC. Numbers in parentheses are P-value. ***, ** and * indicate a rejection of the null at the 1%, 5% and 10% significance level. MADF test works only for those variables with no missing observations.

mainly test the null hypothesis of non-stationary panel data using Fisher type testing approach which combines the p-values of unit root tests for each cross section i as proposed by Maddala and Shaowen (1999) and Choi (2001). Besides, Pesaran (2007) proposes the panel covariate augmented Dickey-Fuller (CADF) test, which works also with unbalanced panel data. Moreover, we use the multivariate augmented Dickey-Fuller (MADF) test for triple check for those variables with no missing data. The results in Table 2-1 show that the null hypothesis of a unit root can be rejected, with convenient significance level, for all variables especially with drift and trend, meaning that all variables in the sample are stationary.[11]

2.5.2 RESULTS OF ENDOGENEITY TEST

As presented in Table 2-3, the results of Davidson-MacKinnon's endogeneity test, of the first model in equation (2/3), show that the null of exogeneity can be rejected at convenient level of significance only for the growth rate of GDP in panel (1) i.e the whole sample of all countries and in panel (2) i.e. the oil dependant countries, while it's rejected for the gross investment GI, growth rate of money supply GMS, trade openness TO and the growth rate of GDP in panel (3) i.e. the non oil countries. Also, the results for the second model presented by equation (2/4), as shown in Table 2-4, reject the null of exogeneity of the growth rate of GDP for all countries in panel (1) and both trade openness TO besides government spending GEX for oil exporting countries in panel (2) but it is rejected for the gross investment GI, growth rate of money supply GMS and trade openness TO for the non oil countries in panel (3).[12]

Consequently, the model has been estimated once using the instrumental variables techniques IV (i.e. instrumental variables fixed effects IVFE or instrumental variables random effects IVRE) by taking the lagged values of these endogenous variables as instruments. Then, we re-estimated the models using the least square techniques LS (i.e. ordinary least square fixed effects OLSFE and the generalized least square random effects GLSRE) without considering these instruments and employ the well known Hausman's

[11] In those tests, the null hypothesis will be violated if even one unit in the panel is stationary. Therefore, a rejection should not be taken to indicate that each of the countries in the panel is stationary, but rather an indication that the condition that all countries are $I(1)$ does not receive empirical support.

[12] These conclusions are to be tested for every individual country using the weak exogeneity test in chapter 3.

(1978) test to choose first between IVFE and IVRE estimations, secondly between OLSFE or GLSRE estimations and finally between the instrumented IV and un-instrumented LS models[13]. Hausman's results for the first model i.e equation (2/3) support that there is no significant evidence of endogeneity besides that OLSFE and GLSRE yield identical coefficients for all countries and non oil countries, therefore we decline to use GLSRE and IV models for both of them. On the other hand, it supports the existence of endogeneity and that OLSFE and GLSRE does not provide identical coefficients for oil dependant countries, so we decided to use IVRE. Moreover, Hausman's results for the second model—i.e. equation (2/4)–support that there is no significant evidence of endogeneity besides that OLSFE and GLSRE yield identical coefficients for all, oil and non oil countries.

2.5.3 RESULTS OF AUTOCORRELATION AND HETEROSKEDASTICITY TESTS

As mentioned above, most of the models are to be estimated using the panel fixed effects which may suffer from autocorrelation and causes the results to be less efficient. Therefore, we tested for autocorrelation using Wooldridge's (2002) test, the result provides strong evidence of autocorrelation as the null hypothesis of no autocorrelation is strongly rejected for the three panels i.e. all, oil and non-oil countries in both models of equations (2/3) and (2/4) as illustrated in Table 2-2. Also, we used the modified Wald statistic for group-wise heteroskedasticity test in the residuals of the fixed effect regressions to test for heteroskedasticity. The null hypothesis is decisively rejected for all panels i.e. all, oil and non-oil countries respectively for both models.

Table 2-2 Autocorrelation and Heteroskedasticity Results

Model	Country Group	Wooldridge's (2002) test for autocorrelation in panel data H0: No first-order Autocorrelation	Modified Wald test for group-wise heteroskedasticity in panel data H0: $\sigma_i^2 = \sigma^2$ for all countries
Model (1) Eq.(2/3)	Panel(1): All	50.75 (0.00)	402.83 (0.00)
	Panel(2): Oil	189.96 (0.00)	49.39 (0.00)
	Panel(3):Non-oil	214.79 (0.00)	48.33 (0.00)
Model (2) Eq.(2/4)	Panel(1): All	33.99 (0.00)	264.28 (0.00)
	Panel(2): Oil	72.07 (0.00)	50.58 (0.00)
	Panel(3): Non-oil	74.79 (0.00)	49.22 (0.00)

Numbers in parentheses are P-values.

[13] See Figure 2-1.

2.5.4 THE ESTIMATED MODELS[14]

In accordance with the results of autocorrelation and heteroskedasticity, we consider the estimation of our models using feasible generalized least squares FGLS estimators, with panel specific AR(1) autocorrelation (PSAR1) and heteroskedasticity structure, it allows estimation in the presence of AR(1) panels and cross-sectional correlation and heteroskedasticity across panels. Starting by estimating the model presented by equation (2/3), the most interesting aspect of the estimates is the existence of a positive relationship between government fiscal balance GFB and current account balance CAB as $(\beta' > 0)$. The results shown in Table 2-3 strongly support (TDH) and reject the (REH) for oil exporting countries whereas supporting (REH) and reject (TDH) for the non-oil exporting countries as β_1 almost zero and not significant.[15]

These outcomes are contrary to the results of Miller and Russek (1989) for the US (a large developed economy) during the fixed exchange rate period (1946:i to 1971:ii) in which the twin deficits notion is not supported, whereas it is in the same line (i.e. TDH is supported) as the results of eight OECD countries (Australia, Britain, Canada, France, Germany, Ireland, Italy and the United States) over the period of floating exchange rates from 1972:i to 1987:iv (Kearney and Monadjemi 1990). In oil exporting countries, a one percent increase in government fiscal balance to GDP ratio increases current account balance to GDP by 0.28—0.39 percent.[16] This result supports Morsy (2009) for oil exporting countries in which a one percent increase in the government fiscal balance to GDP ratio leads to an almost 0.5 percent increase in the current account balance to GDP ratio. Also, these results accord with Owoye (2006) for Nigeria in which there is a positive relationship between trade and budget deficits in both the short and long run. The plausible explanation that oil exporting countries are Keynesian[17] may be that they care little about

[14] The reported results in the chapter's context are for all countries except Kuwait because it has a huge drop in the current account balance in 1991 which may affect the estimation. But, however the results for all countries including Kuwait are provided in Appendix C as will as the results for all countries excluding Kuwait in the first difference, because the results of the time series unit root tests for the individual countries in chapter 3 contradict the results of panel data unit root tests, to confirm our main results and avoid any doubt, interestingly the results are the same in terms of signs with slight change in the magnitudes when including Kuwait and when using the differenced data which make robust results.

[15] This result is almost the same as given by all other estimation techniques.

[16] The change of current account and general fiscal balances by 0.30 percent of GDP is considered to be significant because the average rate of these balances to GDP is -2.5 to 7.5 percent of GDP.

[17] Being Keynesian country does not imply its people to be Keynesian also.

short to medium run fiscal deficits (and its effect on the current account) which caused by the increasing government expenditures because they spend all of the oil revenues and expect more future income from that expenditure which is not the case with non-oil countries.[18]

Our results are in line with the conventional view and resemble the findings of Vamvoukas (1997), Saleh et al (2005), Enders and Lee (1990), and Mohammadi (2004) who has found that the increase of budget surplus to GDP ratio by one percent improves the current account balance to GDP ratio by 0.31 to 0.49 percent in developing countries, and 0.21 to 0.24 percent in industrial countries. Also, Jeffrey and Tallman (1993) argued that the 1980's US budget deficit contributed significantly to its large trade deficit. When gross investment exceeds gross saving, current account surplus/deficit decreases/increases respectively and also increasing/decreasing fiscal surplus/deficit do the same, which is clearly shown in equation (2/1). The conclusion is that, the wider the gap between saving and investment is the greater will be the deterioration in the current account balance. A one percentage point increase in the saving-investment gap to GDP ratio tends to raise current account deficit to GDP ratio by 0.17 percent in the panel as a whole. In the oil exporting countries each increase by one percent in saving-investment gap deteriorate current account by 0.35 percent, whereas improves current account balance in non-oil countries by 0.08 percent.

Also, there is a positive relationship between the gross rate of money supply and current account balance in oil exporting countries. An increase in the growth rate of money supply by one percent improves the current account balance to GDP ratio by 0.05 percent. That is, in these same small open economies; current account surplus with fixed nominal exchange rate regime (as the Arab oil countries) increases the acquisition of hard currencies causing the nominal exchange rate to appreciate forcing the central banks to intervene to hold the exchange rate constant. It buys the foreign currencies, in exchange for domestic currency. This intervention causes the home country currency stock to increase and interest rate starts to decline. Because these economies are small and open, when the interest rate

[18] The agents in these countries are forward-looking in a passive way as they do not increase their saving now to pay the future taxe (which is the case in REH), they spend more now and when the future comes all they have to do is to export more oil.

Table 2-3 Results of Estimated Coefficients of Model 1 i.e. Eq. (2/3)

Panel (1): All Countries

$$CAB_{it} = \alpha + \beta_1 GFB_{it} + \beta' GFBD1_{it} + \beta_2 GDS_{it} + \beta_3 GI_{it} + \beta_4 GMS_{it} + \beta_5 TO_{it} + \beta_6 CM_{it} + \beta_7 TT_{it} + \beta_8 GDPG_{it} + u_{it}$$

	IVFE	IVRE	FE OLS	RE GLS	FGLS PSAR1 Heterosk.
α	-8.44 (6.97)	-5.46 (3.57)	-12.9*** (2.70)	-6.69*** (2.59)	**-12.25***** (1.91)
β_1	0.02 (0.23)	0.49** (0.23)	0.003 (0.10)	0.51*** (0.17)	-0.04 (0.07)
β'	0.77** (0.39)	0.33 (0.39)	0.34*** (0.11)	0.04 (0.18)	**0.28***** (0.08)
β_2	0.54*** (0.08)	0.62*** (0.06)	0.56*** (0.03)	0.58*** (0.03)	**0.69***** (0.03)
β_3	-0.67*** (0.12)	-0.79*** (0.12)	-0.73*** (0.05)	-0.84*** (0.08)	**-0.86***** (0.03)
β_4	0.48* (0.30)	0.41 (0.33)	0.05** (0.02)	0.10** (0.04)	**0.04***** (0.01)
β_5	2.19 (5.05)	-0.99 (2.53)	3.42* (2.10)	0.48 (1.56)	0.05 (0.96)
β_6	0.08 (0.07)	0.03 (0.06)	0.002 (0.02)	-0.02 (0.03)	-0.003 (0.01)
β_7	0.07** (0.03)	0.08*** (0.03)	0.10*** (0.01)	0.10*** (0.02)	**0.13***** (0.01)
β_8	-0.55 (0.42)	-0.42 (0.49)	0.07*** (0.02)	0.04 (0.03)	-0.002 (0.006)
R^2	0.51	0.65	0.77	0.78	—

Hausman test (IVFE vs. IVRE)	**67.36 (0.00)**
Hausman test (OLSFE vs. GLSRE)	**34.30 (0.00)**
Hausman test (IVFE vs. OLSFE)	**2.18 (0.98)**
D-M Test for *GFB*	**0.99 (0.32)**
D-M Test for *TO*	**0.97 (0.33)**
D-M Test for *GGDP*	**8.59 (0.00)**

Panel (2): Oil Countries

$$CAB_{it} = \alpha + \beta_1 GFB_{it} + \beta_2 GDS_{it} + \beta_3 GI_{it} + \beta_4 GMS_{it} + \beta_5 TO_{it} + \beta_6 CM_{it} + \beta_7 TT_{it} + \beta_8 GDPG_{it} + u_{it}$$

	IVFE	IVRE	FE OLS	RE GLS	FGLS PSAR1 Heterosk.
α	-0.31 (16.35)	24.13 ** (9.66)	-2.80 (5.34)	23.10*** (4.04)	**9.87***** (3.22)
β_1	0.82** (0.39)	1.22*** (0.42)	0.37*** (0.07)	0.77*** (0.08)	**0.39***** (0.05)
β_2	0.56*** (0.14)	0.35*** (0.14)	0.54*** (0.05)	0.22*** (0.04)	**0.59***** (0.04)
β_3	-0.78*** (0.20)	-0.68*** (0.23)	-0.78*** (0.07)	-0.70*** (0.10)	**-0.94***** (0.05)
β_4	0.55 (0.37)	0.67 (0.45)	0.07*** (0.03)	0.14*** (0.04)	**0.05***** (0.02)
β_5	0.92 (10.89)	-10.75* (6.14)	-1.21 (3.55)	-7.82*** (2.19)	**-7.37***** (1.72)
β_6	0.10 (0.10)	0.07 (0.11)	-0.007 (0.02)	-0.03 (0.03)	-0.001 (0.02)
β_7	0.06 (0.05)	0.02 (0.05)	0.10*** (0.01)	0.05*** (0.02)	**0.10***** (0.01)
β_8	-0.61 (0.51)	-071 (0.64)	0.08*** (0.02)	0.07** (0.03)	0.02 (0.006)
R^2	0.22	0.21	0.60	0.72	—

Hausman test (IVFE vs. IVRE)	**0.10 (1.00)**
Hausman test (OLSFE vs. GLSRE)	**161.52 (0.00)**
Hausman test (IVRE vs. OLSFE)	**22.04 (0.005)**
D-M Test for *GFB*	**1.55 (0.21)**
D-M Test for *TO*	**1.59 (0.20)**
D-M Test for *GGDP*	**11.04 (0.00)**

Panel (3): Non-oil Countries

$$CAB_{it} = \alpha + \beta_1 GFB_{it} + \beta_2 GDS_{it} + \beta_3 GI_{it} + \beta_4 GMS_{it} + \beta_5 TO_{it} + \beta_6 CM_{it} + \beta_7 TT_{it} + \beta_8 GDPG_{it} + u_{it}$$

	IVFE	IVRE	FE OLS	RE GLS	FGLS PSAR1 Heterosk.
α	-13.11*** (4.83)	-16.56*** (3.87)	-18.27*** (3.29)	-22.21*** (2.88)	**-16.77***** (3.29)
β_1	-0.26* (0.15)	-0.18 (0.14)	0.03 (0.10)	0.02 (0.11)	0.005 (0.07)
β_2	0.45*** (0.08)	0.77*** (0.05)	0.47*** (0.06)	0.81*** (0.04)	**0.62***** (0.06)
β_3	-0.62*** (0.12)	-0.58*** (0.10)	-0.58*** (0.06)	-052*** (0.07)	**-0.54***** (0.06)
β_4	-0.77*** (0.25)	-0.46*** (0.20)	-0.08 (0.06)	-0.04 (0.07)	0.05 (0.03)
β_5	0.06 (4.89)	-8.93*** (2.46)	4.64* (2.65)	-6.66*** (1.84)	**-6.82***** (2.22)
β_6	0.08 (0.05)	0.11*** (0.04)	0.04 (0.04)	0.09*** (0.04)	0.02 (0.03)
β_7	0.19*** (0.04)	0.17*** (0.02)	0.13*** (0.02)	0.16*** (0.02)	**0.14***** (0.02)
β_8	0.18 (0.11)	0.17* (0.10)	-0.11** (0.05)	-0.03 (0.06)	-0.04 (0.03)
R^2	0.61	0.84	0.73	0.87	—

Hausman test (IVFE vs. IVRE)	**26.25 (0.00)**
Hausman test (OLSFE vs. GLSRE)	**66.19 (0.00)**
Hausman test (IVFE vs. OLSFE)	**10.37 (0.24)**
D-M Test for *GFB*	**0.003 (0.96)**
D-M Test for *TO*	**4.295 (0.04)**
D-M Test for *GGDP*	**0.167 (0.68)**
D-M Test for *GI*	**3.577 (0.06)**
D-M Test for *GMS*	**17.12 (0.00)**

*, ** and *** denote 10, 5 and 1 percent significance levels respectively. D-M test is the Davidson-MacKinnon test of exogeneity of a variable. GLS is the feasible generalized least-squares estimators—with PSAR1 and Heterosk–it allows estimation in the presence of AR (1) panels and cross-sectional correlation and heteroskedasticity across panels.

tries to fall below world interest rate as a result of increasing money supply, savers will invest abroad. This result is in the vein of the outcomes by Owoye (2006) in which he has found that a positive association relates the trade account balance and money supply in Nigeria (oil exporting country). But there is no room for monetary policy to play a role in non-oil countries in order to improve current account position because its relationship with growth rate of money supply is not significant.

We hypothesised that the trade openness TO would have an impact on the current account balance, the results rejects that hypothesis for all countries, but it supports our hypothesis for oil and non oil countries. A one percent increase in trade openness decreases the current account balance by 7.37 and 6.82 percent in the oil and non oil countries respectively. This result is contrary to Chowdhury and Saleh (2007) outcomes for Sri Lanka. The plausible explanation is that more openness in trade leads to more imports relative to the exports as most of those countries' imports are manufactured goods—which sold for higher prices–while almost all of its exports are oil and raw material. In contrary, the current account balance is not sensitive to capital mobility in all country groups which supports the results for the growth rate of money supply in oil countries. That is, the contractionary fiscal policy by running fiscal surplus decreases both the interest rate and income[19]. The decreased income decreases the aggregate demand and brings about current account improvement (surplus), without any effect on capital flows, causing foreign currencies to increase, monetary authorities react by increasing money supply. Furthermore, there is positive relationship between terms of trade and the current account balance, a one percent increase in country's terms of trade with its trade partner improves current account position in all, oil and non-oil countries by 0.13, 0.10 and 0.14 percent respectively. For oil producing countries, high oil prices contribute to the improvement of its terms of trade. In contrary, the results do not provide any evidence of a relationship between current account balance and GDP growth rate.

As mentioned earlier, both Keynesian and Ricardian views predict that deficits due to a temporary rise in government spending will cause a current account deficit. They differ, however, on the effect of a temporary tax cut. To capture that difference we split up government fiscal balance into its two components of taxes and government expenditure as

[19] Because it shifts the IS curve leftwards.

Table 2-4 Results of Estimating Coefficients of Model 2 i.e. Eq. (2/4)

Panel (1): All Countries

$$CAB_{it} = \alpha + \beta_1 TAX_{it} + \beta' TAX_{it} D1 + \beta_2 GEX_{it} + \beta'' GEX_{it} D1 + \beta_3 GDS_{it} + \beta_4 GI_{it} + \beta_5 GMS_{it} + \beta_6 TO_{it} + \beta_7 CM_{it} + \beta_8 TT_{it} + \beta_9 GDPG_{it} + u_{it}$$

	IVFE	IVRE	FE OLS	RE GLS	FGLS PSAR1 Heterosk.
α	-11.69 (11.11)	12.31** (5.22)	-8.77** (4.62)	14.08*** (2.59)	2.96*** (3.30)
β_1	-0.05 (0.26)	0.002 (0.26)	-0.10 (0.11)	-0.04 (0.14)	-0.08 (0.07)
β'	0.94** (0.43)	1.17*** (0.42)	0.47*** (0.13)	0.80*** (0.16)	0.35*** (0.09)
β_2	-0.19 (0.31)	-0.86*** (0.28)	-0.19 (0.13)	-0.97*** (0.15)	-0.50*** (0.11)
β''	-0.43 (0.40)	-0.20 (0.45)	-0.18 (0.15)	0.23 (0.15)	0.12 (0.10)
β_3	0.56*** (0.09)	0.37*** (0.09)	0.54*** (0.04)	0.29*** (0.03)	0.53*** (0.04)
β_4	-0.62*** (0.13)	-0.57*** (0.13)	-0.72*** (0.05)	-0.65*** (0.06)	0.87*** (0.04)
β_5	0.50* (0.30)	0.55 (0.37)	0.06*** (0.02)	0.11*** (0.03)	0.03*** (0.01)
β_6	1.62 (5.44)	-7.02** (2.82)	1.73 (2.28)	-5.11*** (1.31)	0.17 (1.39)
β_7	0.07 (0.06)	0.04 (0.07)	0.002 (0.02)	0.03 (0.02)	-0.007 (0.01)
β_8	0.08*** (0.03)	0.04 (0.03	0.10*** (0.01)	0.06*** (0.01)	0.10*** (0.01)
β_9	-0.55 (0.41)	-0.58 (0.52)	0.07*** (0.02)	0.05** (0.02)	0.024** (0.01)
R^2	0.62	0.64	0.81	0.78	—

Hausman test (IVFE vs. IVRE)	**9.91 (0.54)**
Hausman test (OLSFE vs. OLSRE)	**327.03 (0.00)**
Hausman test (IVRE vs. OLSFE)	**8.99 (0.62)**
D-M Test for *TAX*	**0.11 (0.74)**
D-M Test for *GEX*	**2.29 (0.13)**
D-M Test for *TO*	**1.49 (0.22)**
D-M Test for *GGDP*	**7.36 (0.006)**

Panel(2): Oil Countries

$$CAB_{it} = \alpha + \beta_1 TAX_{it} + \beta_2 GEX_{it} + \beta_3 GDS_{it} + \beta_4 GI_{it} + \beta_5 GMS_{it} + \beta_6 TO_{it} + \beta_7 CM_{it} + \beta_8 TT_{it} + \beta_9 GDPG_{it} + u_{it}$$

	IVFE	IVRE	FE OLS	RE GLS	FGLS PSAR1 Heterosk
α	-128.50 (87.05)	-23.23 (65.35)	-0. 39 (9.33)	40.38*** (7.75)	36.38*** (6.44)
β_1	0.60** (0.26)	1.21** (0.61)	0.36*** (0.08)	0.64*** (0.10)	0.23*** (0.06)
β_2	1.42 (1.26)	-0.28 (0.84)	-0.41*** (0.14)	-1.03*** (0.13)	-0.85*** (0.11)
β_3	1.20*** (0.47)	0.54 (0.37)	0.52*** (0.06)	0.17*** (0.05)	0.38*** (0.05)
β_4	-0.57*** (0.24)	-0.62** (0.32)	-0.79*** (0.07)	-0.77*** (0.10)	-1.03*** (0.05)
β_5	0.44* (0.25)	0.85 (0.69)	0.07*** (0.03)	0.12*** (0.04)	0.04*** (0.02)
β_6	31.08 (23.57)	1.94 (15.56)	-1.63 (3.80)	-11.9*** (2.66)	-8.15*** (2.25)
β_7	0.05 (0.07)	0.09 (0.14)	-0.006 (0.02)	-0.03 (0.03)	-0.005 (0.02)
β_8	0.20*** (0.08)	0.04 (0.05)	0.10*** (0.02)	0.05*** (0.02)	0.08*** (0.02)
β_9	-0.45 (0.34)	-0.87 (0.89)	0.08*** (0.02)	0.07*** (0.03)	0.02** (0.01)
R^2	0.13	0.10	0.60	0.73	—

Hausman test (IVFE vs. IVRE)	**1.80 (0.99)**
Hausman test (OLSFE vs. OLSRE)	**58.50 (0.00)**
Hausman test (IVRE vs. OLSFE)	**14.29 (0.11)**
D-M Test for *TAX*	**0.022 (0.88)**
D-M Test for *GEX*	**4.304 (0.04)**
D-M Test for *TO*	**2.542 (0.11)**
D-M Test for *GGDP*	**7.022 (0.00)**

Panel(3): Non-oil Countries

$$CAB_{it} = \alpha + \beta_1 TAX_{it} + \beta_2 GEX_{it} + \beta_3 GDS_{it} + \beta_4 GI_{it} + \beta_5 GMS_{it} + \beta_6 TO_{it} + \beta_7 CM_{it} + \beta_8 TT_{it} + \beta_9 GDPG_{it} + u_{it}$$

	IVFE	IVRE	FE OLS	RE GLS	FGLS PSAR1 Heterosk.
α	-11.24* (6.71)	-7.16*** (4.40)	-11.18** (4.62)	-10.89*** (3.72)	-10.00*** (4.10)
β_1	-0.27* (0.15)	-0.25* (0.13)	-0.03 (0.10)	-0.06 (0.10)	-0.04 (0.07)
β_2	0.21 (0.22)	-0.10 (0.18)	-0.22* (0.13)	-0.38*** (0.13)	-0.26** (0.12)
β_3	0.44*** (0.09)	0.64*** (0.06)	0.42*** (0.06)	0.64*** (0.06)	0.55*** (0.06)
β_4	-0.61*** (0.12)	-0.59*** (0.09)	-0.55*** (0.06)	-051*** (0.06)	-0.55*** (0.06)
β_5	-0.75*** (0.27)	-0.44** (0.20)	-0.06 (0.06)	-0.02 (0.06)	0.05 (0.04)
β_6	-0.7 2 (5.05)	-7.63*** (2.47)	2.45 (2.81)	-4.88*** (1.79)	-6.06*** (2.22)
β_7	0.07 (0.05)	0.07* (0.04)	0.03 (0.04)	0.04 (0.04)	0.02 (0.03)
β_8	0.18*** (0.04)	0.16*** (0.02)	0.12*** (0.02)	0.14*** (0.02)	0.13*** (0.02)
β_9	0.17 (0.12)	0.15 (0.11)	-0.11** (0.05)	-0.07 (0.05)	0.02 (0.03)
R^2	0.64	0.86	0.82	0.89	—

Hausman test (IVFE vs. IVRE)	**19.66 (0.02)**
Hausman test (OLSFE vs. OLSRE)	**44.21 (0.00)**
Hausman test (IVFE vs. OLSFE)	**9.44 (0.39)**
D-M Test for *TAX*	**0.057 (0.81)**
D-M Test for *GEX*	**0.061 (0.81)**
D-M Test for *TO*	**4.64 (0.03)**
D-M Test for *GGDP*	**0.347 (0.56)**
D-M Test for *GI*	**3.656 (0.06)**
D-M Test for *GMS*	**14.99 (0.00)**

*, ** and *** denote 10, 5 and 1 percent significance levels respectively. D-M test is the Davidson-MacKinnon test of exogeneity of a variable. GLS is the feasible generalized least-squares estimators—with PSAR1 and Heterosk–it allows estimation in the presence of AR (1) panels and cross-sectional correlation and heteroskedasticity across panels.

illustrated in equation (2/4). As shown in Table 2-4, the most interesting feature of the second model estimates is the existence of a positive relationship between taxes and current account balance CAB, $(\beta' > 0)$ for oil countries. Whereas there is no such relationship for non oil countries, (β_1) is almost zero and not significant.

Furthermore, there is a negative relationship between government expenditure and current account balance in both oil and non oil countries. The results shown in Table 2-4 strongly indicate that oil countries are Keynesian and the non oil countries are Ricardian. Plausible explanation of that result is that the oil exporting countries care little about the fiscal deficit because the more the current government spending on infrastructure, the more the future income, which is not true for non-oil countries. In oil exporting countries, one percent increase (decrease) in taxes to GDP ratio, increases current account surplus (deficit) to GDP by 0.23 - 0.35 percent. One percent increase in government expenditure to GDP ratio tends to deteriorate current account position in both oil and non oil countries by 0.26 – 0.85 percent. Regarding the other variables, they have the same signs and almost the same magnitudes as those from the first model in equation (2/3) except for the growth rate of GDP as one percent increase of it brings about 0.024 and 0.02 in all and oil countries respectively.

2.6 CONCLUSIONS

In this chapter we have investigated the association between current account and fiscal balances for the Arab world (small open economies) to test the validity of REH in which lower public savings are met by equal increases in private saving, and as a result the current account does not respond to the changes in government spending against TDH in which a fall in public saving has an adverse effect on the current account balance in some countries from the Arab world. The chapter contributes to the existing literature both in terms of the sample studied (i.e. countries depending on fixed exchange rate, and oil versus non-oil countries) as well as the variables considered. The estimates statistically support the conventional theory of positive relationship between fiscal and external balances TDH for oil producing countries, whereas supporting cthe Ricardian view in non oil countries. In our calibration, we find that one percent increase in the government fiscal balance (surplus/deficit) to GDP ratio tends to (improve/deteriorate) the current account balance to

GDP ratio by 0.28 to 0.39 percent in oil countries in contrast to the non oil countries where such relationship does not exist. More deeply, one percent increase in government expenditure in deteriorates current account by 0.85—0.26 percent in both oil and non oil countries, at the same time, one percent increase (decrease) in taxes to GDP ratio, increases current account surplus (deficit) to GDP by 0.23—0.35 percent just in oil countries.

The wider the gap between saving and investment the greater is the deterioration in the current account balance. An increase in the growth rate of money supply by one point improves the current account balance to GDP ratio by 0.04 percent only in oil countries. Therefore, central banks can play a very important role in order to resolve current account problems in these countries. In addition, unlike non oil countries, oil countries can improve their current account position by increasing its degree of trade openness.

2.7 APPENICES

2.7.1 APPENDIX B

The Fisher Panel Unit Root Test

To test for unit root in panel data, G. S. Maddala (1999) and Choi (2001) suggest to use a non parametric Fisher-type test which is based on a combination of the *p*-values of the test-statistics for a unit root in each cross-sectional unit (the ADF test or other non stationarity tests). Both IPS and Fisher tests combine information based on individual unit root tests and relax the restrictive assumption of the LLC test that p_i is the same under the alternative. As Choi (2001) noted, previous tests (i.e. LLC and IPS) suffer from some common inflexibilities which can restrict their use in applications:

- They all require an infinite number of groups.
- All the groups are assumed to have the same type of non-stochastic component.
- T is assumed to be the same for all the cross-section units and to consider the case of unbalanced panel further simulations are required.
- As Levin and Lin, the critical values are sensitive to the choice of lag lengths in the ADF regressions.
- Finally, all the previous tests hypothesize that none of the groups have a unit root under the alternative hypothesis: they do not allow that some groups have a unit root and others do not.

Choi (2001) tries to overcome these limitations and proposes a very simple test based on the combination of p-values from a unit root test applied to each group in the panel data. There exist a number of possible p-value combinations to this aim, but the Fisher's one turns out to be the better choice. Choi (2001) considers the model:

$$y_{it} = d_{it} + x_{it} \qquad (1)$$

Where; $i = 1,2,....,N$, $t = 1,2,.....,T$ and:

$$d_{it} = \alpha_{i0} + \alpha_{it}t + \cdots + \alpha_{im_i}t^{m_i} \qquad (2)$$

$$x_{it} = \rho_i x_{i(t-1)} + u_{it}$$

u_{it} is integrated of order zero. Note that the observed data it y_{it} are composed of a non-stochastic process d_{it} and a stochastic process x_{it}. Each time series y_{it} can have different sample size and different specification of non-stochastic and stochastic component depending on i. Notably u_{it} may be heteroscedasticity. The null hypothesis is:

$H_0 : \rho_t = 1$ For all i (3)

This implies that all the time series are unit root non-stationary. The alternative hypothesis may be:

$H_a : |\rho_i| < 1$ For at least one i from infinite N (4)

That is some time series are non-stationary while the others are not, or

$H_a : |\rho_i| < 1$ For some $i's$ for infinite N (5)

Let G_{iT_i} be a one-sided unit root test statistic (e.g. DF tests) for the i^{th} group in model (1) and assume that:

- Under the null hypothesis, as $T_i \to \infty$, $G_{iT_I} \Rightarrow G_i$, where G_i is a non degenerate random variable
- u_{it} is independent of u_{js} for all t and s when $i \neq j$
- $(N_k / N) \to k$ (a fixed constant) as $N \to \infty$

Let ρ_i be the *p*-value of a unit root test for cross-section i, [i.e. $\rho_i = F(G_{iT_i})$, where $F(.)$ is the distribution function of G_i]. The proposed Fisher type test is:

$$P = -2\sum_{i=1}^{N} \ln p_i \qquad (6)$$

This combines the *p*-value from unit root tests for each cross section i to test for unit root in panel data. Under null hypothesis of unit root, P is distributed as $\chi^2(2N)$ and $T_i \to \infty$ for all N. Fisher test holds some important advantages:

- It does not require a balanced panel, as the case with our sample.
- It can be carried out for any unit root test derived.
- It is possible to use different lag lengths in the individual ADF regression.

The main disadvantage of this test is that the *p*-values have to be derived by Monte Carlo simulation. When N is large, it is necessary to modify the P test since in the limit it has a degenerate distribution. Having for the P test $E[-2\ln p_i] = 2$ $Var[-2\ln p_i] = 4$, Choi (2001) proposes a Z test:

$$Z = \frac{1}{2\sqrt{N}} \sum_{i=1}^{N} \left(-2 \ln p_i - 2\right) \qquad (7)$$

This statistic corresponds to the standardized cross-sectional average of individual *p*-values. Under the cross sectional independence assumption of the p_i's, the Lindeberg-Levy central limit theorem is sufficient to show that under the unit root hypothesis Z converges to a standard normal distribution as $\left(T_i, N \to \infty\right)_{seq}$. Choi (2001) also studies the effects of serial correlation in it u_{it} on the size for the panel unit root tests and concludes that this is an important source of size distortions.

CADF Panel Unit Root Tests

Given the following Cross Sectional Augmented Dickey Fuller (CADF) regression,

$$\Delta y_{it} = a_i + b_i y_{it-1} + c_i \bar{y}_{t-1} + d_i \Delta \bar{y}_t + e_{it} \qquad (8)$$

The exact null distribution of the t-ratio, $t_i(N,T)$ will depend on nuisance parameters (although not asymptotically), and Pesaran conducts simulations to derive the critical values. He found that the distribution of the t-ratio in the CADF regression is skewed to the left even more than the standard DF distribution. The CADF distribution has a substantially negative mean and its standard deviation is less than unity. Pesaran (2007) considers the following cross-sectional augmented version of the IPS test:

$$CIPS(N,T) = N^{-1} \sum_{i=1}^{T} t_i(N,T) \qquad (9)$$

Where $t_i(N,T)$ is the CADF statistic for the i^{th} cross section unit given by the t-ratio of the coefficient on y_{it-1} in the CADF regression (8). Pesaran also considers an average of the truncated version of the CADF to help deal with the problems created by a lack of independence of the individual CADF statistics. He found that the finite sample distribution of $CIPS*(N,T)$ and the truncated version $CIPS*(N,T)$ differ only for very small values of T and are indistinguishable for $T > 20$.

Pesaran also considers several extensions of the CIPS test procedure to deal with individual specific error terms that are serially correlated. Each of the three models he considers results in the same specification for the CADF regression but with different error specifications and parameter heterogeneity. Consider the case of an $AR(p)$ error specification. The relevant individual CADF statistic is the t-ratio of b_i in:

$$\Delta y_{it} = a_i + b_i y_{it-1} + c_i \bar{y}_{t-1} + \sum_{j=0}^{p} d_{ij} \Delta \bar{y}_{t-j} + \sum_{j=1}^{p} \delta_{ij} \bar{y}_{t-j} + e_{it} \qquad (10)$$

The null hypothesis assumes that all series are non-stationary and Pesaran' CADF is consistent under the alternative that only a fraction of the series is stationary. Another advantage of Pesaran' CADF test over other unit root tests—recently developed by Levin, Lin et al. (2002) and Im, Pesaran et al. (2003)–is that it is suitable for unbalanced panels, as the case with our sample.

MADF Panel Unit Root Tests

The multivariate augmented Dickey-Fuller panel unit root test (MADF) is an extension of a test developed by Abuaf and Jorion (1990) several years earlier. In this test, a single autoregressive parameter is estimated over a panel, by applying Zellner's SUR estimator to *N* equations, corresponding to the units of the panel. Since SUR can only be employed where $T > N$, the test may only be used where this condition is satisfied. Thus, it is not a suitable test for small-*T* large-*N* panels. Each equation is specified as k^{th} order autoregression, and the test involves testing the hypothesis that the sum of the coefficients on the autoregressive polynomial is unity. The null hypothesis states that this condition is satisfied over the *N* equations. Thus, this null will be violated if even one of the series in the panel is stationary. A rejection should thus not be taken to indicate that each of the series in the panel is stationary, but rather an indication that the condition that all series are does not receive empirical support. Critical values are nonstandard, and have been generated by simulation of a response surface. The authors claim that the MADF test is "very much more powerful than the univariate ADF test." (Taylor and Sarno 1998).

2.7.2 APPENDIX C

Table 2-5 The Estimated Coefficients of Mode 1 Eq. (4/2) for all Countries Including Kuwait

$$CAB_{it} = \alpha + \beta_1 GFB_{it} + \beta' GFBD1 + \beta_2 GDS_{it} + \beta_3 GI_{it} + \beta_4 GMS_{it} + \beta_5 TO_{it} + \beta_6 CM_{it} + \beta_7 TT_{it} + \beta_8 GDPG_{it} + u_{it}$$

	α	β_1	β'	β_2	β_3	β_4	β_5	β_6	β_7	β_8
All Countries	-15.57*** (2.55)	-0.003 (0.10)	0.28*** (0.11)	0.58*** (0.03)	-0.76*** (0.05)	0.05** (0.02)	5.31*** (2.07)	-0.005 (0.02)	0.11*** (0.01)	0.08*** (0.01)

D-M Test for endogeneity GFB = 0.54(0.46), TO = 3.37(0.07) and $GGDP$ = 5.36(0.02)

Hausman test **IVFE** against **IVRE** = 0.48 (1.00) → [**IVRE**]
Hausman test **OLSFE** against **GLSRE** = 347.23 (0.00) → [**OLSFE**]
Hausman test **OLSFE** against **IVRE =** 2.70 (0.97) → [**OLSFE**]
} [**OLSFE**]

Overall R-sq for [OLSFE] = 0.80

$$CAB_{it} = \alpha + \beta_1 GFB_{it} + \beta_2 GDS_{it} + \beta_3 GI_{it} + \beta_4 GMS_{it} + \beta_5 TO_{it} + \beta_6 CM_{it} + \beta_7 TT_{it} + \beta_8 GDPG_{it} + u_{it}$$

	α	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8
Oil Countries	-9.18** (4.51)	0.28*** (0.04)	0.56*** (0.04)	-0.82*** (0.07)	0.07*** (0.03)	2.63 (3.25)	-0.02 (0.02)	0.12*** (0.01)	0.09*** (0.02)

D-M Test for endogeneity GFB = 0.89 (0.35), TO = 3.97 (0.05) and $GGDP$ = 7.02 (0.01)

Hausman test **IVFE** against **IVRE** = 214.27 (0.00) → [**IVFE**]
Hausman test **OLSFE** against **GLSRE** = 325.26 (0.00) → [**OLSFE**]
Hausman test **OLSFE** against **IVFE =** 3.51 (0.90) → [**OLSFE**]
} [**OLSFE**]

Overall R-sq for [OLSFE] = 0.66

	α	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8
Non-Oil Countries	-18.27*** (3.29)	0.03 (0.10)	0.47*** (0.06)	-0.58*** (0.06)	-0.08 (0.06)	4.64* (2.65)	0.04 (0.04)	0.14*** (0.02)	-0.11*** (0.05)

D-M Test for endogeneity GFB = 0.003 (0.96), TO = 4.70 (0.03) , GMS = 21.79(0.00) and $GGDP$ = 0.16 (0.68)

Hausman test **IVFE** against **IVRE** = 25.41 (0.00) → [**IVFE**]
Hausman test **OLSFE** against **GLSRE** = 66.19 (0.00) → [**OLSFE**]
Hausman test **OLSFE** against **IVFE =** 8.87 (0.35) → [**OLSFE**]
} [**OLSFE**]

Overall R-sq for [OLSFE] = 0.73

Values in parentheses are standard errors of estimates. ***, ** and * Denote significant at 1%, 5% and 10% respectively.

Table 2-6 The Estimated Coefficients of Mode 2 Eq. (4/3) for all Countries Including Kuwait

$$CAB_{it} = \alpha + \beta_1 TAX_{it} + \beta' TAX_{it} D1 + \beta_2 GEX_{it} + \beta'' GEX_{it} D1 + \beta_3 GDS_{it} + \beta_4 GI_{it} + \beta_5 GMS_{it} + \beta_6 TO_{it} + \beta_7 CM_{it} + \beta_8 TT_{it} + \beta_9 GDPG_{it} + u_{it}$$

	α	β_1	β'	β_2	β''	β_3	β_4	β_5	β_6	β_7	β_8	β_9
All Countries	-5.34 (4.08)	-0.15 (0.11)	0 .40*** (0.12)	-0.09 (0.10)	-0.41*** (0.14)	0.52*** (0.03)	-0.78*** (0.05)	0.05** (0.02)	3.09 (2.13)	-0.003 (0.02)	0.10*** (0.01)	0.08** (0.01)

All Countries:

D-M Test for endogeneity TAX = 0.13(0.71), $TAXD1$ = 0.10(0.74), GEX = 1.98(0 .15), $GEXD1$ = 0.27(0.59), TO = 3.10(0.08) and $GGDP$ = 7.39(0.01)

Hausman test **IVFE** against **IVRE** = 60.22(0.00) → [**IVFE**]
Hausman test **OLSFE** against **GLSRE** = 761.24(0.00) → [**OLSFE**]
Hausman test **OLSFE** against **IVRE =** 3.49(0.98) → [**OLSFE**]
} [**OLSFE**]

Overall R-sq for [OLSFE] = 0.80

$$CAB_{it} = \alpha + \beta_1 TAX_{it} + \beta_2 GEX_{it} + \beta_3 GDS_{it} + \beta_4 GI_{it} + \beta_5 GMS_{it} + \beta_6 TO_{it} + \beta_7 CM_{it} + \beta_8 TT_{it} + \beta_9 GDPG_{it} + u_{it}$$

	α	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9
Oil Countries	5.89 (7.76)	0.22*** (0.05)	-0.51*** (0.11)	0.50*** (0.05)	-0.86*** (0.07)	0.06*** (0.03)	0.01 (3.40)	-0.01 (0.02)	0.10*** (0.01)	0.09*** (0.02)
Non-Oil Countries	-11.18*** (4.62)	-0.03 (0.10)	-0.22* (0.13)	0.42*** (0.06)	-0.55*** (0.06)	-0.06 (0.06)	2.45 (2.81)	0.03 (0.04)	0.12*** (0.02)	-0.11** (0.05)

Oil Countries:

D-M Test for endogeneity TAX = 0.16(0.68), GEX = 5.71(0.01), TO = 4.16(0.04) and $GGDP$ = 6.71(0.01)

Hausman test **IVFE** against **IVRE** = 29.57(0.00) → [**IVFE**]
Hausman test **OLSFE** against **GLSRE** = 80.92(0.00) → [**OLSFE**]
Hausman test **OLSFE** against **IVFE =** 4.91(0.84) → [**OLSFE**]
} [**OLSFE**]

Overall R-sq for [OLSFE] = 0.69

Non-Oil Countries:

D-M Test for endogeneity TAX = 0.77(0.38), GEX = 0.34(0.56), GI = 3.65(0.06) TO = 4.64(0.03), GMS = 14.99(0.00) and $GGDP$ = 1.74(0.18)

Hausman test **IVFE** against **IVRE** = 19.66(0.02) → [**IVFE**]
Hausman test **OLSFE** against **GLSRE** = 44.21(0.00) → [**OLSFE**]
Hausman test **OLSFE** against **IVFE =** 9.44(0.39) → [**OLSFE**]
} [**OLSFE**]

Overall R-sq for [OLSFE] = 0.82

Values in parentheses are standard errors of estimates. ***, ** and * Denote significant at 1%, 5% and 10% respectively.

Table 2-7 The Results of Both Models in First Difference for all Countries but Kuwait

Model 1: Equation (4/2)

$$CAB_{it} = \alpha + \beta_1 \Delta GFB_{it} + \beta_2 \Delta GDS_{it} + \beta_3 \Delta GI_{it} + \beta_4 \Delta GMS_{it} + \beta_5 \Delta TO_{it} + \beta_6 \Delta CM_{it} + \beta_7 \Delta TT_{it} + \beta_8 \Delta GDPG_{it} + u_{it}$$

Coefficient	Panel(2): Oil Countries			Panel(3): Non-oil Countries		
	FE OLS	**RE GLS**	**FGLS PSAR1 Heterosk**	**FE OLS**	**RE GLS**	**FGLS PSAR1 Heterosk.**
α	-0.02 (0.27)	-0.02 (0.28)	-0.03 (0.25)	0.49*** (0.20)	0.49*** (0.19)	0.41*** (0.17)
β_1	0.20*** (0.05)	0.20*** (0.05)	0.18*** (0.04)	-0.03 (0.06)	-0.03 (0.05)	0.01 (0.06)
β_2	0.51*** (0.06)	0.51*** (0.06)	0.58*** (0.06)	0.45*** (0.06)	0.45*** (0.06)	0.45*** (0.06)
β_3	-0.97*** (0.05)	-0.97*** (0.05)	-0.97*** (0.04)	-0.53*** (0.06)	-0.53*** (0.06)	-0.58*** (0.05)
β_4	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.07** (0.03)	0.07*** (0.03)	0.08*** (0.03)
β_5	0.07 (3.2)	-0.04 (3.13)	0.60 (2.91)	-17.38*** (2.73)	-17.30*** (2.69)	-12.46*** (2.50)
β_6	-0.008 (0.011)	-0.01 (0.01)	-0.01 (0.01)	-0.01 (0.02)	-0.01 (0.02)	-0.03 (0.02)
β_7	0.08*** (0.01)	0.08*** (0.01)	0.10*** (0.01)	0.20*** (0.02)	0.20*** (0.02)	0.16*** (0.02)
β_8	0.04*** (0.01)	0.04*** (0.01)	0.03*** (0.01)	0.032 (0.02)	0.03 (0.02)	0.05*** (0.02)
$\mathbf{R^2}$	0.86	0.85	—	0.68	0.67	—
H test (OLSFE vs. OLSRE): 0.82 (0.99)				**H test (OLSFE vs. OLSRE): 0.08 (1.00)**		

Model 2 : Equation (4/3)

$$CAB_{it} = \alpha + \beta_1 \Delta TAX_{it} + \beta_2 \Delta GEX_{it} + \beta_3 \Delta GDS_{it} + \beta_4 \Delta GI_{it} + \beta_5 \Delta GMS_{it} + \beta_6 \Delta TO_{it} + \beta_7 \Delta CM_{it} + \beta_8 \Delta TT_{it} + \beta_9 \Delta GDPG_{it} + u_{it}$$

Coefficient	Panel(2): Oil Countries			Panel(3): Non-oil Countries		
	FE OLS	**RE GLS**	**FGLS PSAR1 Heterosk**	**FE OLS**	**RE GLS**	**FGLS PSAR1 Heterosk.**
α	-0.02 (0.24)	-0.02 (0.24)	-0.01 (0.22)	0.49*** (0.20)	0.49*** (0.19)	0.41*** (0.17)
β_1	0.10*** (0.04)	0.10*** (0.04)	0.10*** (0.04)	-0.03 (0.06)	-0.03 (0.06)	0.003 (0.06)
β_2	-0.86*** (0.10)	-0.85*** (0.10)	-0.88*** (0.09)	0.04 (0.12)	0.04 (0.12)	-0.06 (0.12)
β_3	0.33*** (0.06)	0.33*** (0.06)	0.36*** (0.06)	0.45*** (0.06)	0.45*** (0.06)	0.45*** (0.06)
β_4	-1.03*** (0.04)	-1.03*** (0.04)	-1.02*** (0.03)	-0.53*** (0.06)	-0.53*** (0.06)	-0.58*** (0.05)
β_5	0.01 (0.01)	0.01 (0.01)	0.01 (0.01)	0.07** (0.03)	0.07*** (0.03)	0.08*** (0.03)
β_6	1.27 (2.71)	1.06 (2.70)	-0.19 (2.47)	-17.39*** (2.74)	-17.31*** (2.70)	-12.44*** (2.50)
β_7	-0.004 (0.009)	-0.003 (0.009)	-0.004 (0.008)	-0.01 (0.02)	-0.01 (0.02)	-0.03 (0.02)
β_8	0.05*** (0.01)	0.05*** (0.01)	0.06*** (0.01)	0.20*** (0.02)	0.20*** (0.02)	0.16*** (0.02)
β_9	0.04*** (0.01)	0.04*** (0.01)	0.03*** (0.01)	0.03 (0.02)	0.03 (0.02)	0.05*** (0.02)
$\mathbf{R^2}$	0.89	0.89	—	0.67	0.67	—
H test (OLSFE vs. OLSRE): 50.74 (0.00)				**H test (OLSFE vs. OLSRE): 0.10 (1.00)**		

Values in parentheses are standard errors of estimates. ***, ** and * Denote significant at 1%, 5% and 10% respectively. H test denotes Hausman test statistic besides its p-value in parentheses.

2.7.3 APPENDIX D

Figure 2-2 Current Account Balance as a % of GDP

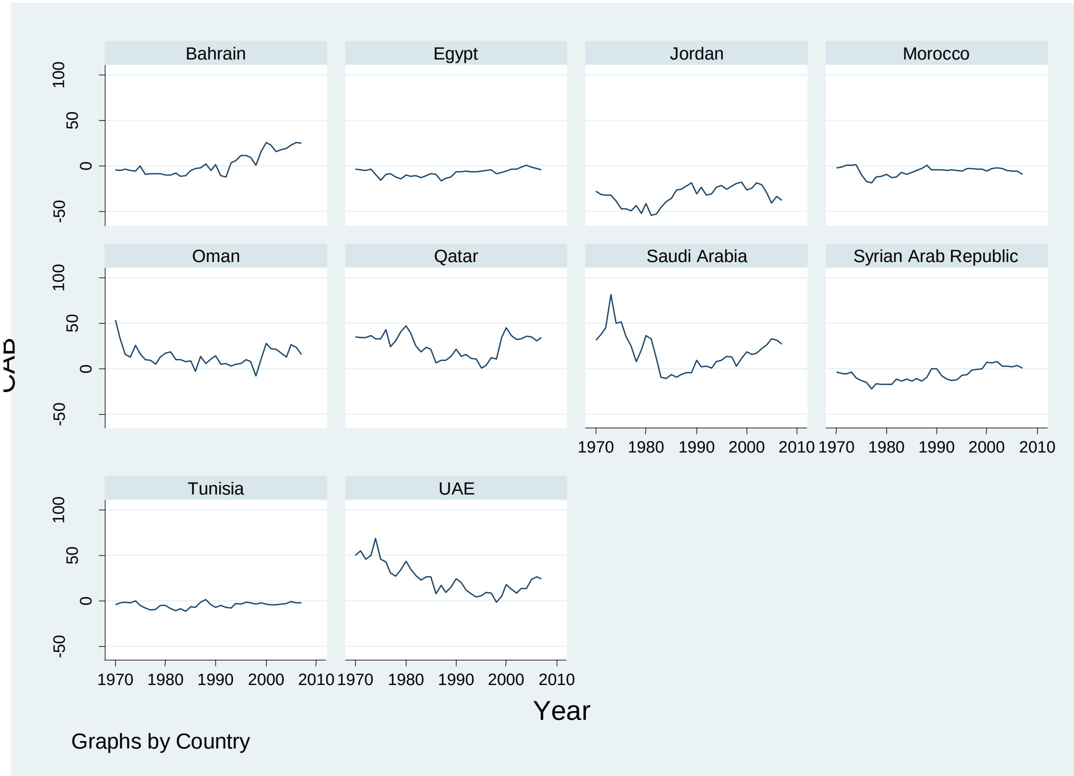


Figure 2-3 General Government Balance as a % of GDP

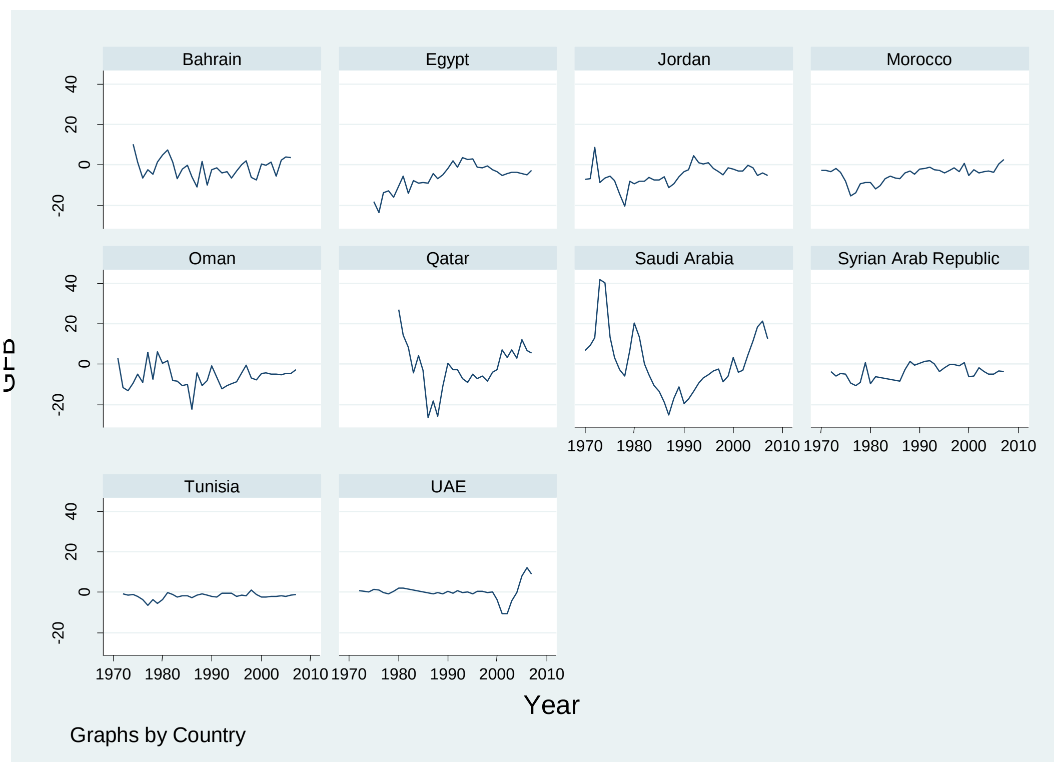


Figure 2-4 General Government Expendiyure as a % of GDP

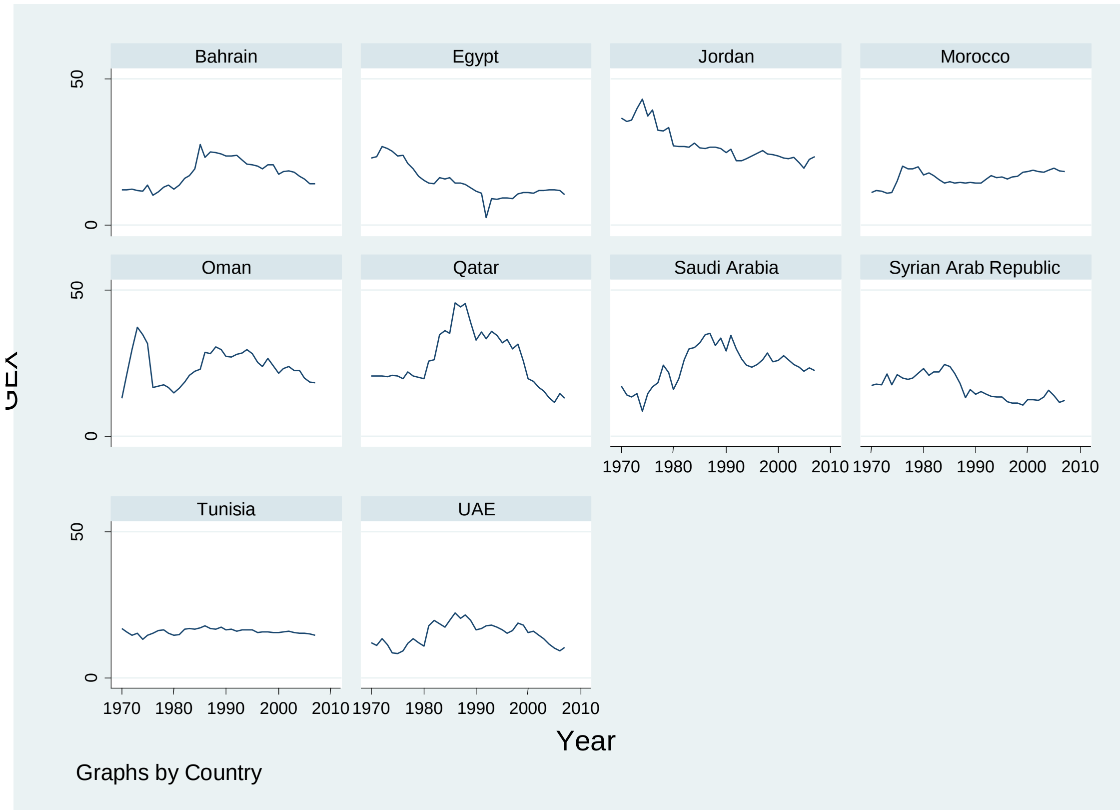


Figure 2-5 Government Revenues TAX as a % of GDP

Figure 2-6 Gross Domestic Saving GDS as a % of GDP

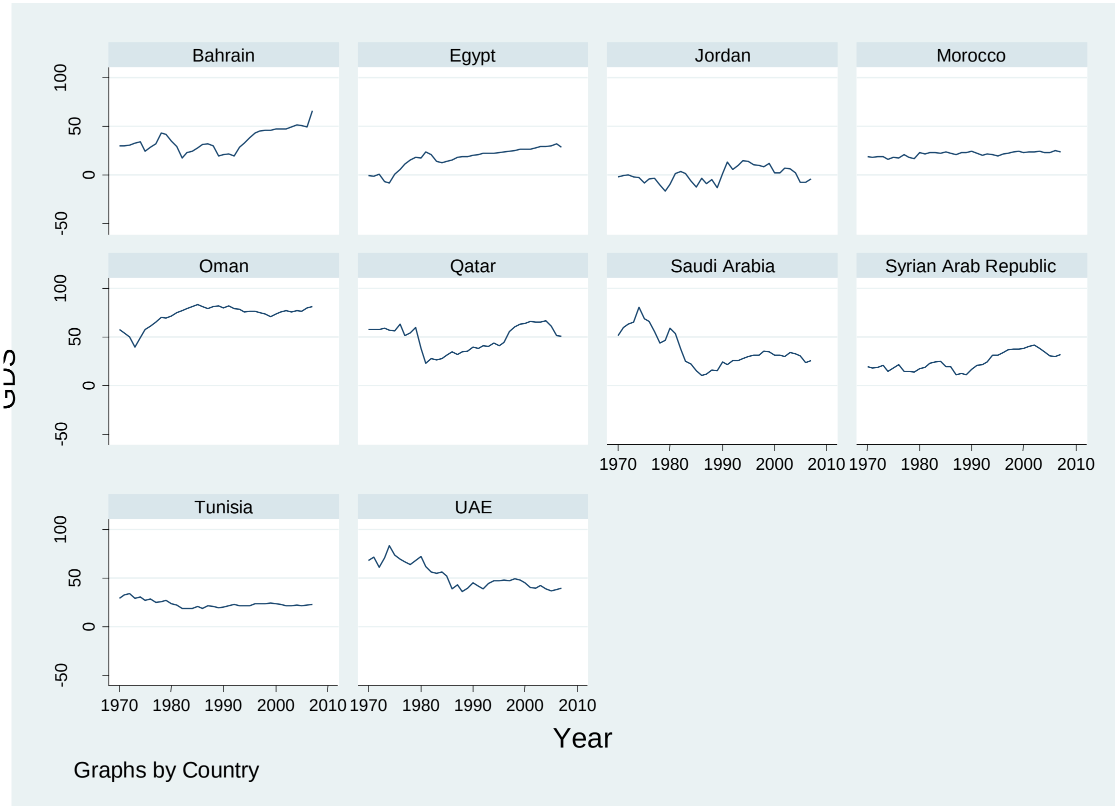


Figure 2-7 Gross Investment GI as a % of GDP

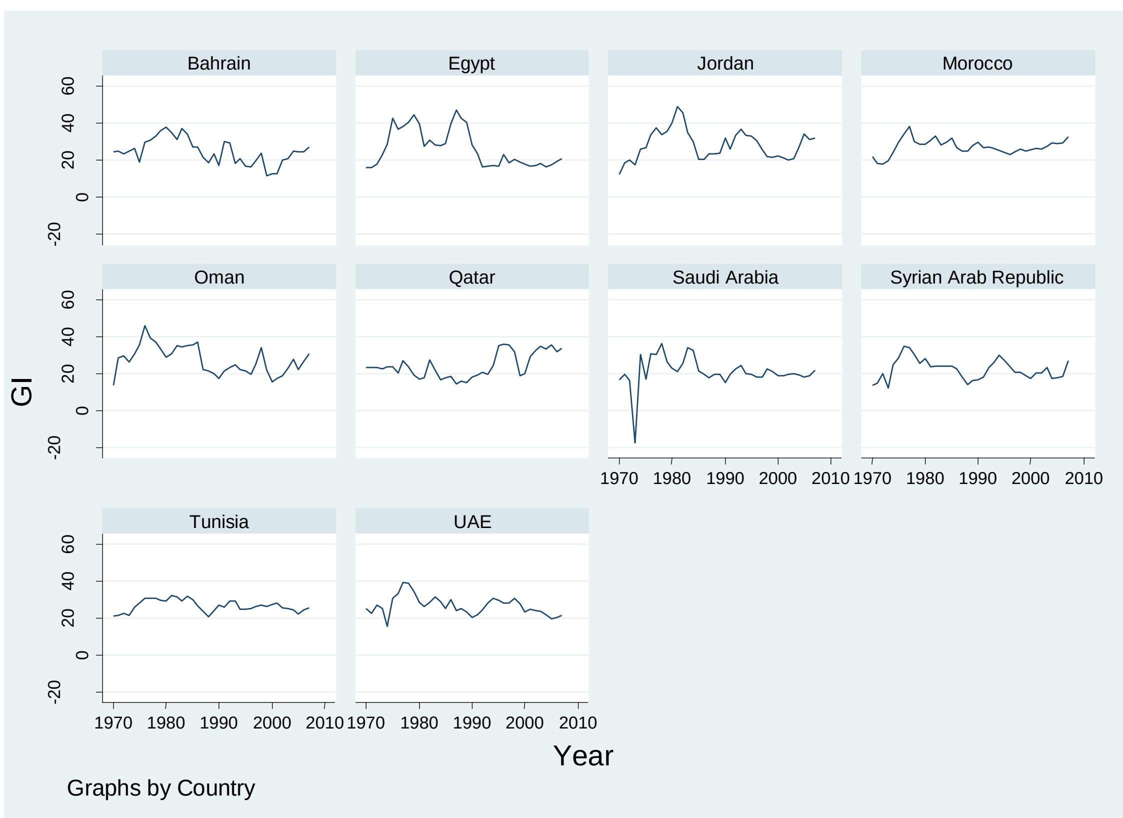


Figure 2-8 Growth Rate of Money Supply GMS as a % of GDP

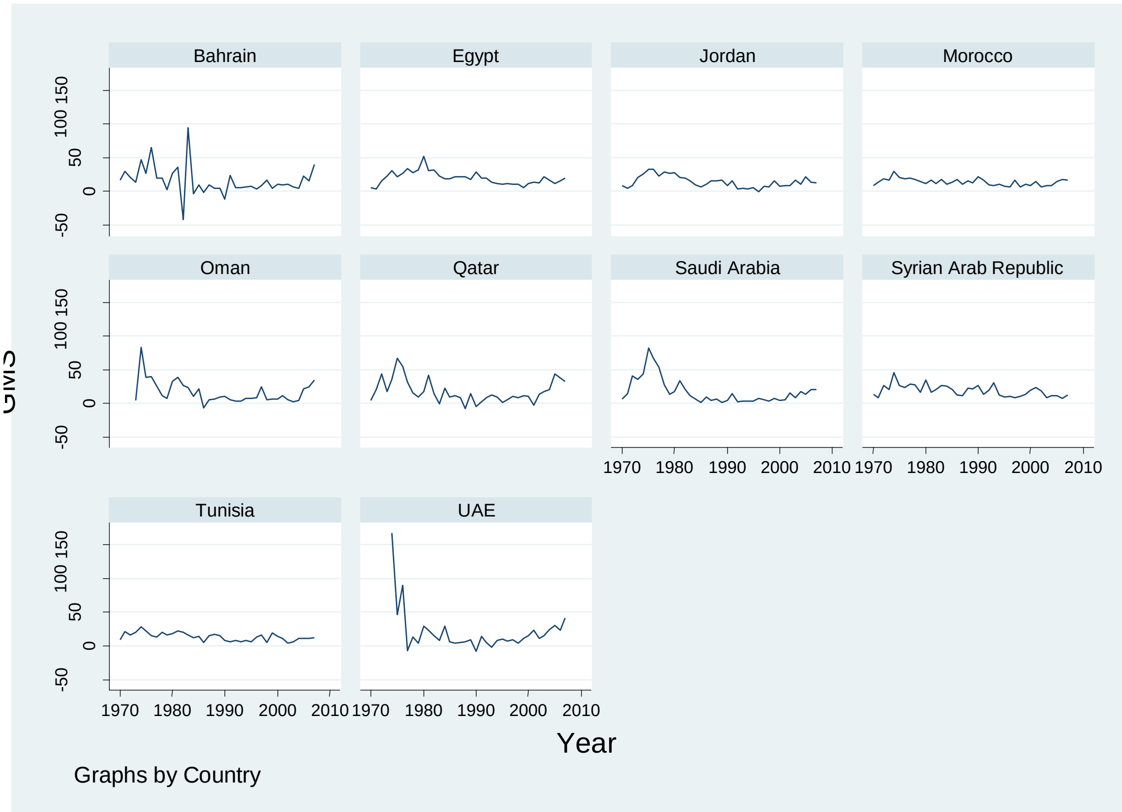


Figure 2-9 Trade Openness TO

Figure 2-10 Capital Mobility CM

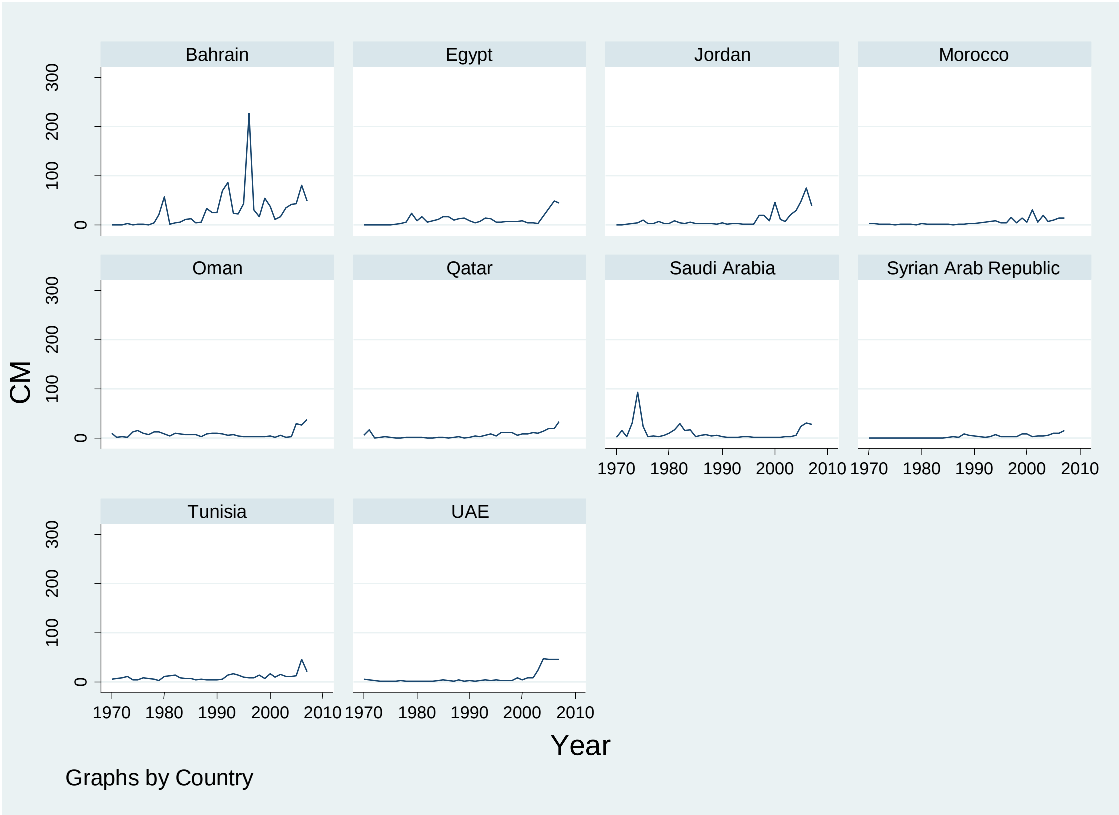


Figure 2-11 Terms of Trade TT

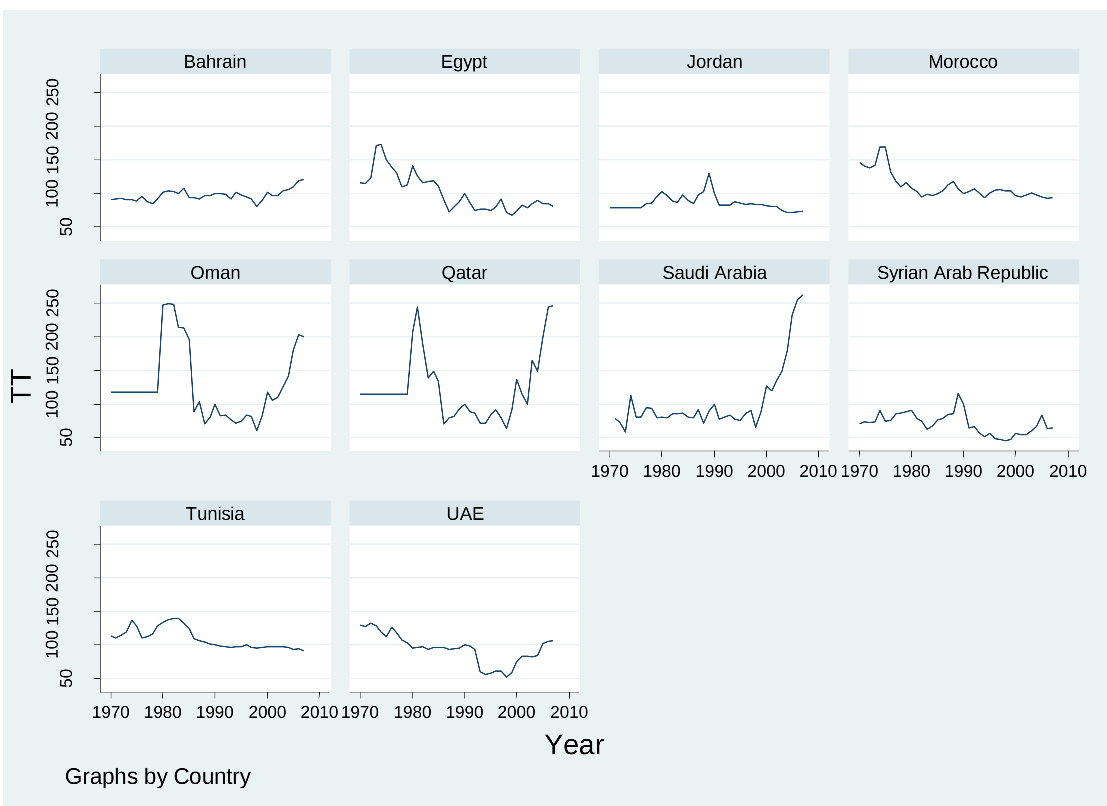
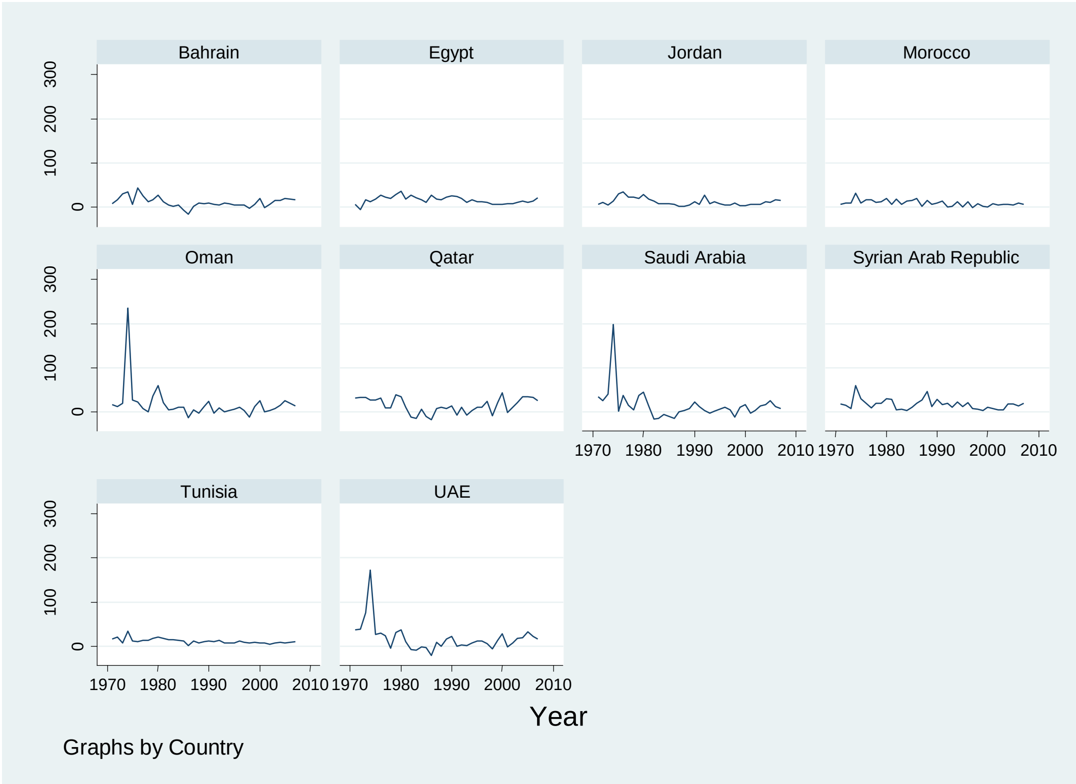


Figure 2-12 The Growth Rate of GDP



CHAPTER 3

DYNAMIC AND LONG-RUN RELATIONS BETEEN FISCAL POLICY AND CURRENT ACCOUNT

CHAPTER 3: DYNAMIC AND LONG-RUN RELATIONS BETEEN FISCAL POLICY AND CURRENT ACCOUNT

3.1 INTRODUCTION

As seen in chapter two, the association between fiscal policy and the current account is investigated for the inspected countries by testing the (TDH) against the (REH) by means of panel data analysis. The illustrated estimates in section 2.5.4 and Appendix C statistically support the (TDH) in the oil exporting countries, whereas it supports the (REH) in the non oil exporting countries. In that calibration, one percent increase in the fiscal (surplus/deficit) to GDP ratio tends to (improve/deteriorate) the current account balance to GDP ratio by 0.28 to 0.39 percent in oil countries in contrast to the non-oil countries where such relationship is not significant. Also, a one percent increase in government expenditure found to deteriorate current account by 0.85 and 0.26 percent in oil and non oil countries respectively, at the same time, one percent increase (decrease) in taxes to GDP ratio, increases current account surplus (deficit) to GDP by 0.23 percent only in the oil countries.

Notwithstanding, the panel data analysis—applied in chapter two–has given a general conception about the relationship between fiscal policy and current account in the examined economies and despite that panel data technique has several advantages[20] such as allowing to control for unseen variables like cultural factors and it helps to control for unobservable variables that change over time but not across entities (i.e. national policies, federal regulations, international agreements, etc.). To establish the precise association and the potential interrelationship between fiscal policy and the current account as well as the other control variables in Eq. (2/4), one has to examine four alternative reasonable suppositions for every country, each with dissimilar policy implications. These are that fiscal deficits cause current account deficits (i.e. TDH), that current account deficits cause fiscal deficits, that both variables are causally independent (i.e. REH), and finally that there is a bidirectional causality between these two variables.

To determine which alternative is true for each of the investigated countries, the current chapter examines empirically those hypotheses (i.e. TDH and REH) and find out

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[20] For more about advantages and disadvantages of panel data analysis see Hsiao (2003) and Baltagi (2008).

the interrelationship between current account, taxes, government expenditures, saving, investment, money supply, terms of trade and GDP growth rate[21] and introduce some new evidence using Johansen's (1991) vector error correction model (VECM), Granger Non-Causality test and impulse response analysis on the same annual data in chapter two. (VECM) inspects both the long run relationship between current account and fiscal policy along with the other macroeconomic variables through the cointegrated vectors and the dynamic relations of the short run throughout the vector autoregression (VAR) as well as the adjustment from the short run to the long run equilibrium. Granger Non-Causality test determines the direction in which the effects of one variable goes to anather variables and vice versa. The next section expands on the previous studies mentioned in sections 1.2 and 2.1 by adding some studies classified by the econometric methodology.

3.2 REVIEW OF EMPIRICAL LITERATURE

The correlation between current account and fiscal deficits in the United States and other developed countries has been investigated empirically by a number of researchers such as Darrat (1988), Miller and Russek (1989), Abell (1990), Alse and Bahmani-Oskooee (1992), Kasa (1994), Normandin (1999), Leachman and Francis (2002), Hatemi-J and Shukur (2002), Bagnai (2006), Bartolini and Lahiri (2006), Salvatore (2006), and Beetsma and Giuliodori et al. (2008). As important as this issue is, there has been at most very little empirical consideration dedicated to the application of this debate on the developing countries (specially the investigated ones) such as Anoruo and Ramchander (1998), Khalid and Guan (1999), Kouassi, Mougoue et al. (2004), Owoye (2006), Parikh and Rao (2006), Arize and Malindretos (2008).

Furthermore, despite that each of the above studies provides significant insights into the topic, a consensus has yet to emerge. In general, these studies have found evidence signifying that fiscal expansion aggravates the current account imbalance. Estimates of the influence of an increase in the fiscal deficit to GDP ratio by one percent on the current account to GDP ratio range between 0.2 and 0.7 percentage points, depending on the sample and used techniques (Abbas, Bouhga-Hagbe et al. 2010). These studies can be mainly classified, according to the employed econometric methodologies, into three

[21] In this chapter we included only the variables with significant relationship with current account in chapter two.

categories. The first category uses VAR analysis to investigate the impact of fiscal policy on current account. The second and third categories analyze the long run relationship between fiscal policy variables and current account using causality and cointegration techniques, and panel data regression technique respectively. The reminder of this section presents some very recent studies for each category.

3.2.1 VAR STUDIES

Corsetti and Müller (2006) used VAR analysis for the quarterly data 1980-2006 of Australia, Canada, UK and the US found that a one percent increase in the government spending to GDP ratio deteriorates trade balance by 0.5 percent of GDP for the UK, 0.17 percent of GDP for Canada, and there is no significant effect for the US and Australia. Moreover, Monacelli and Perotti (2006) employed structural VAR techniques, for a series of OECD countries, and found that in all countries a rise in government spending induces real exchange rate depreciation and trade balance deficit to increase. In the US, however, the effect on the trade balance is small. Also, they argue that in all countries private consumption rises in response to a government spending shock, and therefore co-moves positively with the real exchange rate. In addition, their model is successful in delivering the right co-movement between the real exchange rate and the trade balance, if the elasticity of substitution between domestic and imported goods is sufficiently small.

Normandin (2006) employed VAR and causality test on the G7 countries data over the post-1975 period, the results reveal that the responses of external and budget deficits are substantial and persistent for most countries. In particular, the fiscal policy has the most important effects on the external deficits for Canada, Japan, and the United States; somewhat smaller impacts for France, Germany, and the United Kingdom; and negligible effects for Italy. More recently, Beetsma, Giuliodori et al. (2008) examined the effects of the increase in public spending on trade balances and budget deficits in the European Union, using Panel-VAR analysis. They found that a one percent increase in public spending to GDP ratio produces a 1.2 to 1.6 percent rise in GDP, moreover, the increasing imports and declining exports are responsible for a fall of the trade balance to GDP ratio by 0.5 to 0.8 percent. Additionally, the spending increase induces budget deficit to GDP ratio to rise by 0.7 percent referring to the potential relevance of the twin deficits hypothesis for the European Union.

3.2.2 CAUSALITY TESTS AND COINTEGRATION STUDIES

Ahmed and Ansari (1994) employed cointegration and error correction techniques to investigate the relationship between the fiscal and current account deficits in Canada over the period 1973-1991. Their major finding is that the current account deficit is related both to the fiscal deficit and the savings-investment gap. Leachman and Francis (2002) found, using cointegration and multi-cointegration analysis for the US prior to 1974, the twin deficit phenomenon is a long-run structural relationship in the post World War II. But in the more recent period, 1974 forward, they found a weak evidence of that cointegration (i.e. long-run relationship) between fiscal deficits and trade deficits. In all cases, the causality runs from internal to external deficits in the dynamic adjustment process. Daly and Siddiki (2009) found a long-run relationship between budget deficits, real interest rate and current account deficit in 13 out of 23 OECD countries. Besides, they argue that the twin deficits are less likely to be conjoined in the countries with a more extensive financial infrastructure.

3.2.3 PANEL DATA STUDIES

Chinn and Prasad (2000) found that; for developing countries; government budget balances is positively correlated with the current account balances. Also higher terms of trade are related to the current account surplus whereas it is weakly associated with the degree of openness to international trade, capital control, and average GDP growth. Moreover, Mike and Torsten (2005) tested empirically the effects of government fiscal balances, relative cyclical positions, and the real exchange rate on the current account balances for annual data of fourteen OECD countries over 1982-2003 period. They found that a one percent of GDP increase in government budget balance improves current account balance by about 0.3 percent of GDP.

Bussière, Fratzscher et al. (2005) evaluated empirically the comparative importance of budget deficits and productivity shocks on the current account position on a sample of 21 OECD countries data from 1960 to 2003. They found little evidence for a contemporaneous effect of budget deficits on the current account, while country-specific productivity shocks appear to play a key role. Afonso and Rault (2009) assessed the long run relationship between current account and budget balances, and effective real exchange rates, for the period 1970-2007 and for the EU and OECD countries. The results confirm both positive and negative effects of budget balances on current account balances for several countries. The magnitude of the effects varies across countries, and there is no evidence pointing to a direct and close relationship between budgetary and current account balances.

3.3 ECONOMETRIC METHODOLOGY

3.3.1 VECTOR ERROR CORRECTION MODEL (VECM)

Given the results of nonstationarity of the investigated variables as presented in section 3.5.1, two alternative estimation techniques are available to estimate the model: firstly the relatively recent autoregressive distributed lag (ARDL) approach to cointegration proposed by Pesaran, Shin et al. (1996). Secondly, the vector error correction model (VECM) proposed by Johansen (1988) and developed by Johansen (1991) and (1992). But, however the major disadvantage of the (ARDL) approach to cointegration is that it is designed only for the case of a single cointegrating relation. In the event of more than one cointegration relation, (ARDL) estimation will not be valid (Huq and Arshad 2010). Consequently, because our results indicate that more than one cointegrating vector has been detected for all countries (see section 3.5.2), using a single equation technique such as (ARDL) will be biased. For that reason, the (VECM) will be implemented to estimate the model.

Using Johansen's vector error-correction model (VECM), we examine the dynamic relations between current account and fiscal policy in addition to the other mentioned macroeconomic variables. Engle and Granger's (1987) two-step error-correction model may also be used in a multivariate context, the (VECM) yields more efficient estimators of cointegrating vectors. This is because the (VECM) is a full information maximum likelihood estimation model, which allows for testing for cointegration in a whole system of equations in one step and without requiring a specific variable to be normalized. This allows us to avoid carrying over the errors from the first step into the second, as would be the case if Engle-Granger's methodology is used. It also has the advantage of not requiring a priori assumptions of indogeniety or exogeniety of the variables. The (VECM) general form is

$$\Delta Y_t = \alpha\left(\beta Y_{t-1} + \psi\right) + \sum_{j=1}^{k-1} \Gamma_j \Delta Y_{t-j} + \varphi + \varepsilon_t \qquad (3/1)$$

Where $\sum_{j=1}^{k-1} \Gamma_j \Delta Y_{t-j}$ and $\alpha\beta Y_{t-1}$ are the vector autoregressive (VAR) component in first differences and error-correction components, respectively, in levels of Eq. (3/1). Y_t is a $p \times 1$ vector of variables integrated of order one. ψ, is a $p \times 1$ vector of constants representing a trend specifications system which allows for linear trends in the undifferenced data with cointegrating equations that are stationary around a non-zero mean. k is a lag structure, while ε_t is a $p \times 1$ vector of white noise error terms. Γ_j, is a $p \times p$ matrix that represents short-term adjustments among variables across p equations at the j lags. β, is a $p \times r$ matrix of cointegrating vectors, and Δ denotes first differences, α is a $p \times r$ matrix of speed of adjustment parameters representing the speed of error correction mechanism. If there is cointegration, some of the α must be non-zero, there must be some feedback on the (Y_t) to keep them from diverging, (i.e. there must be some Granger causality in the system). A larger α suggests a faster convergence toward long-run equilibrium in cases of short-run deviations from this equilibrium.

The model in Eq. (3/1) will be estimated using Johansen's (1991) Vector Error Correction Model (VECM), which employs the full information maximum likelihood method, by implementing in the following steps:

- Find the truncated lag (k) such that the residuals from each equation of the (VECM) are uncorrelated.
- Test whether all variables are integrated of order one by applying a unit root test.
- Determine the order of cointegration.

- Regress ΔY_t against the lagged differences of ΔY_t and Y_{t-k} and estimate the eigenvectors (cointegrating vectors) from the Canonical correlations of the set of residuals from these regression equations.

3.3.2 LAG SELECTION

The lag order of the basic (VAR) process is essential to (VECM). The optimal lag orders will be selected to minimize four statistics; the Akaike Information Criterion (AIC), the Hannan-Quinn Information Criterion (HQIC), the Final Prediction Error (FPE), the Schwarz-Bayes Information Criterion (SBIC) as well as the sequence of Log Likelihood (LL) and Likelihood Ratio (LR) tests. These formulas are given by:

$$LL = -\left(\frac{T}{2}\right) * \left[In\left(\left|\hat{\Sigma}\right|\right) + pIn(2\pi) + p\right] \tag{3/2}$$

$$LR(j) = 2\left[LL(j) - LL(j-1)\right] \tag{3/3}$$

$$AIC = -2\left(\frac{LL}{T}\right) + \frac{2t_p}{T} \tag{3/4}$$

$$HQIC = -2\left(\frac{LL}{T}\right) + \frac{2In\left[In(T)\right]}{T}t_p \tag{3/5}$$

$$FPE = \left|\Sigma_u\right| * \left(\frac{T+\overline{m}}{T-\overline{m}}\right)^K \tag{3/6}$$

$$SBIC = -2\left(\frac{LL}{T}\right) + \frac{In(T)}{T}t_p \tag{3/7}$$

T denotes the number of observations, $\hat{\Sigma}$ is the maximum likelihood estimate of $E[\varepsilon_t \varepsilon_t^{'}]$, ε_t is the $(p \times 1)$ vector of disturbances, $\overline{m}$ is the average number of parameters over the p equations, t_p is the number of parameters in the model [for detailed explanation see Nielsen (2006), Hamilton (1994) and Lutkepohl (2005)].

3.3.3 UNIT ROOT TESTS

To estimate the (VECM), we first check all variables for stationarity and unit roots through performing the Augmented Dickey-Fuller (ADF) test proposed by Dickey and Fuller (1979). Since (ADF) test has relatively low power (i.e. it is less likely to reject the null hypothesis of nonstationarty when the stationary alternative is true), the investigated time series are subjected to two additional tests. The modified Dickey-Fuller test developed by Elliott, Rothenberg et al. (1996) and known as the (DF-GLS) test and it is similar to the (ADF) test except that the time series is transformed using a generalized least squares (GLS) regression before the test is done. The (DF-GLS) test has been shown to have substantially higher power than the standard (ADF) and is more likely to reject the null hypothesis of a unit root when the time series has a root that is close but not equal to one.

Both the (ADF) and (DF-GLS) tests have in their null hypothesis the presence of a unit root (as shown in equation 3/8). Because the sample size is small and (ADF) and (DF-GLS) unit root tests do not reject the null of non-stationarity too often unless there is strong evidence against it.[22] It has become cautious, therefore, to supplement such tests with one that maintains stationarity as its null hypothesis. One such test, (KPSS), is offered by Kwiatkowski, Phillips et al. (1992) in which the time series is alleged to be the sum of three components a deterministic trend, a random walk, and a stationary error. The null hypothesis that the time series is trend stationary is equivalent to the hypothesis that the variance of the random walk component is equal to zero. We use the model in Eq. (3/1) to perform these tests on the variables in its levels and the first differences using the following formula;

$$\Delta y_t = a + \gamma y_{t-1} + \sum_{i=1}^{s} \phi_i y_{t-i} + u_t \qquad (3/8)$$

We test the hypothesis:

$$H_0 : \gamma = 0 \qquad (3/9)$$

[22] If the confidence interval around the null is wide because of small sample size, one may not reject the null of unit root even if the process is stationary.

$$H_1 : \gamma < 0 \qquad (3/10)$$

If $\gamma = 0$, then y_t contains a unit root or non-stationary. If $\gamma < 0$, then y_t is stationary. That is, the null hypothesis of KPSS test is $H_0 : \gamma < 0$ and the alternative is $H_1 : \gamma = 0$. Inference from this test is complementary to that derived from those based on the Dickey-Fuller distribution such as (ADF), (DF-GLS) and (PP) test proposed by (Phillips and Perron 1988). The (KPSS) test is often used in conjunction with those tests to investigate the possibility that a series is fractionally integrated (that is, neither $I(1)$ nor $I(0)$, see Schmidt and Lee (1991) and Sibbertsen and Krämer (2006). If I have ambiguous or contradictory results from (ADF), (DF-GLS) and (KPSS) for one variable or more, Phillips-Perron (PP) test is used only for that variables to confirm if it is stationary or not. Full illustration of these entire unit root tests are provided in the.

3.3.4 COINTEGRATION RANK TEST

The order of cointegration (r) indicates the dimension of the cointegrating space and is determined by constructing the following test statistics;

$$\lambda_{trace} = -T \sum_{i=r+1}^{p} In\left(1 - \hat{\lambda}_i\right) \qquad (3/11)$$

Where T is the number of observations and λ_{teace} is the estimated eigenvalues, this statistic does not represent the regular chi-square distributions, but as Johansen shows, it weakly converges to a function of $(p - r)$ dimensional Brownian motion. Johansen and Juselius (1990) compute the critical values of this function, and Osterwald-Lenum (1992) recalculates and extends the critical values for higher dimensions. The null hypothesis of the trace statistic is that there are no more than r cointegrating relations. Restricting the number of cointegrating equations to be r or less implies that the remaining $p-1$ eigenvalues are zero. We will reject models where matrix $\alpha\beta$ has a full rank (i.e. the rank of $\alpha\beta$ is p) since in such situation Y_t is already stationary and has no unit root, and so there would be no error-correction.[23]

3.4 EMPIRICAL MODEL AND DATA DESCRIPTION

3.4.1 EMPIRICAL MODEL

Populating the same variables represented in Eq. (2/4), except the degree of trade openness TO and the degree of capital mobility CM as both of them showed no significant impact on the current account position in many cases, in the (VECM) formula mentioned in Eq. (3/1) gives the following system of eight variables;

$$\begin{bmatrix} \Delta CAB_t \\ \Delta TAX_t \\ \Delta GEX_t \\ \Delta GDS_t \\ \Delta GI_t \\ \Delta GMS_t \\ \Delta TT_t \\ \Delta GDPG_t \end{bmatrix} = \begin{bmatrix} \alpha_{11} & \alpha_{12} & \cdots & \alpha_{1r} \\ \alpha_{21} & \alpha_{22} & \cdots & \alpha_{2r} \\ \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots \\ \alpha_{81} & \alpha_{82} & \cdots & \alpha_{8r} \end{bmatrix} \times \left(\begin{bmatrix} \beta_{11} & \beta_{12} & \cdots & \cdots & \beta_{18} \\ \beta_{21} & \beta_{22} & \cdots & \cdots & \beta_{28} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \beta_{r1} & \beta_{r2} & \cdots & \cdots & \beta_{r8} \end{bmatrix} \times \begin{bmatrix} CAB_{t-1} \\ TAX_{t-1} \\ GEX_{t-1} \\ GDS_{t-1} \\ GI_{t-1} \\ GMS_{t-1} \\ TT_{t-1} \\ GDPG_{t-1} \end{bmatrix} + \begin{bmatrix} cons_1 \\ const_2 \\ \vdots \\ cons_r \end{bmatrix} \right)$$

$$+ \left(\begin{bmatrix} \Gamma_{11} & \Gamma_{12} & \cdots & \cdots & \Gamma_{18} \\ \Gamma_{21} & \Gamma_{22} & \cdots & \cdots & \Gamma_{28} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \Gamma_{81} & \Gamma_{82} & \cdots & \cdots & \Gamma_{88} \end{bmatrix} \times \begin{bmatrix} \Delta CAB_{t-1} \\ \Delta TAX_{t-1} \\ \Delta GEX_{t-1} \\ \Delta GDS_{t-1} \\ \Delta GI_{t-1} \\ \Delta GMS_{t-1} \\ \Delta TT_{t-1} \\ \Delta GDPG_{t-1} \end{bmatrix} + \begin{bmatrix} cons_1 \\ cons_2 \\ \vdots \\ \vdots \\ cons_8 \end{bmatrix} \right) + \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \\ \varepsilon_{6t} \\ \varepsilon_{7t} \\ \varepsilon_{8t} \end{bmatrix} \qquad (3/12)$$

r, denotes cointegration rank, ε_t is the disturbance term, Γ is the short-term adjustments matrix, β are the cointegrating vectors, and Δ denotes first differences, α is

[23] If $\alpha\beta$ is the null matrix, there are p unit roots and the proper specification of equation (3/1) is one without the error correction term. In this case, a VAR model is the correct specification. If the rank of $\alpha\beta$ is between 0 and p, there exist r linearly independent columns in the matrix and r cointegrating relations in the system of equations.

the speed of adjustment parameters matrix. As noted in Johansen (1995), to identify the free parameters of the cointegrating vectors, r^2 restrictions must be imposed on the system. Johansen and Juselius (1992) and Johansen (1995) have shown that such a system can be normalized, so that one or more coefficient -according to the rank of cointegration r - in each vector are zero. For example, one possible matrix of the three cointegrating vectors for eight dimensions system might be:

$$\beta = \begin{bmatrix} 1 & 0 & 0 & \beta_{14} & \beta_{15} & \beta_{16} & \beta_{17} & \beta_{18} \\ 0 & 1 & 0 & \beta_{24} & \beta_{25} & \beta_{26} & \beta_{27} & \beta_{28} \\ 0 & 0 & 1 & \beta_{34} & \beta_{35} & \beta_{36} & \beta_{37} & \beta_{38} \end{bmatrix} \quad (3/13)$$

3.4.2 WEAK EXOGENEITY AND THE LONG RUN GRANGER-CAUSALITY

The cointegration equation β itself does not tell anything about which variable adjusts to the equilibrium, which variable do not, or the speed of the adjustment process. Such information exists in the estimated adjustment parameter matrix α. The error correction coefficients of α matrix reflect the speed of adjustment of all variables in the system toward the long run equilibrium. For example, if $r = 4$, the larger the 1st or 2nd or 3rd or 4th parameters of α_{CAB} vector—regardless of its signs–the greater the response of CAB to the previous period's deviation from the 1st or 2nd or 3rd or 4th long run equilibrium relations. Conversely, if the four parameters of α_{CAB} are equal to zero, CAB does not respond to the deviations from the long-run equilibrium relationships. In this case, CAB is called weakly exogenous to the system i.e. no feedback "bidirectional-causality" or unidirectional-causality from CAB to the other variables and vise versa.

Specifically, a given variable can be considered weakly exogenous to the system when disequilibrium in the cointegrating relationships do not precipitate error correcting changes in that variable. Statistically, weak exogeneity requires that all of the adjustment parameter values in the relevant equation of the adjustment parameter matrix α be equal to zero. Thus it has become common practice in cointegrated VAR models to treat some variables as weakly exogenous, resulting in partial or conditional VECMs[24].

The conditional VECM model of p number of variables Y_t of the $n \times 1$ subset vector y_t is obtained if the remaining $q = p - n$ variables x_t can be treated as weakly exogenous[25]. For this purpose it is convenient to place the variables x_t in the last q positions of the vector Y_t in the VECM representation (3/12)[26], and introduce conformable partitionings of relevant vectors and matrices as

$$Y_t = \begin{bmatrix} y_t \\ x_t \end{bmatrix}, \quad \alpha = \begin{bmatrix} \alpha_{\mathrm{y}} \\ \alpha_{\mathrm{x}} \end{bmatrix}, \quad \Gamma_{\mathrm{i}} = \begin{bmatrix} \Gamma_{yi} \\ \Gamma_{xi} \end{bmatrix}, \quad \varepsilon_{\mathrm{t}} = \begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{xt} \end{bmatrix}, \text{ and } \Omega = \begin{bmatrix} \Omega_{yy} & \Omega_{yx} \\ \Omega_{xy} & \Omega_{xx} \end{bmatrix}$$

If $\alpha_x = 0$ then x_t is weakly exogenous and valid inference can proceed in the conditional model of y_t given its past value and x_t, namely:

$$\Delta y_t = \Lambda \Delta x_t - \alpha_y \beta' Y_{t-1} + \psi + \sum_{j=1}^{k-1} \tilde{\Gamma}_{yj} Y_{t-j} + \varphi + \tilde{\varepsilon}_{yt_t} \qquad (3/14)$$

Where $\Lambda = \Omega_{yx}\Omega_{xx}^{-1}$, $\tilde{\Gamma}_{\mathrm{yi}} = \Gamma_{yi} - \Lambda\Gamma_{xi}$, and $\tilde{\varepsilon}_{\mathrm{yt}} = \varepsilon_{yt} - \Lambda\varepsilon_{xt}$ (Jacobs and Wallis 2010) and (Johansen 1995). Weak exogeneity can be tested for the individual adjustment parameter α, with respect to each cointegrated vector, using t-test of the each indivdual α parameter. Moreover, for model (3/12), we can test for joint weak exogeneity of a certain variable; let us say GGDP, using the joint likelihood ratio Wald-χ^2 test with r degrees of freedom, to test the hypothesis;

$$H_0 : \alpha_{81} = \alpha_{82} = \cdots = \alpha_{8r} = 0 \text{ against } H_1 : \alpha_{81} \neq \alpha_{82} \neq \cdots \neq \alpha_{8r} \neq 0 \qquad (3/15)$$

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[24] The problem of rank determination in partial systems is discussed in Harboe et al. (1998) where it is shown that even if weak exogeneity is assumed the deterministic term makes it difficult to determine the rank without modelling the full system. Thus we work in the full system, and test for weak exogeneity and that the value of the cointegrating rank is known, this process is done automatically with command vecrank in Stata.

[25] The number of weakly exogenous variables in the system can be at most $(p - r)$.

[26] We first exclude the weakly exogenous variable from the (VECM) and run the usual diagnostic tests and compare its results with those results of partial VECM and decide the final model accordingly.

If H_0 accepted, then the variable GGDP is weakly exogenous to the system[27] and we can proceed in the model conditioning on the GGDP and still have valid inference as long as the condition[25] is sutisfied. As weak exogeneity concept is relted to the abcence of causality between the weakly exogenous variables and the system, the long run Granger-non-causality in case of cointegrated variables implies that speeds of adjustment coefficients to be equal zero or to be not significant. For instance, for the CAB sequence to be unaffected or Granger-non-caused by GI in equation (3/12), α_{15} has to be zero or insignificant. On contrary, if α_{51} not equal to zero or significant, we can say that CAB affect or Granger-cause GI in the long run. However, if α elements, with respect to GI in all cointegrated vectors, equal to zero, we conclude that GI is not Granger-caused by any of those cointegrated vectors' variable in the long run. Generally speaking, to have long run Granger-causality from any variable to the other variables in the system, we should have adjustment parameter not equal zero i.e. $\alpha \neq 0$ for that variable regarding to the other variables' cointegrated vectors. Then there is, at least, Granger long run direct causality in one direction. It is worth noting at this point that the aforementioned discussion is regarding the direct causality, but some times the feedback or the one-direction causality exists between two variables or more indirectly through another variable or more.

To sum up, the system has some variables endogenously determined in the model (will always appeer at the first positions of the sysem) while the other explanatory variables are weakly exogenous to the system (which appear on the last positions). Thus it is valid to condition on the weakly exogenous variables. This enables us to analyze the long run equations for the endogenous variables conditional on the variables which are not endogenously determined in the model. We also have to keep in mind that the long run non feedback and Granger-non-causality does not entail short run Granger-non-causality, but we may still have short run Granger-causality with no long run feedback. If both the long and short run Granger-non-causality accepted for a variable, that variable will be strongly exogenous and we can exclude it from the system except if that exclusion deteriorates the

[27] In this case the GGDP long run equation $[(\alpha\beta) * (\text{the first lag of all variables including GGDP})]$ excepected to have no significant varables in its right hand side especially if there is no indirect caustion, but lagged GGDP could be significant in the right hand side of the other equations.

diagnostic results for the system[28]. On the other hand, both the long and short run Granger-non-causality rejected between two variables, therefore there is strong causation between them.

3.4.3 SHORT RUN GRANGER-CAUSALITY

Besides the long run Granger-causality, which is reflected by the adjustment coefficients α, short run Granger-causality can occur through the the joint significance of the lagged differenced independent variables in each equation of the system. Granger (1969) argued that variable x causes another time series variable y if the former helps predicting the latter. Accordingly, x is said to Granger-cause another variable y if the past values of x, along with the past values of y, can be used to predict the future values of y more accurately than if only past values of y are used. In our calebaration, we provide Wald test statistics on the joint significance of the lagged differenced independent variables in all respective equations. For example, given the model in equation (3/12), the short run equations for the current account balance CAB and TAX can be written as;

$$\begin{aligned}\Delta CAB_t &= \Gamma_{11}\Delta CAB_{t-1} + \Gamma_{12}\Delta TAX_{t-1} + \Gamma_{13}\Delta GEX_{t-1} + \Gamma_{14}\Delta GDS_{t-1} + \Gamma_{15}\Delta GI_{t-1} \\ &+ \Gamma_{16}\Delta GMS_{t-1} + \Gamma_{17}\Delta TT_{t-1} + \Gamma_{18}\Delta GGDP + \varepsilon_{t1}\end{aligned} \qquad (3/16)$$

$$\begin{aligned}\Delta TAX_t &= \Gamma_{21}\Delta CAB_{t-1} + \Gamma_{22}\Delta TAX_{t-1} + \Gamma_{23}\Delta GEX_{t-1} + \Gamma_{24}\Delta GDS_{t-1} + \Gamma_{25}\Delta GI_{t-1} \\ &+ \Gamma_{26}\Delta GMS_{t-1} + \Gamma_{27}\Delta TT_{t-1} + \Gamma_{28}\Delta GGDP + \varepsilon_{t2}\end{aligned} \qquad (3/17)$$

The Wald test statistic can be used to test; for example, if TAX does not Granger-cause CAB by testing the following hypothesis;

$$H_0 : \Gamma_{11} = \Gamma_{12} = 0 \qquad \text{against} \qquad H_1 : \Gamma_{11} \neq \Gamma_{12} \neq 0 \qquad (3/18)$$

If H_0 can be rejected, we conclude that taxex TAX Granger-causes current account balance CAB, but if H_0 accepted, then there is no short run causality running from taxes to the current account balance. Likewise, we can use equation (3/17) to test the short

[28] Stata provides long-run exclusion tests to check if a variable or more from that included in the VECM can be omitted from the long-run relationships.

run causality in the opposite direction, i.e. from CAB to TAX, by testing the following hypothesis;

$$H_0 : \Gamma_{21} = \Gamma_{22} = 0 \qquad \text{against} \qquad H_1 : \Gamma_{21} \neq \Gamma_{22} \neq 0 \qquad (3/19)$$

If H_0 can be rejected, we conclude that the current account balance CAB Granger-causes taxes TAX, but if H_0 accepted, then there is no causality running from the current account balance to taxes in the short run. If the null accepted in both (3/18) and (3/19), we conclude thate there is a short run feedback "bidirectional Granger-causality" between taxes and the current account balance. The results of that test will be provided in section 3.5.3 for each short equation in our eight-dimensional system.

3.4.4 DATA DESCRIPTION

Because the used panel data set for the empirical analysis in chapter two is unbalanced (i.e. there is some missing values for some variables in some countries), one has to estimate these missing values because (VECM) needs a complete time series with no gaps. Therefore, univariate imputation is used to impute a single variable. It can be used repeatedly to impute multiple variables, and this can be justified when the variables are independent and will be used in separate analyses. In practice, multiple variables usually must be imputed simultaneously, and that requires using a multivariate imputation method. The choice of an imputation method in this case depends on the pattern of missing values. If variables follow a monotone-missing pattern, they can be imputed sequentially using independent univariate conditional distributions, which are implemented in the monotone method. A separate univariate imputation model can be specified for each imputation variable, which allows simultaneous imputation of variables of different types. When a pattern of missing values is arbitrary, an iterative method is required to fill in missing values. For detailed illustration about filling in the missing values see (StataCorp. 2009). Precisely, we imputed the variable TAX for 1980 in Egypt, for 1990-1991 in Kuwait, for 1982-1985 in Syria and 1982-1986 in UAE, another variable was GMS which has been imputed only in Kuwait for 1990-1991. We used the available data for Tax along with the compleat series of GEX and GGDP in the process of TAX imputation and the original GMS along with GGDP and CAB to imput the two missing values in Kuwait.

3.5 EMPIRICAL RESULTS

3.5.1 RESULTS OF THE UNIT ROOT TESTS

Nonstationary time series are very frequent in macroeconomics. For example, Bohn (1998) argued that "the cointegration literature generally uses real levels of fiscal variables to test for cointegration and finds unit roots in real government spending, debt, and taxes". Similarly, Phillips and Moon (2000) consider the time series components of the variables used in Penn World Tables which have been broadly used to study growth convergence among various countries such as per capita GDP growth have strong nonstationarty. This issue may arise from various grounds and the underlying causes may have important implications for the appropriate treatment of the series. For instance, assume that the GDP growth is purely caused by inventions and gains in knowledge. Further suppose that these innovations are not a function of time and that they are not elapsed. In each period GDP growth is equal to its previous period's value plus an increase due to that period's innovations. So, we can say that GDP growth series is subject to shocks whose effects do not die away with time meaning that the GDP growth level will not be stationary in this case i.e. $\mathrm{I}(1)$. However, we will be able to extract a stationary series by by taking the first difference, but in some occasions we may need to take the second (or third, fourth etc.) difference of a series to make it stationary i.e. $\mathrm{I}(0)$. The variables that need to be differenced n times to achieve stationaraty are called integrated variables of order n or $\mathrm{I}(n)$ (Mahadeva and Robinson 2004).

To detect the prense of nonstationary series in our variables, we first inspect the data visually in its level and the first difference. Secondly, we apply different unit root tests for multiple shick as it is a common strategy in the empirical research using several different unit root tests and seeing if they give the same conclusions. Accordingly, the visuall inspection of the grapghs shown in APPENDIX G indicates that most of the investigated variables follow a random walk or a random walk with trend. Therefore, we proceed to use the unit root tests presented in section3.3.3 and explained in the APPENDIX F, specifically, the (ADF), (DF-GLS) and (KPSS) unit root tests were mainly performed for all variables in level, whereas (ADF) and (KPSS) tests have been applied for the first difference of all variables. In addition, (PP) unit root test proposed by Phillips and Perron

(1988) has been performed only for those variables in which we can't reject the null of nonstationarty in its first difference at one percent of significance using the previous tests.

The results reported in APPENDIX F in Table 3-38 to Table 3-47 indicate that the null hypothesis unit root could not be rejected, at the most of the standard significant levels, for all variables in its level by (ADF), (DF-GLS) and (PP) tests. But, (ADF) and (PP) tests on first differences, however, do reject the null hypothesis of unit roots for most series with p-values below 0.01. The maximum lag order for the (ADF) and (DF-GLS) test is by default calculated from the sample size, using Modified Akaike's Information Criterion (MAIC) and the rule provided by Schwert (1989) for (KPSS) test. On the other hand, the results of (KPSS) test demonstrate the rejection of the null hypothesis of stationarity for most series in its level while the null of stationarity of the differenced data is accepted almost for all variables. Cooperatively, the results of the (ADF), (DF-GLS), (KPSS) and (PP) tests, as well as the visual inspection of the graphs, provide strong evidence that our series are individually integrated of order one, i.e. $I(1)$, thereby establishing a rationale for subsequent cointegration testing.

Before proceeding with our analysis, we need to discuss the obtained unit root results from the macroeconomics perspective especially for the fiscal policy variables and the growth rate of the GDP and the implications of being $I(1)$. Fiscal policy is said to be sustainable if the budget deficit is stationary i.e. integrated of order zero $I(0)$; in other words, the government deficit will not grow to unmanageable proportions, and the actual deficit will asymptotically converge to zero over time (Trehan and Walsh 1988, Trehan and Walsh 1991). Equivalently, if the government expenditure (including debt service) and revenue series do not contain a unit root, then the budget deficit is $I(0)$ and the sustainable fiscal policy is reached. Otherwise, debt is unsustainable except in case if the two nonstationary series have a long-run equilibrium relationships i.e. are cointegrated. That is, the condition of $I(0)$ budget deficit made by Trehan and Walsh is obtained and debt is strongly sustainable.

Empirically, Quintos (1995) argued that fiscal policy is only weakly sustainable since the deficit is still sustainable despite that the cointegration between revenues and expenditures inclusive of debt payment holds only up to 1980 but does not hold in the 80s in the US. So, it is not a necessary but a sufficient condition for a strict sustainability. The necessary condition requires that debt grow slower than the borrowing rate. But, his finding of shifts in the deficit is more uncertain when normalized by gross national product or population. Also, Afonso and Rault (2008) found that general government revenue and expenditure to GDP ratios are nonstationarity in the majority of the 27 EU countries. Moreover, they found a cointegration between government revenue and expenditure ratios for 14 EU countries over the period 1960-2006, and found government expenditures growth rate is higher than public revenues suggestting that fiscal policy may not have been sustainable for most countries while it may have been less unsustainable for countries such as Denmark, Finland, Luxembourg, and the Netherlands.

In a study published by the United Nations in (2004) about the ESCWA region, the government revenues, expenditures, defict and debts (measured in levels and ratios to GDP) were investigated for both stationarity and cointegration to predict fiscal sustainability for the economies including Bahrain, Egypt, Jordan, Kuwait, Lebanon, Oman, Syria and the UAE for the periods 1960-2002. Interestingly, based on the (ADF) and (PP) unit root tests, the government revenues and expenditures were found to be nonstationay for all countries i.e $I(1)$ while its first difference were $I(0)$ or stationary. Meanwhile, budget deficit were $I(1)$ in Kuwait, Lebanon, Syria and UAE, but $I(0)$ in Bahrain and Oman and the results for Egypt and Jordan were mixed. Moreover the cointegration between government revenues and expenditures was confirmed in all countries except for Lebanon and UAE which mean unsustainable fiscal policy in these two countries since government spending and revenues are drifting too far apart and do not seem to be converging towards a long-run equilibrium relationship. The reason is the servicing of the Lebanon's huge debt, which compels the government to spend far more than it earns and the UAE spending has far exceeded income since the early 1980s and 2000s. The situation in the other countries is ranging from strong sustainability for Bahrain and Oman, should to be sustainable in Egypt and Kuwait and weakly sustainable in Jordan and Syria. We repeated the same analysis using our data for all countries by testing for the unit root in the budget balance GFB and running the cointegration between the government expenditure GEX and revenue TAX as illustrated in Table 3-48. We found the same results for all above countries except for Kuwait, Syria and UAE; for the remaining countries like Morocco, Qatar and Tunisia we found a mixed results for the unit root tests and no cointegration, then we can say the fiscal situation in these countries is weakly sustainable wile in Saudi Arabia it is similar to Kuwait i.e. projected to be sustainable.

Likewise, the possible nonstationarty of GDPs has been a cornerstone of empirical macroeconomics at least since the seminal work of Nelson and Plosser (1982). For instance, Cochrane (1988) found a small random walk component in the US yearly GNP and its growth rates, also Kwiatkowski, Phillips et al. (1992) and Shin and Schmidt (1992) detected weak evidence against the null of trend stationarity for US GDP. Similarly, Yin-Wong and Chinn (1996) applied (ADF) and (KPSS) unit root test on the annual real GDP per capita for 126 countries and concluded that it is very likely to be a difference stationary process. To avoid the controversy surrounding the Dickey-Fuller tests for unit roots, Naci Mocan (1994) estimated a flexible trend model for the US GNP with four different data sets that span the years 1869-1991 and found strong evidence of a stochastic trend for all sub-periods and for all series. Moreover, Cogley (1990) and Kormendi and Meguire (1990) found burly random walk behavior in the GDP data in multi-country studies. In addition, Phillips and Moon (2000) indicated that per capita GDP growth from the Penn World Tables, extensively used in applied cross-country analysis, exhibits strong nonstationarity.

On contrary, using the Bayesian techniques, DeJong and Whiteman (1991) forcefully argued against the presence of unit root in the US GDP. Also, the US real GNP was found neither simple trend-stationary nor difference-stationary over the period 1875–1993 by Newbold, Leybourne et al. (2001) who found very strong evidence against a common fixed trend-stationary representation in the periods 1875–1929 and 1950–1993; but, if a choice between difference-stationarity and trend-stationarity must be made, the former is the preferable, as it implies less stringent assumptions. Moreover, Vougas (2007) found evidence favouring the non-linear deterministic trend and trend stationarity i.e. absence of a unit root in the log of post WWII US real GDP. Likewise, Fleissig and Strauss (1999) found overwhelming evidence that the OECD data are trend stationary using bootstrap methods that accommodate more general forms of serial and cross correlation in the data.

The argument seems to be away from settled, with contributions both supporting and rejecting the stationarity of the GDPs. Therefore, with the objective to relax the often conflicting and inconclusive existing debate on whether the observed secular growth can be characterized by a deterministic or stochastic trend. Darné (2009) argued that the persistence in US output can be explained both by infrequent but significant economic and financial events (infrequent large shocks) and by period-by-period permanent innovations (frequent small shocks), such as productivity shocks resulting from technological changes. The US real GNP will have stochastic trend when the data adjusted for these outliers that had large, but either temporary or permanent effect on output. Furthermore, Murray and Nelson (2000) argued that trend stationarity is not supported by the more homogeneous post-war data. Besides, Mishra (2009) applied fractional integration[29] test of the four real US GNP series, for the period 1869–1993, and found that outlier adjusted GNP series are mean-reverting and are more persistent than original.

In contrast, Iwamoto and Kobayashi (1992) tested for a unit root in Japanese GNP between 1955 and 1987, paying particular attention to the kink in the GNP time series. Their results show that Japanese GNP has a unit root in samples both before and after the kinked point. In addition, fluctuations in GNP which caused mainly by permanent shocks or transitory shocks play a minor role. Likewise, the visual inspection of the GDP growth rate in our investigated countries shows a higher spike in the early 70s due the oil price shock 1973 caused by the oil embargo during the Arab Israeli war. Unfortunately, there is no enough data before that date to enable us running the unit root test before that point as all GDP series starts 1971.[30] However, the graphs depict a down turn point in the GDP growth rate at different time point for each country most of which are related to the First Gulf War between Iraq and Iran which lasted from September 1980 to August 1988 followed by the Iraqi invasion to Kuwait on August 1990 and the war of Desert Storm afterwards concomitant of some local policy changes such as the Sadat Infitah in Egypt i.e. Egypt's Open-Door Policy for foreign investment on 1978 and the event of signing the Peace treaty with Israel in 1979 and Sadat assassination in October 1981. Another example

[29] KPSS tests often used in conjunction with DF-GLS to detect "long memory" or fractional integration i.e. a non-integer value of the integration parameter, which implies that the series is neither I(0) nor I(1), but I(d), $0 < d < 1$.

[30] May be we be able to retest the GDP variable if long series covers some years before 1973 found.

is Morocco where before 1992 it was central planning economy with very low efficiency and large incompetent public sector, but from that year economic reform was adopted along with privatization etc. Accordingly, following Iwamoto and Kobayashi (1992) we split each series into two sub-series before and after the inspected break point and apply the DF-GLS unit root test for each sub-sample, the results shown in Table 3-49 indicate that the data are nonstationary before and after the kinked point which support the previously obtained results that the growth rate of the GDP in our datasets are nonstationary.

3.5.2 RESULTS OF LAG ORDERS AND COINTEGRATION RANKS

Essentials to this testing, are the lag order of the underlying (VAR) process and the trend specification of the (VAR) in its error correction form. The choice of k —optimal lag order– is based on the minimization of four order-selection statistics: the final prediction error (FPE), the Akaike Information Criterion (AIC), the Hannan-Quinn Information Criterion (HQIC), the Schwarz-Bayes Information Criterion (SBIC), and the likelihood-ratio (LR). $k = 4$, has been chosen for all countries in the sample by (AIC), (HQIC), (SBIC), and (LR) except lag of 2 for Tunisia according to (LR), whereas $k = 3$ is selected by (FBE) for all countries except lag of 2 for Qatar.

When information criteria suggest different values of k Johansen, Mosconi et al. (2000) note that it is common practice to prefer the (HQIC) criterion. However, like others, we have set $k = 2$ in our subsequent analysis mainly because setting k at different values results in implausible estimates of the cointegration vectors. Clearly, the cointegration analysis of our sample lacks sufficient observations with too many variables to estimate, so we cannot run (VECM) with many lags. Running (VECM) with two lags, Johansen trace test, illustrated in Eq. (3/11), were conducted with different trend specifications that allows for linear trend in the undifferenced data with cointegrating equations that are stationary around a non-zero mean, linear trends in the cointegrating equations and that restrictes the cointegrating equations to being stationary with zero means.

Table 3-1 Trace Test Statistics for the Number of Cointegrated Vectors

λ_{trace}								Rank r
H_0:	$r=0$	$r \le 1$	$r \le 2$	$r \le 3$	$r \le 4$	$r \le 5$	$r \le 6$	
Bahrain[A]	254.10	175.99	127.70	80.15	40.28**	16.55	7.00	**4**
Egypt[A]	246.63	163.13	98.26	64.58**	38.70	20.27	8.86	**3**
Jordan[B]	244.81	169.44	105.39	61.20	30.43**	13.00	4.97	**4**
Kuwait[A]	232.76	166.73	107.13	64.80**	36.99	20.21	6.64	**3**
Morocco[B]	211.74	140.97	87.82**	54.26	32.88	16.97	8.02	**2**
Oman[A]	292.94	181.19	129.13	86.18	53.22	32.74	18.13	**Full[31]**
Qatar[B]	438.59	281.65	171.91	107.76	66.82	37.08**	16.60	**5**
Saudi Arabia[B]	368.33	231.72	158.24	97.39	59.86**	35.64	19.20	**4**
Syria[B]	339.22	234.37	165.56	101.47	66.75	39.38**	19.83	**5**
Tunisia[C]	239.96	162.51	107.83	70.08	42.54	23.48**	11.17	**5**
UAE[A]	275.50	191.37	115.17	77.17	52.76	30.97	13.36**	**6**
UAE[¥ B]	243.41	150.82	98.69	54.78	21.95**	9.82	0.00	**4**

[A] test statistics of λ_{trace} are based on unrestricted constant which allows for a linear trend in the undifferenced data and cointegration equations that are stationary around a nonzero mean.

[B] test statistics are based on a restricted trend model that excludes linear trends in the differenced data but allows for linear trends in the cointegrating equations.

[C] test statistics are based on a model that does not include a trend or a constant. When there is no trend or constant, the cointegrating equations are restricted to being stationary with zero means.

[A, B and C] are determind according to the best fit of the models given the diagnostic tests in Table 3-34. The null hypothesis, H_0, implies at most r cointegrating vectors, where r , is the order of cointegration.

[¥] The second model for yhe UAE has all variable excluding the gross domestic saving.

** Accept the null at the 5 percent level of significance.

The results, shown in Table 3-1, strongly reject all of the null hypotheses and support the conclusion that there are no cointegrating vectors for Oman.[32] In contrary, accept the null hypotheses $H_0: r \le 3$, supporting the conclusion that there are three cointegrating vectors for Egypt and Kuwait. Whereas, rejecting all of the null hypotheses, except $H_0: r \le 2$, supporting the existence of two cointegrating vectors for Morocco. But, accept the null hypotheses $H_0: r \le 4$, concluding that there are four cointegrating vectors for Bahrain, Jordan, Saudi Arabia and UAE for its model of all variables excluding savings. Furthermore, accept the null hypotheses $H_0: r \le 5$, concluding that there are five

[31] This result of full rank means that the Omani data are stationary which strengthens both the Omani results of unit root tests and the Fisher type panel unit root tests performed in chapter two. If our panel data set has at least one country with stationary data, we can reject the null of nonstationarty of the whole panel. Then, we can conclude that the investigated panel data set in chapter two was stationary because of the Omani results.

[32] See footnote 3031.

cointegrating vectors for Qatar, Syria and Tunisia and accept the null of $H_0 : r \leq 6$ for UAE in its all variables model.

3.5.3 VECM RESULTS

Given the evidence of cointegration, to investigate the eight variables' system with r cointegrating vectors, we first run unrestricted (VECM) by which one can recognize the long run equilibrium relationship that may exist between the investigated variables. We run the model firstly in the same variables order giving in equation (3/12) and test for: (1) the weak exogeneity, (2) if any variable should be excluded from the model and (3) model mis-specification i.e. autocorrelation and normality etc. Accordingly, we estimate the model, mostly, with all variables and probably without one or more variables, in different order as the weakly exogenous variables will be placed in the last positions in the system (see section 3.4.2). The current section will be devoted to the discussion of the final results obtained for each country concentrating on the relationship between the current account balance and the fiscal policy variables taxes and the government expenditure in the long and short run as it is the main goal of this study as established in section 1.4.

Because β parameters by itself cannot provide the requird information about the causality between the investigated variables and how quickely it adjusts to the long relationship as well as the long run relationship including its two components α and β. We will report the following for each country: (1) the unrestricted and the restricted cointegration matrix β; (2) the adjustment parameters α for each variable with respecte to all cointegrated vectors; (3) the long run equation for each variable i.e. the impact matrix $\alpha\beta$; (4) the joint weak exogenity test results; (5) the exclusion test results; (6) the short run parameters Γ and (7) the result of the short run Granger-non-causality test. As we interested in the explanation of the long run relationship between the current account and fiscal policy variables taxes and government expenditure and the potential direct and indirect causality between them, the discussion in the following subsections will be devoted entirely to the related results i.e. portion (C) and (D) because they contain all needed information to understand the long run relationships. Also, the related short run results will be deliberated.

3.5.3.1 BAHRAINI RESULTS

The results for Bahrain, as reported in Table 3-2 portions(A), refer to the unrestricted long run relationship between the investigated variables. The four cointegrating equations CE1, CE2, CE3, and CE4 are estimated directly for beta parameters. The results support a conclusion that the eight variables are perfectly integrated. In all cases, beta coefficients are different from zero. It is known that the cointegration matrix β is not uniquely identified, and the stationary linear combinations βX_t are unique up to linear transformation. The common practice is to normalize each vector in β with respect to a number of elements equal to the cointegration rank i.e. imposing r^2 restrictions on the system. Portion(B) of Table 3-2 illustrates the identified cointegrating vectors. Since there is more than one cointegrating vector, the interpretation of cointegrating vectors is no longer straightforward. However, statistical inference based on the (VECM) facilitates understanding the dynamic interrelationships in the system. An interesting question is whether all of the variables belong to the system. To that end, we carry out some specification tests. The restriction that an individual variable can be excluded from the system (i.e. it has zero coefficients in the cointegrating vectors) is tested using a likelihood ratio test, which is distributed as χ^2 with four degrees of freedom. This test statistic is reported under the Exclusion tests χ^2 column in portion (B) of Table 3-2. Apparently, none of the investigated variables can be excluded from the system.

The long-run component, as shown in portion(D) in Table 3-2, indicates that the relationship between the current account balance CAB and the government spending GEX is positive contrary to both (TDH) and (REH) i.e. increasing GEX improves CAB. That is, most of the Bahraini government's spending is related to the oil production infrastructure[33], therefore the more they spend the more they export oil which helps improving its current account position. On contrary, CAB is connected negatively with taxes TAX contrdicting the hypothesized relation in the (TDH). The plausible explanation is that the increasing government spending is not matched by increasing taxes and tariffs, as illustrated in section 1.9, 1.7 especially on the oil sector at least until 2006 which restrict the government

[33] In chapter 4 we found import elasticity to the government spending in the oil producing countries is the higher because most of their import is related to their oil production investment.

Table 3-2 Bahraini VECM Results

(A) - The Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{4,GDS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$
CE1	1	0.13	0.31	0.96	-0.61	-0.52	-0.83	0.98
CE2	0.67	1	0.04	1.21	-0.12	-0.20	-1.02	-0.12
CE3	-1.68	-0.72	1	-1.33	0.09	1.30	1.30	0.06
CE4	0.86	-2.36	0.07	1	-0.20	-0.51	-0.04	-0.56

(B) - The Reduced Form Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{4,GDS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$	**Exclusion tests χ^2 (P-value)**
CE1	1	0	0	0	-0.76***	-0.87***	-0.40*	1.89***	137.19 (0.00)
CE2	0	1	0	0	-0.005	0 .03	-0.29***	0.33***	101.10 (0.00)
CE3	0	0	1	0	-0.71***	0.23***	-0.09	1.52***	205.91 (0.00)
CE4	0	0	0	1	0.39***	0.29***	-0.37*	-1.48***	79.06 (0.00)

(C) - Adjustment Coefficients Matrix α

Adjustment Parameters	α_{CAB}	α_{TAX}	α_{GEX}	α_{GI}	α_{GMS}	α_{GDS}	α_{TT}	α_{GGDP}
CE1	-2.14***	-0.85**	-0.06	2.09***	10.23***	-0.09	0.97	2.03
CE2	-0.81	-1.91***	-0.37**	0.78**	1.78	-0.35	-0.05	1.14
CE3	1.27***	0.82***	-0.06	-1.12***	-3.6***	-0.16	0.011	-0.79
CE4	-1.54***	-0.64**	-0.09	1.47***	9.56***	-0.32	1.15*	2.18**
Joint Weak Exogeneity Tests χ^2	13.45 (0.00)	38.60 (0.00)	15.17 (0.00)	31.22 (0.00)	25.15 (0.00)	6.43 (0.17)	7.13 (0.13)	5.56 (0.23)

(D) - Impact Parameters Matrix $\alpha\beta$

Independent Variables	CAB_{t-1}	TAX_{t-1}	GEX_{t-1}	GI_{t-1}	GMS_{t-1}	GDS_{t-1}	TT_{t-1}	$GGDP_{t-1}$
ΔCAB_t	-2.14***	-0.81	1.27***	-1.54***	0.167	1.7***	1.57***	-0.10
ΔTAX_t	-0.85**	-1.90***	0.82***	-0.64**	-0.09	0.70***	1.07***	-0.06
GEX_t	-0.06	-0.37**	-0.06	-0.09	0.08**	0.007	0.17	-0.21***
ΔGI_t	2.09***	0.78**	-1.12***	1.47***	-0.26***	-1.64***	-1.52***	0.32***
ΔGMS_t	10.23***	1.78	-3.6***	9.56***	-1.59***	-6.97***	-7.94***	0 .28
ΔGDS_t	-0.09	-0.35	-0.15	-0.31	0.07	-0.06	0.27	-0.05
ΔTT_t	0 .97	-0.05	0 .01	1.15*	-0.299***	-0.52	-0.82	0.14
$\Delta GGDP_t$	2.03	1.14	-0.79	2.18**	-0.19	-1.3	-1.9**	-0.19

***, ** and * denote significant at the 1%, 5% and 10% respectively.

from gaining more revenues. The first glance to the above result shows unidirectional causality between the current account balance CAB and fiscal policy variables GEX and TAX, but the deeper investigation reveals that this conclusion is far from the truth. The complete story can be captured using the adjustment paramters α in conjunction with the impact parameters matrix as shown in portions (C) and(D) of Table 3-2. The long run Granger-non-causality, represented by the individual p-value of the adjustment parameters, illustrate that CAB causes TAX, GI and GMS, while TAX causes GEX and GI, meanwhile GEX causes CAB, TAX, GI and GMS, finally GI causes CAB, TAX, GMS, TT and GGDP. Therefore, the direct causality is running from the current account balance to taxes and from GEX to CAB. But, the long run causality is running indirectly from TAX to CAB and from the later to GEX through other variables. That is, TAX causes GI which causes CAB meaning that there is a feedback between the later and the system, also CAB causes TAX which in turn causes GEX indicating a feedback between the later and the system. This result is strongly supported by the rejection of the joint weak exogeneity of CAB, TAX, GEX, GI and GMS which entails feedback relationships between all those variables.[34] Furthermore, as mentioned above[27] GDS long run equation has no significant parameters in its right hand side because the joint weak exogeneity cannot be rejected and the individual p-value cannot reject the long run Granger-non-causality from the endogenous variables twowards the weakely exogenous GDS. But, however this result does not imply that GDS to not affect any of these variables, as shown in portion (D) in Table 3-2, GDS found to be significant in the right hand side of CAB, TAX, GI and GMS long run equations.

The estimated adjustment coefficients indicate different speed of adjustment towards the long run relationships of the variables. Individual p-values for the CAB variables is significant at 1% in the cointegrating equations CE1, CE3 and CE4, while the adjustment speed of TAX is significant at 5% in CE1 and at 1% in the cointegrating equations CE2, CE3 and CE4. GEX adjustment speed is significant at 5% only in CE2, but GI is strongly significant in all vectors, which supports the aforementioned indirect feedback from GEX to CAB through GI, and GMS is very significant in all vectors except CE2. Moreover, the joint χ^2 tests strongly reject the weak exogeneity in all of these variables except the three variables supporting the individual p-values results and confirming the feedback between those variables. The magnitudes of the equilibrium

[34] Note that the long run feedback in the system does not imply direct causality between all variables in both directions but it may run from one variable to another variable through one or more of the remaining variables in the system.

adjustments as signified by the estimates can be fairly sizable, especially which adjusts to equilibrium in CE1 by 10.23% per year and by 9.56% per year in CE4. On the other hand, the CAB, TAX, GEX and GI adjustments towards the equilibrium in the cointegrating relationships occur at much slower rates, typically from 0.37% to 2.14% per year. On contrary, the results of both joint weak exogeneity tests χ^2 and the individual p-values can not reject the null hypotheses of weak exogeneity of GDS, TT and GGDP (the variables in the last position of the system). That is, the system is estimated of the endogenous variables CAB, TAX, GEX and GI conditioning on the weakly exogenous variables GDS, TT and GGDP.

Although, the reasonable weak exogeneity of GDS, TT and GGDP suggests long run non-causality from CAB, TAX, GEX and GI to GDS, it does not imply short run non-causality. We also examine a related concept of Granger-non-causality in the (VECM) which relates to the short run parameters as illustrated in subsection 3.4.3. Based on the results of Table 3-3, particularly the first row, we can conclude that TAX, GI, GDS and TT Granger-cause CAB in the short run. Likewise, the short run Granger-causality runs from CAB, GI, GMS and TT to TAX, from all variable to GEX and GI, from CAB, GI and TT to GMS, from GMS and TT to GDS, from GMS. These results as well as the long run Granger-causality confirm the conclusion that we have strong causality in the model especially for the endogenous variables. Despit the fact that GDS, TT and GGDP considered weakly exogenous, it cannot be strongly exogenous because GI causes the later (in the long run) and GMS causes the formers in the short run.

Table 3-3 Bahraini Short-Run Granger Non-Causality

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔGDS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$
ΔCAB_t	4.23 (0.04)	4.86 (0.08)	4.23 (0.12)	4.67 (0.09)	4.33 (0.11)	4.63 (0.10)	4.82 (0.08)	4.25 (0.12)
ΔTAX_t	4.69 (0.09)	4.07 (0.04)	4.18 (0.12)	5.31 (0.07)	6.6 (0.04)	4.30 (0.11)	4.25 (0.12)	5.41 (0.07)
GEX_t	4.63 (0.10)	7.91 (0.02)	4.49 (0.03)	4.66 (0.10)	10.37 (0.01)	4.62 (0.10)	4.77 (0.09)	5.86 (0.05)
ΔGI_t	8.37 (0.02)	8.15 (0.02)	10.90 (0.00)	8.14 (0.00)	8.98 (0.01)	12.03 (0.00)	10.38 (0.01)	8.42 (0.01)
ΔGMS_t	4.87 (0.09)	0.00 (0.99)	0.21 (0.09)	5.23 (0.07)	0.00 (0.98)	1.04 (0.59)	4.42 (0.10)	1.50 (0.47)
ΔGDS_t	4.25 (0.12)	0.92 (0.63)	0.68 (0.71)	4.39 (0.11)	5.87 (0.05)	0.02 (0.89)	10.66 (0.00)	0.80 (0.67)
ΔTT_t	0.77 (0.68)	0.77 (0.68)	0.78 (0.68)	1.37 (0.50)	9.94 (0.01)	1.26 (0.53)	0.77 (0.38)	0.90 (0.63)
$\Delta GGDP_t$	2.51 (0.29)	2.47 (0.29)	1.22 (0.54)	3.34 (0.19)	1.43 (0.49)	1.86 (0.39)	3.05 (0.22)	1.21 (0.27)

Numbers in parentheses p-values for the Wlad chi square Granger-non-causality test.

These results strongly support the long run results for all variables except GDS and GGDP where the former's short run equation has significant variables in its right hand side contrary to its long run equation and the opposite is true for GGDP. The most interesting result is the short run Granger-causality from CAB to GMS. Given the short run parameters in Table 3-4, the current account surplus depreciates the currency forcing central banke to do sterilization, in order to keep the adopted fixed exchange rate, by buying the local currency and selling the dollar which redudes money supply as one percent increase in the current account balance decreases GMS by 4.31 percent.

Table 3-4 Bahraini Short-Run Parameters Matrix

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔGDS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$
ΔCAB_t	1.53** (0.75)	-0.32 (0.37)	0 .06 (0.81)	1.33* (0.75)	-0.09 (0.06)	-0.92** (0.48)	-0.95** (0.48)	0 .08 (0.15)
ΔTAX_t	-0.36 (0.42)	0.42** (0.21)	-0.42 (0.46)	-0.52 (0.42)	0.073** (0.04)	-0.112 (0.27)	-0.10 (0.27)	-0.05 (0 .08)
GEX_t	-0.10 (0.22)	0.31*** (0.11)	-0.52** (0.24)	0.05 (0.22)	-0.04*** (0.02)	-0.07 (0.15)	-0.07 (0.15)	0.06 (0.04)
ΔGI_t	-1.5*** (0.54)	0.013 (0.26)	0 .79 (0.57)	-1.5*** (0.53)	0.12*** (0.04)	1.15*** (0.35)	1.02*** (0.34)	-0.12 (0.10)
ΔGMS_t	-4.31* (2.40)	0.05 (1.2)	1.19 (2.5)	-4.27* (2.4)	0.004 (0.21)	1.52 (1.5)	2.97** (1.54)	0.53 (0.47)
ΔGDS_t	0.71 (0.53)	-0.24 (0.26)	0.46 (0.57)	0.81 (0.53)	-0.10*** (0.05)	0.05 (0.34)	-0.56* (0.34)	0.08 (0.10)
ΔTT_t	-0.52 (0.82)	-0.12 (0.41)	0.42 (0.88)	-0.96 (0.83)	0.23*** (0.07)	0 .19 (0 .53)	0.46 (0.52)	-0.09 (0.16)
$\Delta GGDP_t$	-1.85 (1.4)	-0.94 (0.70)	-0.10 (1.5)	-2.3* (1.4)	0.10 (0.12)	0.94 (0.90)	1.45 (0.90)	-0.30 (0.27)

***, ** and * denote significant at the 1%, 5% and 10% respectively and standard error in parentheses.

3.5.3.2 EGYPTIAN RESULTS

Using the same sequences, Table 3-5 portion(A) illustrates the Egyptian results of the long run beta parameters of the cointegrating equations i.e. CE1, CE2, and CE3 as the rank of cointegration is 3, as shown in Table 3-1. In all cases, the beta coefficients are different from zero. But unfortunately, the joint weak exogenity test provides results contradicting the p-value tests and also illustrates that the condition[25] that the number of weakly exogenous variables in the conditional VECM system can be at most $(p-r)$ has been marginally violated. Therefore, we re-estimate the model with three lags. Interestingly, the joint weak exogenity test shows that there is no varaiables can be considered weakly exogenous to the system at the conventional level of significance. As shown in Table 3-6 portion(B), nine restrictions have been imposed on the system to normalize each vector in β matrix with respect to every first three variables for each equation. Portion (B) of Table 3-6 illustrates the identified cointegrating vectors; the normalised cointegrating coefficients only load on the GDS, GI, GMS, TT and GGDP series. The restriction that an individual variable can be excluded from the system is tested using a likelihood ratio test, which is distributed as χ^2 with five degrees of freedom. This test statistic is reported under the exclusion tests χ^2 column in portion(B) of Table 3-6. It is clearly seen that, at very haigh significant levels, none of the investigated variables should be excluded from the system.

Parameters exemplified in portion(B) of Table 3-6 allocate the speed at which the variables adjust towards long run equilibrium along with its p-values and the results of joint weak exogeneity test. None of the α parameters equal zero for any variable in all cointegrated equations, therefore, weak exogeneity is rejected for all variables. Individual p-values for CAB are significant at 10% and 1% level in CE1 and CE2 respectively, also it is significant at 1% for TAX in all vecors while it is significant at 1%, 5% and 1% for GEX in CE1, CE2 and CE3 respectively, at 5% for GDS only in CE1, at 1% for GI in CE3, at 10% for GMS in CE2, at 1% for TT in CE3 and at 5%, 1% and 5% for GGDP in CE1, CE2 and CE3 respectively. Similarly, the joint tests reject weak exogeneity for all variables at convenient significant levels. Therefore, long run Granger-causality could be found between all variables. For example, CAB long run Granger-causes TAX, GEX, GDS and GGDP; also, TAX found to Granger-cause CAB, GEX, GMS, TT and GGDP; additionally, GEX long run Granger-cause TAX, GEX, GI and GGDP. These results suggest strong feedback between all variables and the system.

The estimated adjustment coefficients indicate different speed of adjustment towards the long run equilibrium relationships of the variables. The magnitudes of the equilibrium adjustments as signified by the estimates can be fairly sizable, especially in GGDP, GMS and TT which adjusts to equilibrium in CE2 by 3.54%, 5.09% and 7.0% per year and by 3.36% per year in CE3 for GGDP. In addition, CAB, TAX, GEX and GDS adjust towards the long run equilibrium in the CE1 at much slower rates, typically from 0.33%, 0.53%, 0.28% and 0.32% per year respectively. As weak exogeneity is rejected for all variables, then all variables can be considered endogenous to the system and therefore the estimated VECM not conditional on any exogenous variables. These results confirm the existence of the feedback relationships between those variables directly or indirectly.

Table 3-5 Egyptian Results of VECM

(A) - The Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$
CE1	1.00	-15.77	2.08	-1.50	-0.82	-6.70	-0.57	6.77
CE2	9.02	1.00	-46.16	-1.14	14.81	-9.03	10.64	-23.10
CE3	-2.42	-0.26	1.00	1.38	-0.82	-0.88	0.06	1.08

(B) - The Reduced form Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$	Exclusion tests χ^2 (P-value)
CE1	1	0	0	-0.61***	0.22***	0.43	-0.13***	0.22*	347.07 (0.00)
CE2	0	1	0	0.04	0.03	0.49***	-0.006	-0.38***	316.27 (0.00)
CE3	0	0	1	-0.09	-0.28***	0.29***	-0.26***	0.44***	382.22 (0.00)

(C) - Adjustment Coefficients Matrix α

Adjustment Parameters	α_{CAB}	α_{TAX}	α_{GEX}	α_{GDS}	α_{GI}	α_{GMS}	α_{TT}	α_{GGDP}
CE1	-0.71**	0.36	0.05	0.69**	0.58	-1.14	-2.39*	0.05
CE2	-0.20	-0.88***	-0.13	-0.18	-0.14	-1.63***	-0.61	0.33
CE3	0.70**	-0.24	-0.38	-0.45*	-1.07**	0.44	3.43***	-0.27
Joint Weak Exogeneity Tests χ^2	5.16 (0.16)	11.89 (0.00)	3.96 (0.27)	6.87 (0.07)	4.03 (0.26)	10.86 (0.01)	8.42 (0.04)	0.37(0.15)

***, ** and * denote significant at the 1%, 5% and 10% respectively.

Table 3-6 Egyptian Results of VECM with Three Lags

(A) - The Matrix of Cointegrating Vectors β								
Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$
CE1	1	-3.01	1.59	-1.54	-0.70	-0.49	-0.50	1.10
CE2	-0.05	1	-0.38	-0.66	-0.01	0.95	-0.09	-1.18
CE3	-0.15	0.93	1	-0.02	-0.29	0.47	-0.18	0.11

(B) - The Reduced form Matrix of Cointegrating Vectors β									
Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$	**Exclusion tests χ^2 (P-value)**
CE1	1	0	0	-4.24***	-0.74*	2.84***	-0.83***	-3.26***	24.93 (0.00)
CE2	0	1	0	-0.83***	-0.15	1.05***	-0.18***	-1.09***	27.66 (0.00)
CE3	0	0	1	0.13	-0.25***	-0.10	-0.13***	0.66***	111.59(0.00)

(C) - Adjustment Coefficients Matrix α								
Adjustment Parameters	α_{CAB}	α_{TAX}	α_{GEX}	α_{GDS}	α_{GI}	α_{GMS}	α_{TT}	α_{GGDP}
CE1	-0.33*	0.53***	0.28*	0.32**	0.49	-0.41	-0.94	-0.89**
CE2	2.09***	-2.95***	-1.44**	-0.71	-1.30	3.54*	7.06***	5.09***
CE3	-0.10	-2.17***	-1.45***	0.04	2.50***	2.27	0.90	3.36**
Joint Weak Exogeneity Tests χ^2	13.58 (0.00)	20.89 (0.00)	8.83 (0.03)	8.59 (0.03)	8.43 (0.03)	6.26 (0.09)	10.65 (0.01)	8.88 (0.03)

(D) - Impact Parameter matrix $\alpha\beta$								
Independent Variables	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$
ΔCAB_t	-0.33*	2.09***	-0.10	-0.34	-0.04	1.27***	-0.09	-1.28***
ΔTAX_t	0.53***	-2.95***	-2.17***	-0.07	0.61***	-1.4***	0.38***	0.10
ΔGEX_t	0.28*	-1.44**	-1.45***	-0.20	0.38**	-0.57	0.23*	-0.30
ΔGDS_t	0.32**	-0.71	0.04	-0.75***	-0.14	0.15	-0.14	-0.22
ΔGI_t	0.49	-1.30	2.50***	-0.65	-0.81***	-0.24	-0.49***	1.49***
ΔGMS_t	-0.41	3.54*	2.27	-0.91	-0.81	2.35***	-0.60*	-1.06
ΔTT_t	-0.94	7.06***	0.90	-1.73	-0.59	4.67***	-0.61	-4.09***
$\Delta GGDP_t$	-0.89**	5.08***	3.36**	-0.05	-0.98**	2.52***	-0.63**	-0.50

***, ** and * denote significant at the 1%, 5% and 10% respectively.

As presented in Table 3-6 portion (D), the long run equation of the current account balance depicts negative relationship (but not significant) between the current account balance CAB and the government expenditure GEX alike to (TDH) and (REH) (i.e. Egyptian increase of government spending, if significant, deteriorates its current account balance). In contrary, the relationship between the current account balance CAB and taxes TAX is positive, analogous to the (TDH) and contrary to the non oil countries result in chapter 2, a one percent increase in TAX to GDP ratio improves the current account balance CAB to GDP ratio by 2.09 percent. The same pattern—with different magnitude–of the relationship between the current account balance CAB and taxes TAX is represented in the long run equation of TAX. Therefore, we reject the validity of the (TDH) for Egypt in the long run. Similarly, government expenditure GEX is positively affected by the current account balance as stated by the former's long run equation. Therefore, we conclude that there is bidirectional causality between current account balance CAB and fiscal policy variables government expenditure GEX and taxes TAX contrary to both (TDH) and (REH).[35]

Table 3-7 Egyptian Granger Non-Causality Test

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$
ΔCAB_t	5.22 (0.07)	7.80 (0.09)	7.71 (0.10)	8.37 (0.07)	8.53 (0.07)	14.87 (0.00)	12.54 (0.01)	12.98 (0.01)
ΔTAX_t	15.30 (0.00)	15.24 (0.00)	16.19 (0.00)	15.52 (0.00)	17.02 (0.00)	23.11 (0.00)	15.67 (0.00)	15.55 (0.00)
ΔGEX_t	2.33 (0.67)	4.22 (0.37)	1.54 (0.46)	3.61 (0.46)	1.90 (0.75)	3.77 (0.43)	2.22 (0.69)	3.75 (0.44)
ΔGDS_t	2.57 (0.63)	3.68 (0.45)	5.13 (0.27)	1.22 (0.54)	3.79 (0.43)	2.22 (0.69)	5.72 (0.22)	1.85 (0.76)
ΔGI_t	13.58 (0.00)	13.22 (0.01)	18.73 (0.00)	16.94 (0.00)	12.63 (0.00)	12.95 (0.01)	14.54 (0.00)	14.68 (0.00)
ΔGMS_t	15.77 (0.00)	13.51 (0.00)	14.00 (0.00)	24.37 (0.00)	12.82 (0.01)	10.21 (0.00)	13.24 (0.01)	12.85 (0.01)
ΔTT_t	17.20 (0.00)	11.24 (0.02)	10.40 (0.03)	11.03 (0.02)	13.24 (0.01)	17.23 (0.00)	10.30 (0.00)	16.09 (0.00)
$\Delta GGDP_t$	6.19 (0.18)	9.29 (0.05)	6.70 (0.15)	16.63 (0.00)	7.96 (0.09)	12.72 (0.01)	7.37 (0.11)	6.15 (0.04)

Numbers in parentheses p-values for the Wlad chi square Granger-non-causality test.

Besides, we can examine a related concept of Granger-causality in the (VECM) which relates to the short run parameters. Based on the results of Table 3-7, we can

[35] These results come in the line with Marinheiro, C. F. (2008) results for Egypt in which both the current account and fiscal balances are positively related with causality running from the later to the former.

conclude that all variables included in the system Granger-cause CAB, TAX, GI, GMS and TT, including themselves, in the short run at conventional level of significance. On contrary, GEX and GDS found to be not affected by any of the other variables in the system, but GGDP is short run Granger-caused by TAX, GDS, GI and GMS. These results strongly support the long run causality shown above, then we can conclude that the (VECM) for Egypt has strong causality between most variables. Interestingly, the results from the short run Granger-causality, supplemented by the short run parameters presented in Table 3-8, regarding both CAB and GMS strongly support the view that the current account surplus depreciates the Egyptian currency forcing central banke to do sterilization, in order to keep the adopted fixed exchange rate, by buying the Egyptian pound and selling the dollar which redudes money supply. That is, one percent increase in the current account balance decreases growth rate of money supply by 2.85 percent in the short run.

The rejection of the (TDH) for Egypt could be explained in the light of the Egyptian economy characteristics, as policy efforts should be devoted mostly to the reduction of the current account deficit. Egypt did not pay the required attention to decrease its fiscal deficit in favour of improving the current account position, it is also necessary to resort to other policies like export promotion ones. From our results, it is clearly seen that maintaining some flexibility in the Egyptian exchange rate system could be crucial. This would avoid the Egyptian economy the costs of sterilization and make it less vulnerable to eventual speculative capital flows.

Table 3-8 Egyptian Short-Run Parameters Matrix for VECM with Three Lags

	ΔCAB_{t-1}	ΔCAB_{t-2}	ΔTAX_{t-1}	ΔTAX_{t-2}	ΔGEX_{t-1}	ΔGEX_{t-2}	ΔGDS_{t-1}	ΔGDS_{t-2}	ΔGI_{t-1}	GI_{t-2}	ΔGMS_{t-1}	GMS_{t-2}	ΔTT_{t-1}	TT_{t-2}	$\Delta GGDP_{t-1}$	$GGDP_{t-2}$
ΔCAB_t	-0.82 (0.55)	-0.44 (0.54)	-0.93 (0.61)	-0.60 (0.43)	-0.95 (0.61)	0.11 (0.38)	0.42 (0.33)	-0.69 (0.49)	0.09 (0.22)	-0.41*** (0.17)	-0.79*** (0.24)	-0.34** (0.17)	0.27*** (0.11)	-0.04 (0.12)	0.90*** (0.29)	0.30 (0.26)
ΔTAX_t	1.12** (0.52)	-0.93* (0.52)	2.29*** (0.58)	1.35*** (0.41)	-0.307 (0.59)	-0.90** (0.36)	-0.54* (0.32)	1.27*** (0.47)	0.01 (0.22)	-0.05 (0.17)	0.32 (0.23)	-0.21 (0.16)	-0.19** (0.10)	0.09 (0.12)	0.09 (0.28)	0.56** (0.25)
ΔGEX_t	0.46 (0.49)	-0.43 (0.49)	1.03** (0.55)	0.77** (0.38)	0.13 (0.55)	-0.39 (0.34)	-0.23 (0.30)	0.75* (0.44)	-0.04 (0.20)	-0.03 (0.16)	0.02 (0.22)	-0.17 (0.15)	-0.09 (0.09)	0.05 (0.10)	0.10 (0.26)	0.44** (0.23)
ΔGDS_t	0.13 (0.45)	-0.66 (0.44)	0.75 (0.50)	0.28 (0.35)	-0.77 (0.50)	-0.32 (0.31)	0.15 (0.27)	0.33 (0.41)	0.30 (0.18)	0.02 (0.14)	-0.14 (0.20)	-0.02 (0.14)	0.09 (0.08)	0.21** (0.10)	0.18 (0.24)	0.23 (0.22)
ΔGI_t	0.71 (0.90)	0.51 (0.89)	-0.78 (1.01)	-0.79 (0.71)	1.81* (1.01)	0 .74 (0.62)	1.07** (0.56)	-0.10 (0.81)	-0.21 (0.37)	1.02*** (0.29)	0.21 (0.41)	-0.03 (0.28)	-0.26 (0.18	0.24 (0.20)	-1.16*** (0.49)	-0.63 (0.43)
ΔGMS_t	-2.82** (1.34)	0.54 (1.32)	-3.05** (1.51)	-2.67*** (1.04)	-0.58 (1.50)	1.29 (0 .926)	3.49*** (0 .824)	-2.28** (1.21)	-0.090 (0.552)	0 .014 (0.430)	-1.81*** (0 .602)	-0.648 (0 .410)	0 .68*** (0.263)	-0.080 (0 .298)	1.52** (0.72)	-0.31 (0.65)
ΔTT_t	-4.329** (2.15)	-1.45 (2.12)	-4.96** (2.42)	-2.38 (1.68)	-1.94 (2.40)	0 .455 (1.48)	1.93 (1.32)	-1.14 (1.95)	0.65 (0.88)	-1.42** (0.69)	-3.14*** (0.96)	-1.10* (0.66)	1.33*** (0.42)	-0.24 (0.48)	3.08*** (1.16)	1.18 (1.03)
$\Delta GGDP_t$	-1.89 (1.33)	1.93 (1.31)	-4.02*** (1.50)	-3.09*** (1.04)	-0.02 (1.49)	1.05 (0.92)	2.67*** (0.82)	-2.30** (1.20)	-0.35 (0.55)	0.77* (0.43)	-0.94 (0.60)	-0.44 (0.41)	0 .41 (0.26)	-0.11 (0.30)	0.15 (0.72)	-1.45*** (0.64)

***, ** and * denote significant at the 1%, 5% and 10% respectively and standard error in parentheses.

3.5.3.3 JORDANIAN RESULTS

As before, Table 3-9 portion (A) illustrates the Jordanian results of the long run beta parameters of the cointegrating equations i.e. CE1, CE2, CE3 and CE4 as the rank of cointegration is 4, as shown in Table 3-1. In all cases, beta coefficients are different from zero. As the rank of cointegration is four, 16 restrictions have been imposed on the system to normalize each vector in β matrix with respect to every first four variables for each equation. Portion (B) of Table 3-9 demonstrates the identified cointegrating vectors with respect to CAB, GDS, GMS and TAX. The normalised cointegrating coefficients only load on the GI, GEX, GGDP and TT series. However, we test whether all of the variables belong to the system i.e. the exclusion test using a likelihood ratio test which is distributed as χ^2 with five degrees of freedom. This test statistic as reported in portion (B) of Table 3-9 shows that none of the variables included in our conditional (VECM) can be excluded from the system at any conventional significance levels.

The long-run coefficients, as shown in Table 3-9 portion (D), point to the relationship between the current account balance CAB and only one variable growth rate of money supply GMS, both are connected negatively. That is, capital inflow into Jordan depreciates its curreny forcing the monetary authorities to sterilize, to keep its exchange rate fixed, by reducing money supply. This result confirmed with significant shor run Granger-causality running from CAB to GMS, as shown in Table 3-11, as the one percent increase in the former decreases the later by 0.24 percent (but it is not significant) as illustrated in Table 3-11. Moreover, the current account balance is found to be explanatory variable in the long run equation of GGDP as one percent increase in the former improves the later by 0.89 percent. To that point, the appealing question is: can we find any link between the current account balance and fiscal policy variables? The answer entails a discussion about the adjustment parameters α and its relation with the long run Granger-causality.

Portion (C) of Table 3-9 shows that CAB long run Granger-cause GGDP while GDS causes GMS and GEX, in the meantime GMS causes CAB, GMS and GI, finally Tax causes GDS and GI. Therefore, the long run causality runs from TAX to GDS to GMS to CAB. As beta parameters have to be used in conjunctionwith alpha parameter, the impact parameters matrix reveals the seconde part of the long run story. That is, CAB causes GGDP; the later causes GDS which in turn causes GEX, but the later causes the former (i.e. GDS) which causes CAB. Also, GGDP causes GMS which causeas GI which cuases TAX. Therefore, we can conclude that there is a feedback between the current account balance and fiscal policy variables taxes and government spending through the other variables, but we don have direct causation between CAB and TAX which support both the (REH) and our result for the non oil countries in chapter 2. On the other hand, the direct relation between CAB and GEX cannot be found contrary to both (TDH) and (REH). May be the reason for missing this direct relationships is that Jordan economy depends heavily on the remittancies and forien aid which are not included in the current account balance as shown in CHAPTER 2: section 2.4.1. Additionally, as mentioned above[27] TT long run equation has no significant parameters in its right hand side because the joint weak exogeneity cannot be rejected and the individual p-value cannot reject the long run Granger-non-causality from the endogenous variables twowards the weakely exogenous TT. But, however TT is found to have some impact on the model through GDS, GMS and GGDP.

Parameters exemplified in portion (C) of Table 3-9 assigns the speeds at which the variables adjust towards the long run equilibrium as well as p-values and the joint weak exogeneity test results. Individual p-values for CAB are significant at 10% and 1% in CE1 and CE3 respectively, also individual p-values for the GDS are significant at 5% in CE2 and CE4, GMS is significant at 1% in CE3 only, TAX is significant at 1% in CE4 while GEX is significant at 1% in CE3 and CE4 and finaly GGDP is significant at 1% in CE1 only. Similarly, the joint χ^2 tests reject weak exogeneity for all variables except GGDP and TT. But, dispite the joint weak exogeniety of GGDP we can find a feedback between it and the system as shown above because of its highly significant individual p-value in CE1. Although, the estimated adjustment coefficients indicate different speed of adjustment towards the long run relationships between the variables, the magnitudes of the equilibrium adjustments for all variables are less than 1% which means that longer time is needed to restore the long run equilibrium. The largest speed towards the long run equilibrium found for CAB in GMS cointegration equation as it sdjust by 0.99 percent which support the view of using sterilization by the Jordanian central bank in order to keep its exchange rate fixed as explained above.

Table 3-9 Jordanian Results of VECM

(A) - The Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,GDS}$	$\beta_{3,GMS}$	$\beta_{4,TAX}$	$\beta_{5,GI}$	$\beta_{6,GEX}$	$\beta_{7,GGDP}$	$\beta_{8,TT}$
CE1	1.00	-1.67	0.04	2.43	1.29	-0.85	-0.51	-0.35
CE2	1.28	1.00	-5.28	-10.52	7.77	23.58	-10.82	-4.54
CE3	0.97	-0.41	1.00	0.67	1.17	0.05	-0.67	-0.29
CE4	-5.90	6.66	2.28	1.00	-10.35	-4.93	3.62	1.74

(B) - The Reduced form Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,GDS}$	$\beta_{3,GMS}$	$\beta_{4,TAX}$	$\beta_{5,GI}$	$\beta_{6,GEX}$	$\beta_{7,GGDP}$	$\beta_{8,TT}$	Exclusion tests χ^2 (P-value)
CE1	1	0	0	0	2.64***	6.39***	-4.35***	-1.92***	266.96 (0.00)
CE2	0	1	0	0	1.11	6.24***	-4.05***	-1.78***	60.784 (0.00)
CE3	0	0	1	0	-1.07**	-4.47***	2.69***	1.23***	149.399 (0.00)
CE4	0	0	0	1	0.225	1.37***	-1.24***	-0.59	257.69 (0.00)

(C) - Adjustment Coefficients Matrix α

Adjustment Parameters	α_{CAB}	α_{GDS}	α_{GMS}	α_{TAX}	α_{GI}	α_{GEX}	α_{GGDP}	α_{TT}
CE1	-0.56	0.08	-0.22	0.29	0.12	0.16	0.89***	-0.08
CE2	0.06	-0.71**	-0.15	-0.22	-0.07	-0.33***	-0.58	0.45
CE3	-0.99***	-0.36	-0.97***	-0.11	0.54***	-0.19	0.55	-0.06
CE4	-0.62	0.77**	-0.45	-0.47**	0.78***	0.16	0.56	-0.87
Joint Weak Exogeneity Tests χ^2	11.22 (0.02)	28.54 (0.00)	37.01 (0.00)	26.19 (0.00)	10.59 (0.03)	9.47 (0.05)	6.22 (0.18)	3.76 (0.44)

(D) - Impact Parameter Matrix $\alpha\beta$

Independent Variables	CAB_{t-1}	GDS_{t-1}	GMS_{t-1}	TAX_{t-1}	GI_{t-1}	GEX_{t-1}	$GGDP_{t-1}$	TT_{t-1}
ΔCAB_t	-0.56	0.06	-0.99***	-0.62	-0.485	0.40	0.280	0.11
ΔGDS_t	0.08	-0.71***	-0.36	0.77**	-0.024	-1.25***	0.61***	0.21*
ΔGMS_t	-0.22	-0.15	-0.97***	-0.45	0.188	1.37***	-0.48**	-0.24**
ΔTAX_t	0.29	-0.22	-0.11	-0.47**	0.529*	0.32	-0.08	-0.02
ΔGI_t	0.12	-0.07	0.54***	0.78***	-0.16	-1.00***	0.25	0.10
ΔGEX_t	0.16	-0.33***	-0.19	0.16	0.309	0.08	-0.10	-0.06
$\Delta GGDP_t$	0.89***	-0.58	0.55	0.56	1.24**	0.38	-0.75***	-0.34***
ΔTT_t	-0.08	0.45	-0.06	-0.87	0.15	1.35	-0.54	-0.20

***, ** and * denote significant at the 1%, 5% and 10% respectively.

Table 3-10 Jordanian Short Run Granger Causality

	ΔCAB_{t-1}	ΔGDS_{t-1}	ΔGMS_{t-1}	ΔTAX_{t-1}	ΔGI_{t-1}	ΔGEX_{t-1}	$\Delta GGDP_{t-1}$	ΔTT_{t-1}
ΔCAB_t	3.60 (0.05)	4.06 (0.13)	4.51 (0.10)	5.85 (0.05)	4.79 (0.09)	4.15 (0.12)	6.24 (0.04)	3.94 (0.13)
ΔGDS_t	6.51 (0.03)	4.71 (0.03)	5.57 (0.06)	8.65 (0.01)	5.05 (0.07)	6.50 (0.03)	5.38 (0.06)	5.10 (0.07)
ΔGMS_t	0.82 (0.66)	3.27 (0.19)	0.08 (0.77)	0.09 (0.95)	0.18 (0.91)	3.09 (0.21)	7.46 (0.02)	2.07 (0.35)
ΔTAX_t	3.62 (0.16)	3.06 (0.21)	9.50 (0.00)	3.04 (0.08)	4.99 (0.08)	3.07 (0.21)	7.17 (0.02)	3.80 (0.14)
ΔGI_t	0.63 (0.72)	0.21 (0.89)	0.14 (0.93)	3.99 (0.13)	0.14 (0.71)	1.13 (0.56)	0.15 (0.92)	0.15 (0.92)
ΔGEX_t	2.62 (0.26)	2.59 (0.27)	3.68 (0.15)	6.98 (0.03)	3.35 (0.18)	2.04 (0.15)	2.06 (0.35)	2.16 (0.33)
$\Delta GGDP_t$	3.97 (0.13)	0.89 (0.64)	0.24 (0.88)	0.17 (0.91)	6.21 (0.04)	0.78 (0.67)	0.12 (0.73)	0.54 (0.76)
ΔTT_t	1.93 (0.38)	1.13 (0.56)	0.36 (0.83)	1.71 (0.42)	125 (0.53)	0.76 (0.68)	0.45 (0.79)	0.35 (0.55)

Numbers in parentheses p-values for the Wlad chi square Granger-non-causality test.

We can also examine a related concept of Granger causality in the (VECM) which relates to the short run parameters. Based on the results provided in Table 3-10, particularly the first row, we can conclude that there is direct short run causality running towards CAB from GMS, TAX, GI and GGDP but the coefficient presented in Table 3-11 regarding these variables in the short ru current account balansce equation are not significant which support the previously discussed indirect long run causality. All variables Granger-cause GDS in the short run, but the only significant variables in that relationship are CAB, GDS, TAX and GI. On contrary, no variable found to affect GI and TT in short run while TAX is Granger-caused by GMS, GI and GGDP. Also, TAX is a Granger-cause for GEX, and GI is a Granger-cause for GGDP.

Table 3-11 Jordanian Short-Run Parameters Matrix

	ΔCAB_{t-1}	ΔGDS_{t-1}	ΔGMS_{t-1}	ΔTAX_{t-1}	ΔGI_{t-1}	ΔGEX_{t-1}	$\Delta GGDP_{t-1}$	ΔTT_{t-1}
ΔCAB_t	-0.63** (0.33)	0.31 (0.31)	0.35 (0.25)	0.23 (0.25)	-0.33 (0.43)	-0.37 (0.66)	-0.20 (0.19)	0.16 (0.20)
ΔGDS_t	-0.74*** (0.29)	0.59** (0.27)	0.31 (0.22)	-0.57*** (0.22)	-0.70* (0.38)	0.78 (0.58)	0.008 (0.17)	0.21 (0.17)
ΔGMS_t	-0.24 (0.27)	0.46* (0.25)	0.06 (0.21)	0.03 (0.21)	0.12 (0.35)	-0.92* (0.53)	0.42*** (0.15)	0.23 (0.16)
ΔTAX_t	-0.25 (0.21)	0.07 (0.19)	0.34** (0.16)	-0.28* (0.16)	-0.53** (0.27)	0.23 (0.42)	0.23** (0.12)	-0.09 (0.13)
ΔGI_t	0.04 (0.25)	0.002 (0.23)	0.004 (0.19)	-0.38** (0.19)	-0.12 (0.32)	0.48 (0.49)	0.03 (0.14)	0.04 (0.15)
ΔGEX_t	-0.09 (0.14)	0.10 (0.14)	0.14 (0.11)	-0.16 (0.11)	-0.24 (0.19)	-0.41 (0.29)	0.03 (0.08)	-0.04 (0.09)
$\Delta GGDP_t$	-0.67* (0.37)	0.24 (0.35)	0.09 (0.29)	-0.07 (0.29)	-1.14*** (0.49)	-0.56 (0.74)	-0.07 (0.22)	0.11 (0.22)
ΔTT_t	0.81 (0.60)	-0.58 (0.57)	-0.03 (0.47)	0.57 (0.47)	0.88 (0.80)	-0.85 (1.21)	0.04 (0.35)	-0.21 (0.37)

***, ** and * denote significant at the 1%, 5% and 10% respectively and standard error in parentheses.

3.5.3.4 KUWAITI RESULTS

Portion (A) of Table 3-12 shows the Kuwaiti long run beta parameters of the cointegrating equations CE1, CE2, and CE3 as the rank of cointegration is 3 as shown in Table 3-1. All beta coefficients are different from zero. Because the cointegration rank is three, 9 restrictions are required on the system to normalize each vector in β matrix with respect to every first three variables for each equation. Portion (B) of Table 3-12 illustrates the identified cointegrating vectors, it is clearly seen that the identified cointegrating coefficients only load on GDS, GI, GMS, GGDP and TT series and all of them are extremely significant. However, a likelihood ratio test is used to investigate whether all variables belong to the system (i.e. if an individual variable can be excluded from the system). The likelihood ratio test, which is distributed as χ^2 with five degrees of freedom, is reported under the exclusion tests χ^2 column in portion (B) of Table 3-12. It is clearly seen that none of the variables included in our system could be excluded from the system at any conventional significance levels.

The long run relationships, as shown in portion (D) of Table 3-12, sketches that the current account balance CAB and both the government expenditure GEX and taxes TAX are negatively related. Every one percent increase in taxes TAX and government expenditure GEX to GDP ratio deteriorates the current account balance CAB to GDP ratio by 1.18 and 4.53 percent. On the other hand, one percent increase in the current account balance CAB to GDP ratio decreases taxes TAX to GDP ratio by 2.42 percent, while it raises government expenditure GEX by 4.66 percent. Therefore, we can conclude that there is bidirectional causality between the current account balance CAB and fiscal policy variables government expenditure GEX and taxes TAX, but the effect of current account on taxes dominates the effect in the opposite direction. Such evidence of bidirectional direct causality from the current account balance to fiscal balance is contradicting the hypothesized relation in the (TDH) and the documented results for the US and some other economies such as those reported in Table 3-36. However, this apparently irregular evidence may be attributed to the fact that the Kuwaiti central government accelerates its spending, building infrastructure, supporting public sector, employing its people etc., more than it receive in revenue in response to any current account imrovement primarly due to oil exports. Under this scenario not only has government spending been increased, but government revenues have also declined due to the fact that most of that spending does not produce equivalent return, and hence government budget surplus decreases or its deficit increases.

Nevertheless, the above bidirectional causality can be tested by the investigation of the long run Granger-causality respresented by significancy of the individual p-values of the adjustment parameters α. All parameters presented in portion (C) of Table 3-12 show the speeds at which the variables adjust towards the long run equilibrium as well as its p-values and the joint weak exogeneity test results. Individual p-values for the variables CAB, TAX, GEX, GDS and GI are all significant at convenient significant levels in CE1, CE2 and CE3 respectively which suggests the existence of feedback between all of these endogenous variables and the system. Therefore, CAB long run Granger-cause TAX, GEX, GDS and GI; whereas TAX causes CAB, GEX, GDS and GI; also GEX Granger-causes CAB, TAX, GDS and GI. Moreover, the joint χ^2 tests reject weak exogeneity for all variables except TT supporting the aforementioned results of the individual p-values and Granger-causality.

TT long run equation, as presented in the last row of portion (D) in Table 3-12, has no significant parameters in its right hand side because the joint weak exogeneity cannot be rejected and the individual p-values cannot reject the long run Granger-non-causality from the endogenous variables twowards the weakely exogenous TT. But, however TT is found to have some impact on the model through CAB, TAX, GEX, GDS and GI. We also found long run causality running from GGDP and GMS to all variables except TT and from GI to CAB, GEX and GDS and from the later to all variables except GMS, GGDP and TT which confirm the above mentioned results that we cannot exclude any from the system of them like the result of the exclusion test. The estimated adjustment coefficients indicate different speed of adjustment towards the long run relationships between the variables. The speeds of the equilibrium adjustments as signified by the estimates can be quite sizable, especially in CAB which adjusts to equilibrium by 7.19%, 1..19% and 4.54% per year in CE1, CE2 and CE3 respectively; also TAX adjusts to long run equilibrium by 2.43%, 0.39% and 2.19% a year in CE1, CE2 and CE3 respectively; GEX adjusts to equilibrium by 4.76%, 0.68% and 2.74% per year in CE1, CE2 and CE3 respectively; while GDS speeds of adjustment towards equilibrium are 4.37% 0.67% and 3.02% per year in CE1, CE2 and CE3 respectively; finally GI adjusts to equilibrium by 0.86%, 0.19% and 0.64% a year in CE1, CE2 and CE3 respectively.

Table 3-12 Kuwaiti Results of VECM

(A) - The Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,GGDP}$	$\beta_{8,TT}$
CE1	1.00	0.63	0.83	-0.86	-2.84	-0.54	0.44	-0.01
CE2	7.23	1.00	10.46	-0.53	-3.96	1.14	-5.70	0.61
CE3	2.20	0.36	1.00	-1.66	2.71	-1.45	-0.25	-0.55

(B) - The Reduced form Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,GGDP}$	$\beta_{8,TT}$	Exclusion tests χ^2 (P-value)
CE1	1	0	0	-0.93***	3.32***	-0.96***	-0.11	-0.44***	984.62 (0.00)
CE2	0	1	0	-0.77***	-7.18***	-0.40	1.70***	0.23***	117.89 (0.00)
CE3	0	0	1	0.67***	-1.98***	0.91***	-0.64***	0.34***	596.27 (0.00)

(C) - Adjustment Coefficients Matrix α

Adjustment Parameters	α_{CAB}	α_{TAX}	α_{GEX}	α_{GDS}	α_{GI}	α_{GMS}	α_{GGDP}	α_{TT}
CE1	-7.19***	-2.43***	4.67***	-4.37***	0.86***	0.02	-1.10	-1.12
CE2	-1.19***	-0.39***	0.68*	-0.67*	0.19***	0.12	-0.58	-0.20
CE3	-4.54***	-2.19***	2.74**	-3.02***	0.64***	-0.26	0.32	-0.23
Joint Weak Exogeneity Tests χ^2	12.59 (0.00)	26.89 (0.00)	10.43 (0.01)	9.60 (0.02)	16.86 (0.00)	8.36 (0.04)	7.07 (0.07)	1.56 (0.67)

(D) – Impact Parameters Matrix $\alpha\beta$

Independent Variables	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	$\Delta GGDP_{t-1}$	ΔTT_{t-1}
ΔCAB_t	-7.19***	-1.19***	-4.54***	4.58***	-6.29***	3.69***	1.6**	1.35***
ΔTAX_t	-2.42***	-0.39***	-2.19***	1.09***	-0.89	0.71***	0.98***	0.23**
ΔGEX_t	4.66***	0.68*	2.74**	-3.03***	5.15***	-2.53***	-1.07*	-0.96***
ΔGDS_t	-4.37***	-0.67**	-3.02***	2.56***	-3.70**	2.01***	1.24**	0.74***
ΔGI_t	0.86***	0.19***	0.64***	-0.52***	0.21	-0.38***	-0.17**	-0.12***
ΔGMS_t	0.02	0.12	-0.26	-0.28	-0.29	-0.27	0.36***	-0.07
$\Delta GGDP_t$	-1.10	-0.58	0.32	1.68	-0.10	1.54*	-1.07*	0.46
ΔTT_t	-1.12	-0.20	-0.23	1.04	-1.84	0.97	-0.07	0.37

***, ** and * denote significant at the 1%, 5% and 10% respectively.

Table 3-13 Kuwaiti Granger Non-Causality Test

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	$\Delta GGDP_{t-1}$	ΔTT_{t-1}
ΔCAB_t	1.78 (0.18)	1.91 (0.38)	12.85 (0.00)	5.53 (0.06)	3.80 (0.14)	12.12 (0.00)	2.66 (0.26)	3.39 (0.18)
ΔTAX_t	5.19 (0.07)	0.84 (0.36)	4.77 (0.09)	4.26 (0.11)	1.32 (0.51)	1.28 (0.52)	3.80 (0.14)	11.90 (0.00)
ΔGEX_t	10.26 (0.00)	4.86 (0.08)	4.80 (0.02)	7.66 (0.02)	7.54 (0.02)	10.92 (0.00)	4.80 (0.09)	5.33 (0.06)
ΔGDS_t	5.32 (0.07)	0.78 (0.67)	8.86 (0.01)	0.16 (0.68)	0.16 (0.92)	9.32 (0.00)	2.75 (0.25)	4.57 (0.10)
ΔGI_t	7.05 (0.02)	0.88 (0.64)	13.63 (0.00)	1.17 (0.55)	0.86 (0.35)	12.73 (0.00)	4.23 (0.12)	2.28 (0.31)
ΔGMS_t	7.30 (0.02)	9.47 (0.00)	8.03 (0.01)	10.16 (0.00)	7.34 (0.02)	7.25 (0.00)	9.04 (0.01)	11.34 (0.00)
$\Delta GGDP_t$	1.18 (0.55)	0.50 (0.77)	2.61 (0.27)	0.26 (0.87)	0.06 (0.96)	4.36 (0.11)	0.06 (0.80)	0.93 (0.62)
ΔTT_t	0.19 (0.91)	1.17 (0.55)	0.13 (0.93)	0.52 (0.76)	0.29 (0.86)	2.20 (0.33)	0.19 (0.90)	0.13 (0.71)

Numbers in parentheses p-values for the Wlad chi square Granger-non-causality test.

. Based on the results in Table 3-13, we conclude that GEX, GDS and GMS short run causes CAB; while the later, GEX and TT causes TAX. Also, GEX and GMS found to be caused by all variables; GDS, GI caused by CAB, GEX and GMS. Given the short run parameters in Table 3-14, this short run causality found to be opposing (TDH) and the long run causality as one percent increase in the current account balance increases taxes by 1.45 perceent. Although, ther is short run causality runs from CAB to GMS which can be taken as a sign of sterilization, the coefficient of CAB in the short run equation of GMS, as shown in Table 3-14, is not significant and very small as well. But, the opposite is true as increasing money supply deteriorates current account position because it pushs the interest rate down which increases capital ouflow.

Table 3-14 Kuwaiti Short-Run Parameters Matrix

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	$\Delta GGDP_{t-1}$	ΔTT_{t-1}
ΔCAB_t	3.58 (2.69)	-0.22 (0.68)	5.70*** (2.21)	-0.14 (1.77)	-1.21 (4.48)	-4.17*** (1.23)	-0.77 (0.54)	-1.26* (0.70)
ΔTAX_t	1.45** (0.71)	-0.16 (0.18)	1.20** (0.45)	-0.81* (0.47)	0.54 (1.18)	-0.24 (0.32)	-0.27** (0.14)	-0.60*** (0.18)
ΔGEX_t	-2.13 (2.03)	0.23 (0.52)	-3.67*** (1.68)	-0.11 (1.34)	1.24 (3.39)	2.69*** (0.94)	0.48 (0.41)	0.92* (0.53)
ΔGDS_t	2.98 (1.91)	-0.36 (0.48)	4.12*** (1.57)	-0.51 (1.26)	0.54 (3.18)	-2.67*** (0.88)	-0.64* (0.39)	-0.95** (0.50)
ΔGI_t	-0.37 (0.28)	0.005 (0.07)	-0.60*** (0.23)	0.02 (0.18)	0.43 (0.46)	0.46*** (0.13)	0.10* (0.06)	0.08 (0.07)
ΔGMS_t	0.08 (0.50)	-0.22* (0.13)	0.59 (0.42)	0.52 (0.33)	-0.13 (0.84)	-0.62*** (0.23)	-0.22** (0.10)	0.17 (0.13)
$\Delta GGDP_t$	2.09 (1.97)	0.17 (0.50)	2.40 (1.62)	-0.64 (1.30)	-0.10 (3.29)	-1.86** (0.91)	-0.10 (0.40)	-0.50 (0.51)
ΔTT_t	-0.72 (1.82)	0.46 (0.46)	-0.24 (1.50)	0.86 (1.20)	-1.32 (3.03)	-1.09 (0.84)	0.12 (0.37)	0.17 (0.47)

***, ** and * denote significant at the 1%, 5% and 10% respectively and standard error in parentheses.

3.5.3.5 MOROCCAN RESULTS

Unlike the preceding countries, we found the current account balances CAB weakly exogenous to the system when we first formulate Morocco's variables system following the same order as given in equation (3/12) and still-stand weakly exogenous in many alternative orders. Moreover, the diagnostic specification test performed very poorly for all of those alternatives. But, however, the best fitted model for Morocco can be obtained when following the order: TAX, GEX, GDS, GGDP, CAB, GI, TT and GMS. Using the above orders, portion (A) of Table 3-15 illustrates the Morocco results of the long run beta parameters of the cointegrating equations CE1, CE2 and CE3 as the rank of cointegration is 3 as shown in Table 3-1. In all cases, the beta coefficients are statistically different from zero.

Given that cointegration rank, nine restrictions have been imposed on the system to normalize each vector in β matrix with respect to the first three variables of each equation. Portion(B) of Table 3-15 illustrates the reduced form cointegrating vectors, the normalised cointegrating coefficients load on GGDP, CAB, TT, GI and GMS series. However, a likelihood ratio test is used to investigate whether all variables belong to the system (i.e. if an individual variable can be excluded from the system), which is distributed as χ^2 with five degrees of freedom. This test statistic is reported under the exclusion tests χ^2 column in portion (B) of Table 3-15. It is clearly seen that none of the investigated variables can be excluded from the system at any conventional level of significance.

The first glance to those results in Table 3-15 may indicate the absence of any feedback between CAB and the system. But, deeper analyses, using the individual p-value of the CAB regarding the adjustment speed towards the long run equilibrium given by CE1, CE2 and CE3, as shown in Table 3-15 portion (C), illustrates that CAB is long run Granger-caused by both GEX and GDS while TAX has no effect on the other variable. On the other hand, the long run Granger-causality is running directly from GEX to TAX, GDS, GGDP and CAB whereas the last two varibles as well as GEX are Granger-caused by GDS. To that point, we cannot find a feedback from CAB to the system because it is weakly exogenous according to the joint test. Therefore, we need to investigate the long run impact parameters matrix in which running long run causality from the weakly exogenous variables into the system can be found.

Portion (D) of Table 3-15 shows that GGDP, CAB, TT and GMS are long run Granger-cause for TAX while GEX is caused by GDS, CAB, TT and GMS. Therefore, we conclude that the long run causality is running indirectly from CAB to TAX contradicting the (TDH) and (REH), a one percent increase in the current account balance reduces TAX by 0.45 percent the plausible explanation is; since issuance of investment laws in 1973-1980, which included various facilities and tax exemptions to attract the foreign capital and encourage the private sector to invest in Moroccan export-oriented light industry to increase the ability to repay its foreign debt, Moroccan economy suffered from insufficiency of private economic activity to meet domestic demand and the inability of its local resources to meet the investment requirements and capital formation, which led to more loans and foreign investment to fill this gap adding to the current debt burden with a reduction in its revenues because of this tax exemptions and the inefficient public sector.

α, parameters represented in portion (C) of Table 3-15 are the speed at which the variables adjust towards the long run equilibrium as well as p-values and the joint weak exogeneity test results. Individual p-values for the CAB, GGDP, GDS and GEX variables are significant at 5% and 1% in CE2 and CE3 respectively, and TAX is significant at 1% in CE1 and CE2. In contrary, individual p-values for the TT, GI and GMS are not significant at any level in any of the cointegration vectors. Moreover, the joint χ^2 tests cannot reject the weak exogeneity for CAB, TT, GI and GMS which means that our (VECM) for Morocco's endogenous variables are estimated conditional on those weakly exogenous variable. As shown above, many variables affect CAB through the GEX, GDS and TT which means that the weakly exogenous variables could be, at least, necessary channels through which the causality runs between the endogenous variables. The estimated adjustment coefficients indicate different speed of adjustment towards the long run relationships of the variables as it ranges from 0.37% and 1.71% indicating that equilibrium takes long time to be restored, these adjustment speeds considered much slower than the range in the previous countries.

Table 3-15 Morocco Results of VECM

(A) - The Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,TAX}$	$\beta_{2,GEX}$	$\beta_{3,GDS}$	$\beta_{4,GGDP}$	$\beta_{5,CAB}$	$\beta_{6,TT}$	$\beta_{7,GI}$	$\beta_{8,GMS}$
CE1	1	-2.43	2.32	2.14	-2.07	-0.69	-2.11	0.54
CE2	1.86	1	-0.11	1.29	0.81	-0.99	-0.18	-0.29
CE3	2.69	-2.23	1	-0.63	0.66	-1.78	4.33	0.69

(B) - The Reduced form Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,TAX}$	$\beta_{2,GEX}$	$\beta_{3,GDS}$	$\beta_{4,GGDP}$	$\beta_{5,CAB}$	$\beta_{6,TT}$	$\beta_{7,GI}$	$\beta_{8,GMS}$	Exclusion tests χ^2 (P-value)
CE1	1	0	0	0.06	0.52***	0.02	1.02***	-0.59***	128.92 (0.00)
CE2	0	1	0	1.43***	-0.31	-0.34***	-2.48***	0.12	126.049 (0.00)
CE3	0	0	1	2.39***	-1.44***	-0.14	-3.96***	0.09	113.47 (0.00)

(C) - Adjustment Coefficients Matrix α

Adjustment Parameters	α_{TAX}	α_{GEX}	α_{GDS}	α_{GGDP}	α_{CAB}	α_{TT}	α_{GI}	α_{GMS}
CE1	-0.78***	0.14	-0.22	-1.14	-0.58	-1.15	-0.10	0.81
CE2	-0.51***	-0.55***	0.67***	1.71**	0.62**	0.32	0.01	-0.49
CE3	0.14	0.37***	-0.41***	-1.51***	-0.48**	0.21	0.16	0.50
Joint Weak Exogeneity Tests χ^2	25.10 (0.00)	31.35 (0.00)	12.32 (0.00)	6.93 (0.07)	4.87 (0.18)	5.81 (0.12)	2.98 (0.39)	1.917 (0.58)

(D) - Impact Parameters Matrix $\alpha\beta$

Independent Variables	TAX_{t-1}	GEX_{t-1}	GDS_{t-1}	$GGDP_{t-1}$	CAB_{t-1}	TT_{t-1}	GI_{t-1}	GMS_{t-1}
ΔTAX_t	-0.78***	-0.51***	0.14	-0.45***	-0.44***	0.14***	-0.06	0.41***
ΔGEX_t	0 .14	-0.55***	0.37***	0.10	-0.28***	0.14***	0.06	-0.12*
ΔGDS_t	-0.22	0.67***	-0.41***	-0.04	0.27**	-0.18***	-0.26	0.18
$\Delta GGDP_t$	-1.14	1.70**	-1.50***	-1.25*	1.05*	-0.40*	0.58	0.75
ΔCAB_t	-0.58	0.61**	-0.47**	-0.30	0.19	-0.156*	-0.22	0.37*
ΔTT_t	-1.15	0.32	0.21	0.88	-1.00*	-0.16	-2.79***	0.74
ΔGI_t	-0.10	0.01	0.16	0.39	-0.29	-0.03	-0.76	0.07
ΔGMS_t	0.80	-0.48	0.49	0.54	-0.14	0.12	0.07	-0.49

***, ** and * denote significant at the 1%, 5% and 10% respectively.

Table 3-16 Morocco Short Run Granger Non-Causality Test

	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	$\Delta GGDP_{t-1}$	ΔCAB_{t-1}	ΔTT_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}
ΔTAX_t	0.62 (0.43)	10.22 (0.00)	3.05 (0.21)	6.22 (0.04)	1.69 (0.42)	2.96 (0.22)	0.65 (0.72)	12.76 (0.00)
ΔGEX_t	1.44 (0.48)	0.00 (0.94)	1.32 (0.51)	1.04 (0.59)	0.30 (0.86)	0.33 (0.84)	1.18 (0.55)	0.17 (0.91)
ΔGDS_t	0.52 (0.77)	8.91 (0.01)	0.28 (0.59)	0.37 (0.83)	0.35 (0.83)	7.66 (0.02)	2.05 (0.35)	1.66 (0.43)
$\Delta GGDP_t$	0.21 (0.90)	0.26 (0.87)	1.04 (0.59)	0.08 (0.77)	0.13 (0.93)	3.10 (0.21)	0.77 (0.68)	0.76 (0.68)
ΔCAB_t	2.19 (0.33)	3.86 (0.14)	0.76 (0.68)	1.31 (0.52)	0.62 (0.43)	0.79 (0.67)	2.42 (0.29)	5.39 (0.06)
ΔTT_t	5.87 (0.05)	6.48 (0.03)	7.61 (0.02)	2.40 (0.30)	3.06 (0.21)	2.37 (0.12)	4.86 (0.08)	5.36 (0.06)
ΔGI_t	0.01 (0.99)	1.38 (0.50)	0.03 (0.98)	0.96 (0.62)	0.55 (0.76)	0.30 (0.85)	0.00 (0.95)	0.01 (0.99)
ΔGMS_t	4.67 (0.09)	3.67 (0.15)	3.71 (0.15)	4.11 (0.12)	2.88 (0.23)	5.88 (0.05)	3.18 (0.20)	2.19 (0.13)

Numbers in parentheses p-values for the Wlad chi square Granger-non-causality test.

Based on the results in Table 3-16, we can conclude that GEX, GGDP and GMS short run Granger-cause TAX, but no short run causality runs directly from any variable to GEX, GGDP and GI. Moreover, TT and GEX found to cause GDS and GMS causes CAB in the short run. Also, TT found to be affected by TAX, GEX, GDS, GI and GMS while TAX and TT causes GMS in the short run. This result confirms the above mentioned long run causality running indirectly from fiscal policy variables to the current account balnance through TT and GMS. That is, when government expenditure increases more than its revenue the inflation increases deteriorating the terms of trade forcing the central bank to intervene (as it follows pegged exchange rate) increasing money supply and deteriorating the current account position as shown in Table 3-17.

Table 3-17 Morocco Short-Run Parameters Matrix

	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	$\Delta GGDP_{t-1}$	ΔCAB_{t-1}	ΔTT_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}
ΔTAX_t	-0.14 (0.18)	-1.08*** (0.37)	-0.414 (0.26)	0.21*** (0.09)	0.33 (0.28)	-0.10 (0.07)	-0.08 (0.27)	-0.25** (0.09)
ΔGEX_t	-0.11 (0.09)	-0.01 (0.18)	-0.14 (0.13)	-0.05 (0.05)	0.07 (0.14)	-0.02 (0.03)	-0.15 (0.14)	0.02 (0.04)
ΔGDS_t	-0.08 (0.17)	1.03*** (0.35)	0.13 (0.25)	0.04 (0.09)	-0.12 (0.27)	0.14*** (0.06)	0.26 (0.26)	-0.10 (0.08)
$\Delta GGDP_t$	0.24 (0.78)	0.73 (1.58)	0.83 (1.12)	-0.11 (0.40)	-0.05 (1.20)	0.33 (0.28)	0.97 (1.16)	-0.28 (0.37)
ΔCAB_t	0.31 (0.30)	-0.93 (0.61)	-0.29 (0.43)	0.05 (0.15)	0.37 (0.46)	-0.09 (0.11)	0.68 (0.45)	-0.33** (0.14)
ΔTT_t	1.34* (0.79)	-3.66*** (1.61)	-3.10*** (1.14)	-0.35 (0.41)	2.00 (1.23)	-0.44 (0.28)	2.50** (1.18)	-0.59 (0.38)
ΔGI_t	0.033 (0.33)	0.77 (0.66)	0.06 (0.47)	-0.14 (0.17)	-0.25 (0.50)	0.054 (0.12)	0.024 (0.49)	0 .007 (0.155)
ΔGMS_t	-0.48 (0.57)	-1.13 (1.15)	-0.80 (0.82)	-0.32 (0.29)	1.04 (0.87)	-0.36* (0.21)	1.20 (0.84)	-0.39 (0.27)

***, ** and * denote significant at the 1%, 5% and 10% respectively and standard error in parentheses.

3.5.3.6 QATARI RESULTS

Qatari results for the long run beta parameters of the cointegrating equations CE1, CE2, CE3, CE4 and CE5, normalized with respect to the first 5 variables because the rank of cointegration is five as shown in Table 3-1, are illustrated in portion (A) of Table 3-18. In all cases, beta coefficients are statistically different from zero. Given that the rank of cointegration rank is five, 25 restrictions have been imposed on the system to normalize each vector in β matrix with respect to each first five variables in each equation. Portion (B) of Table 3-18 illustrates the identified cointegrating vectors which only load on TT, GGDP and GI series. However, a likelihood ratio test is used to test whether all of the variables belong to the system (i.e. if an individual variable can be excluded from the system). The likelihood ratio test, which is distributed as χ^2 with three degrees of freedom, is reported under the exclusion tests χ^2 column in portion(B) of Table 3-18. It is clearly seen that none of the investigated variables can be excluded from the system at the highly significance levels

The long run Granger-causality relationships, as depicted by the adjustment parameters in portion (C) of Table 3-18, are running as the following: CAB Granger-causes TAX, GEX, GDS, TT and GGDP; while TAX cuases GGDP; but GEX causes TAX, GDS, TT and GGDP; whereas GDS causes CAB and GGDP; finally GMS causes CAB, TAX, GEX and GGDP. To that point, we can conclude that the direct long run causality is running from the current account balance to fiscal policy variables taxes and government expenditure. But, however because TT, GGDP and GI are very significant in many vectors of the reduced form cointegration relationships, as provided in portion (B) in Table 3-18, we anticipate to find a feedback from the fiscal policy variables TAX and GEX as well as the other variables through TT or GGDP or GI or all of them. Therefore, relating alpha and beta parameters together gives the complete picture of all long run relationships in one matrix called the impact parameters as illustrated in portion (D) of Table 3-18.

As we can see, CAB found to be long run Granger-caused by GDS, GMS, GI and GGDP, the later is Granger-caused by all variables and GI is Granger-cause of all variables except GMS. Therefore, we can say TAX and GEX indirectly Granger-cause CAB through GDS, GGDP and TT and hence there is feedback in our system. Moreover, the long run components of the impact parameters' matrix indicate that the current account balance CAB is negatively affected (but not significant) by the government spending GEX similar to both (TDH) and (REH). On contrary, government expenditure GEX is strongly and positively affected by the current account balance, one percent increase in the current account balance to GDP ratio increses government spending by 2.03 percent. On contrary, CAB affects TAX negatively as one percent increase in the former to GDP ratio decreases the later to GDP ratio by 2.18 percent.

These results, taken together, indicate that fiscal deficits are not causally prior to the current account deficits; while on the other hand, the current account surplus is causally prior to fiscal deficits. Such evidence of unidirectional direct causality from the current account balance to fiscal deficit is contradicting the hypothesized relation in the (TDH) and the documented results for the US and other developed economies such as those reported in Table 3-36. However, this apparently irregular evidence may be attributed to the fact that the Qatari central government accelerates its spending, building infrastructure, supporting public sector, employing its people etc., more than it receive in revenue in an attempt to benefit from the current account surplus which was generated primarily by gas and oil exports. Under this scenario not only has government spending been increased, but government revenues have also declined due to the fact that most of that spending does not produce equivalent return, and hence government budget surplus decreases or its deficit increases.

Alpha parameters in portion (C) of Table 3-18 illustrate the speed at which the variables adjust towards the long run equilibrium as well as p-values and the joint weak exogeneity test results. The estimated adjustment coefficients indicate different speed of adjustment towards the long run relationships of the variables. Individual p-values for all variables, except GI, are significant at convenient level of significance in at least on cointegration vector. Also, the joint χ^2 tests reject weak exogeneity for all variables except GI; therefor its long run equation in the impact parameters has no significant variable in the right hand side. The magnitudes of the equilibrium adjustments as signified by the estimates can be reasonably sizable; especially TT which adjusts to equilibrium by 11.33% and 10.73% per year in CE1 and CE3 respectively, also GGDP adjusts to equilibrium by 8.08%, 6.47% and 5.80% per year in CE1, CE4 and CE4 respectively. Other variables adjust to equilibrium in the cointegrating relationships at much slower rates, typically from 0.46% to 3.71% per year.

Table 3-18 Qatari Results of VECM

(A) - The Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$	$\beta_{5,GI}$
CE1	1.00	0.36	0.91	-0.67	0.26	-0.15	0.13	0.81
CE2	-58.28	1.00	-28.69	59.57	0.01	10.36	-7.49	-55.99
CE3	0.62	0.35	1.00	-0.13	-0.23	-0.01	0.34	0.75
CE4	1.07	1.17	3.93	1.00	0.22	0.19	-0.85	2.29
CE5	5.47	-3.61	-2.19	-8.36	1.00	-1.47	0.03	3.89

(B) - The Matrix of Reduced form Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$	$\beta_{5,GI}$	Exclusion tests χ^2 (P-value)
CE1	1	0	0	0	0	-0.06	2.72***	-1.09	27.00 (0.00)
CE2	0	1	0	0	0	-0.07**	0.73***	-0.58***	21.56 (0.00)
CE3	0	0	1	0	0	0.05	-1.5***	1.39***	46.28 (0.00)
CE4	0	0	0	1	0	0.14	1.77***	-1.32***	37.65 (0.00)
CE5	0	0	0	0	1	-0.08***	-0.89***	-.022	158.12 (0.00)

(C) - Adjustment Coefficients Matrix α

Adjustment Parameters	α_{CAB}	α_{TAX}	α_{GEX}	α_{GDS}	α_{GMS}	α_{TT}	α_{GGDP}	α_{GI}
CE1	-3.27***	-2.18**	2.03**	2.02**	-2.03	-11.33*	-8.08***	1.30
CE2	-0.09	-1.41***	0.33	0.22	-0.55	-2.25	-2.52***	-0.35
CE3	-1.43	-3.71***	1.53*	1.96***	-2.50	-10.73**	-6.47***	0.013
CE4	3.06**	0.41	-1.54	-1.45	0.68	7.07	5.80***	-1.63
CE5	-1.00***	-0.64***	0.46***	-0.12	-1.20***	-1.63	-0.98***	0.352
Joint Weak Exogeneity Tests χ^2	24.69 (0.00)	25.20 (0.00)	10.48 (0.06)	19.23 (0.00)	15.8 (0.00)	21.18 (0.00)	90.80 (0.00)	3.05 (0.69)

(D) - Impact Parameters Matrix $\alpha\beta$

Independent Variables	CAB_{t-1}	TAX_{t-1}	GEX_{t-1}	GDS_{t-1}	GMS_{t-1}	TT_{t-1}	$GGDP_{t-1}$	GI_{t-1}
ΔCAB	-3.27***	-0.09	-1.43	3.06**	-1.00***	0.64***	-0.42*	-2.20*
ΔTAX	-2.18**	-1.41***	-3.71***	0.41	-0.64***	0.15	0.12	-2.37***
ΔGEX	2.03**	0.33	1.53*	-1.54	0.46***	-0.32	0.21	1.68*
ΔGDS	2.02**	0.22	1.96***	-1.45	-0.12	-0.23	0.13	2.35***
ΔGMS	-2.03	-0.55	-2.50	0 .68	-1.20***	0.22	0.28	-1.60
ΔTT	-11.33*	-2.25	-10.73**	7.07	-1.63	1.4	-1.69	-10.32*
$\Delta GGDP$	-8.07***	-2.52***	-6.47***	5.79***	-0.98***	1.21***	-2.54***	-6.23***
ΔGI	1.3	-0.35	0.013	-1.63	0.35	-0.31	0.06	0.88

***, ** and * denote significant at the 1%, 5% and 10% respectively.

Table 3-19 Qatari Short Run Granger Non-Causality

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$	ΔGI_{t-1}
ΔCAB_t	0.44 (0.50)	0.45 (0.79)	1.17 (0.55)	1.09 (0.58)	9.46 (0.00)	1.01 (0.60)	0.83 (0.65)	8.26 (0.01)
ΔTAX_t	1.83 (0.40)	0.98 (0.32)	4.83 (0.08)	0.99 (0.61)	8.88 (0.01)	1.42 (0.49)	1.07 (0.58)	1.53 (0.46)
ΔGEX_t	3.29 (0.19)	2.94 (0.23)	2.87 (0.09)	3.16 (0.20)	7.50 (0.02)	2.95 (0.22)	2.98 (0.22)	2.88 (0.23)
ΔGDS_t	3.00 (0.22)	3.37 (0.18)	4.31 (0.11)	0.32 (0.57)	0.44 (0.80)	5.15 (0.07)	2.97 (0.22)	5.58 (0.06)
ΔGMS_t	0.34 (0.84)	0.38 (0.82)	0.96 (0.61)	0.32 (0.85)	0.31 (0.57)	0.40 (0.81)	0.69 (0.70)	0.34 (0.84)
ΔTT_t	2.43 (0.29)	3.28 (0.19)	2.54 (0.28)	2.46 (0.29)	4.26 (0.118)	2.38 (0.12)	2.65 (0.26)	2.55 (0.27)
$\Delta GGDP_t$	14.63 (0.00)	11.31 (0.00)	9.31 (0.00)	10.06 (0.00)	12.96 (0.00)	5.46 (0.07)	4.22 (0.04)	8.06 (0.01)
ΔGI_t	0.28 (0.87)	0.25 (0.88)	0.28 (0.86)	0.27 (0.87)	1.78 (0.41)	1.78 (0.41)	2.05 (0.35)	0.25 (0.61)

Numbers in parentheses p-values for the Wlad chi square Granger-non-causality test.

Based on the results in Table 3-19, we can conclude that GEX and GMS short run Granger-cause TAX, but no short run causality runs directly from all variables to GGDP. Moreover, TT and GI found to cause GDS, also GMS and GI causes CAB in the short run. This result is different from the above mentioned long run causality running directely or indirectly from fiscal policy variables to the current account balnance and the other way round. Moreover, GGDP found to be affected by all variables in the short run similar to the long run meaning that there is strong causality from all variables to GGDP. Contrary to the preceding countries, we cannot find short run evidence for sterilization in Qatar as GMS is not affected by CAB whereas the opposite is true, one percent increase in GMS increases CAB by 0.54% as shown in Table 3-20. But, however sterilization could be found in the long run.

Table 3-20 Qatari Short-Run Parameters Matrix

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$	ΔGI_{t-1}
ΔCAB_t	0.80 (1.20)	0.06 (0.29)	0.05 (1.07)	-0.98 (0.96)	0.54*** (0.18)	-0.17 (0.18)	0.13 (0.14)	0.04 (1.40)
ΔTAX_t	1.06 (0.97)	0.231 (0.23)	1.9*** (0.87)	0.187 (0.78)	0.42*** (0.14)	-0.09 (0.14)	-0.04 (0.11)	1.01 (1.13)
ΔGEX_t	-1.55* (0.88)	-0.13 (0.21)	-1.3* (0.79)	0.81 (0.71)	-0.35*** (0.14)	0.14 (0.13)	-0.03 (0.10)	-1.33 (1.03)
ΔGDS_t	-1.13 (0 .78)	-0.30 (0.19)	-1.45** (0.71)	0.35 (0.63)	0.01 (0.12)	0.16 (0.11)	-0.14 (0.09)	-1.68** (0.91)
ΔGMS_t	1.06 (2.46)	0.15 (0.59)	2.10 (2.20)	-0.32 (1.90)	0 .21 (0.37)	-0.19 (0.36)	-0.12 (0.28)	0.45 (2.80)
ΔTT_t	7.35 (5.4)	1.10 (1.30)	5.20 (4.8)	-5.60 (4.35)	1.60** (0.83)	-1.24 (0.80)	0.95 (0.63)	6.42 (6.3)
$\Delta GGDP_t$	6.30*** (1.65)	0.98*** (0 39)	4.17*** (1.48)	-4.16*** (1.32)	0.87*** (0.25)	-0.55*** (0.25)	0.39** (0.19)	5.46***
ΔGI_t	0.52 (0.99)	0.01 (0.24)	0.45 (0.89)	-0.25 (0.79)	-0.122 (0.15)	0.05 (0.15)	-0.08 (0.12)	0.58 (1.16)

***, ** and * denote significant at the 1%, 5% and 10% respectively and standard error in parentheses.

3.5.3.7 SAUDI RESULTS

Based on the results in portion (A) of Table 3-21 the Saudi long run cointegrating equations are CE1, CE2, and CE3 as its cointegration rank is 4 as shown in Table 3-1. In all cases, the beta parameters are statistically different from zero. Because the cointegration rank is four, 16 restrictions have to be imposed on the system to normalize each vector in β matrix with respect to the first four variables for each equation. Portion (B) of Table 3-21 illustrates the identified cointegrating vectors, the normalised cointegrating coefficients only load on the TT, GGDP, GEX and GDS series. The restriction that an individual variable can be excluded from the system is tested using a likelihood ratio test, which is distributed as χ^2 with four degrees of freedom. This test statistic is reported under the exclusion test χ^2 column in portion (B) of Table 3-21. It is clearly seen that none of the investigated variables can be excluded from the system at conventional significance levels.

The long-run component, as shown in portion (D) in Table 3-21, indicates that the relationship between the current account balance CAB and the government spending GEX is negative as proposed by both (TDH) and (REH) i.e. increasing GEX by one percent deteriorates CAB by 1.37 percent. Likewise, CAB is connected negatively with taxes TAX contrdicting the hypothesized relation in the (TDH); one percent increase in TAX deteriorates the current account balance by 1.15 percent. But, the question is what causes what? As CAB seems to have explanatory power towards TAX, one percent increases in the current account balance decreases taxes by 2.34 percent. Therefore, we proceed with explaining the long run causality as represented by the adjustment parameters in portion (C) of Table 3-21. The results illustrate that CAB long run Granger-causes TAX, GI, GMS while TAX Granger-cause CAB, GEX, GI and GMS, also GI long run Granger-cause TAX and GGDP whereas GMS causes TAX, GI and TT. Accordingly, we can conclude that TAX and CAB are related by bidirectional direct causality whereas the causality runs from GEX to CAB.

These results, taken together, indicate that fiscal surplus is causally prior to the current account deficits; while on the other hand, the current account surplus is causally prior to fiscal deficits. Such evidence of bidirectional direct causality from the current account balance to fiscal balance and vise versa is similar to the results found by Kouassi, Mougoue et al. (2004) for Korea and Thiland and Khalid and Guan' (1999) results for Canada and India. However, these results may be attributed to the fact that the Saudi central government accelerates its spending, infrastructure, supporting public sector, employing its people etc., more than it receive in revenue[36] in an attempt to benefit from the current account surplus which was generated primarly by oil exports. On the other hand, that infrastructure spending especialy that related to petrochemicals and oil industry increases import and deteriorate the current account balance.

The long run Granger-non-causality, represented by the individual p-value of the adjustment parameters, illustrate that CAB causes TAX, GI and GMS, while TAX causes CAB, GI and GMS, meanwhile GI causes TAX and GGDP, finally GMS causes TAX, GI, GMS and TT. Therefore, the direct causality is running from the current account balance to taxes and the way round while it runs from GEX to CAB. This result is strongly supported by the rejection of the joint weak exogeneity of CAB, TAX, GI GMS and TT which entails feedback relationships between all those variables. Furthermore, as mentioned above[27] GEX and GDS long run equation has no significant parameters in the right hand side because the joint weak exogeneity cannot be rejected and the individual p-value cannot reject the long run Granger-non-causality from the endogenous variables twowards the weakely exogenous GEX and GDS. But, however this result does not imply that both to not affect any of these variables, as we can see from the impact parameters matrix both variables are very significant in the right hand side of CAB, TAX, GI and GMS.

The joint weak exogeneity is rejected for all variables except GEX and GDS, which support the above long run Granger-causality results. The magnitudes of the equilibrium adjustments as signified by the estimates are relatively slow; as CAB adjusts to the long run equilibrium by 2.04% and 1.15% in CE1 respectevely while TAX adjusts by 2.34%, 1.27% 2.95% and 0.42 in CE1, CE2, CE3 and CE4 respectevely. GI found to adjust by 1.31% in CE1, 0.74% in CE2 and 0.32% in CE4, whereas GMS adjusts by 0.81% in CE1, 0.42 in CE2 and 0.47% in CE4, TT adjusts by 1.51% in CE4 but GGDP adjusts by 3.89% in CE4. Although, the reasonable weak exogeneity of GDS and GEX suggests long run non-causality from other variables to them, it does not imply long run causality from them to the other variables, as our (VECM) is conditioning on them, and it does not entail short run non-causality.

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[36] Given that Saudi Arabia has no taxes or tarrifs, the increase in the revenue is always less than the increase in the spending.

Table 3-21 Saudi Results of VECM

(A) - The Matrix of Cointegrating Vectors *β*								
Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$
CE1	1.00	0.81	0.55	0.05	-0.31	0.10	0.11	-1.28
CE2	1.15	1.00	-1.55	-0.05	0.02	-1.73	-0.54	-0.35
CE3	0.75	-0.31	1.00	-1.59	0.33	-0.04	-2.62	-0.68
CE4	-2.25	1.60	-1.02	1.00	0.09	-0.28	-1.60	0.52

(B) - The Reduced form Matrix of Cointegrating Vectors *β*									
Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	**Exclusion tests χ^2 (P-value)**
CE1	1	0	0	0	-0.96***	6.33***	12.6***	-0.03	105.26 (0.00)
CE2	0	1	0	0	1.37***	-10.9***	-20.4***	-1.24	111.63 (0.00)
CE3	0	0	1	0	0.005	-0.26***	-1.18**	-0.38*	26.38 (0.00)
CE4	0	0	0	1	-0.20***	0.44***	2.50***	0.14	66.45 (0.00)

(C) - Adjustment coefficients matrix *α*								
Adjustment Parameters	α_{CAB}	α_{TAX}	α_{GI}	α_{GMS}	α_{TT}	α_{GGDP}	α_{GEX}	α_{GDS}
CE1	-2.04***	-2.34***	1.31***	0.81**	1.64	-1.54	0.07	-0.51
CE2	-1.15***	-1.27***	0.74***	0.42**	1.00	-0.72	0.04	-0.29
CE3	-1.38	-2.95***	0.54	0.54	1.45	-3.89**	0.07	-0.55
CE4	-0.29	-0.42***	0.32**	-0.47***	1.51***	0.29	-0.07	-0.07
Joint Weak Exogeneity Tests χ^2	23.90 (0.00)	74.48 (0.00)	72.93 (0.00)	40.89 (0.00)	16.46 (0.00)	16.84 (0.00)	1.75 (0.78)	2.50 (0.64)

(D) - Impact Parameters Matrix *αβ*								
Independent Variables	CAB_{t-1}	TAX_{t-1}	GI_{t-1}	GMS_{t-1}	TT_{t-1}	$GGDP_{t-1}$	GEX_{t-1}	GDS_{t-1}
ΔCAB_t	-2.04***	-1.15***	-1.38	-0.29	0.45***	-0.08	-1.37***	1.97***
ΔTAX_t	-2.34***	-1.27	-2.95***	-0.42***	0.58***	-0.26***	-1.05***	2.72***
ΔGI_t	1.31***	0.74***	0.54	0.32**	-0.31***	0.21**	1.63***	-1.12***
ΔGMS_t	0.81**	0.42**	0.54	-0.47***	-0.11	0.22***	-0.11	-0.81*
ΔTT_t	1.64	1.00	1.45	1.51***	-0.51*	-0.28	2.37***	-1.64
$\Delta GGDP_t$	-1.54	-0.72	-3.89**	0.29	0.43	-0.77***	0.54	2.45
ΔGEX_t	0.07	0.04	0.07	-0.07	-0.0005	-0.03	-0.17	-0.09
ΔGDS_t	-0.51	-0.29	-0.55	-0.07	0.09	0.13	0.09	0.58

***, ** and * denote significant at the 1%, 5% and 10% respectively.

Table 3-22 Saudi Short Run Granger Non-Causality

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$	ΔGEX_{t-1}	ΔGDS_{t-1}
ΔCAB_t	0.23 (0.62)	11.20 (0.00)	0.28 (0.87)	8.15 (0.01)	0.44 (0.80)	0.23 (0.89)	0.69 (0.70)	0.77 (0.68)
ΔTAX_t	26.94 (0.00)	9.01 (0.00)	25.54 (0.00)	9.13 (0.01)	19.96 (0.00)	11.22 (0.00)	9.15 (0.01)	21.63 (0.00)
ΔGI_t	3.07 (0.21)	11.48 (0.00)	2.29 (0.13)	28.68 (0.00)	8.13 (0.01)	2.65 (0.26)	3.98 (0.13)	5.79 (0.05)
ΔGMS_t	5.22 (0.07)	8.78 (0.01)	5.32 (0.07)	2.94 (0.08)	4.18 (0.12)	3.11 (0.21)	2.95 (0.22)	6.45 (0.03)
ΔTT_t	1.54 (0.46)	2.46 (0.29)	1.43 (0.48)	1.06 (0.58)	1.05 (0.30)	2.32 (0.31)	3.90 (0.14)	1.06 (0.58)
$\Delta GGDP_t$	0.31 (0.85)	4.74 (0.09)	0.42 (0.81)	2.59 (0.27)	1.67 (0.43)	0.29 (0.58)	0.54 (0.76)	0.39 (0.82)
ΔGEX_t	0.09 (0.95)	3.61 (0.16)	0.10 (0.95)	1.04 (0.59)	0.38 (0.82)	0.27 (0.87)	0.05 (0.81)	0.09 (0.95)
ΔGDS_t	0.05 (0.97)	4.80 (0.09)	0.13 (0.93)	0.05 (0.97)	2.71 (0.25)	0.44 (0.80)	0.17 (0.92)	0.04 (0.83)

Numbers in parentheses p-values for the Wlad chi square Granger-non-causality test.

Based on the results in Table 3-22, we can conclude that TAX short run Granger-cause CAB, GI, GMS, GGDP and GDS but no short run causality runs directly from all variables to GEX and TT, but the later causes GI. Moreover, CAB, GI and GDS found to cause GMS, but the later causes CAB and GI. This result is not far different from the above mentioned long run bidirectional causality running between TAX and CAB, but it differs in the shape of the relation as in short run it is found to be positive contrary to the long run, as shown in Table 3-22, may be because they care less about the short run deficits. Moreover, as CAB increases by one percent GMS declines by 0.32% (but not significant) which may be interpreted, with the short run causality from the former to the later, as a sign of sterilization in the short run contrary to the long run.

Table 3-23 Saudi Short-Run Parameters Matrix

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$	ΔGEX_{t-1}	ΔGDS_{t-1}
ΔCAB_t	0.64 (1.31)	1.25*** (0.43)	0.81 (1.55)	0.54*** (0.24)	-0.003 (0.21)	-0.002 (0.10)	1.12 (1.34)	0.19 (1.19)
ΔTAX_t	1.72*** (0.62)	0.61*** (0.20)	2.22*** (0.73)	0.19 (0.11)	-0.26*** (0.09)	0.03 (0.05)	-0.31 (0.63)	-1.70*** (0.56)
ΔGI_t	-0.90 (0.73)	-0.60*** (0.24)	-1.31 (0.87)	-0.50*** (0.13)	-0.06 (0.11)	-0.02 (0.05)	-1.36*** (0.75)	-0.13 (0.67)
ΔGMS_t	-0.32 (0.67)	-0.64*** (0.22)	-0.37 (0.78)	-0.21* (0.12)	0.06 (0.11)	-0.05 (0.05)	0.23 (0.68)	0.90 (0.61)
ΔTT_t	-2.57 (2.11)	0.96 (0.69)	-2.91 (2.49)	0.10 (0.39)	0.35 (0.34)	0.17 (0.15)	-3.70* (2.15)	1.60 (1.91)
$\Delta GGDP_t$	-0.46 (2.38)	1.50** (0.78)	-1.24 (2.81)	-0.50 (0.44)	-.45 (0.38)	0.09 (0.17)	-1.23 (2.44)	-0.65 (2.16)
ΔGEX_t	0.02 (0.43)	-0.25* (0.14)	0.05 (0.51)	0.081 (0.08)	0.04 (0.07)	0.014 (0.03)	-0.10 (0.44)	-0.08 (0.39)
ΔGDS_t	0.16 (0.76)	0.54** (0.25)	-0.05 (0.90)	-0.02 (0.14)	-0.13 (0.12)	-0.04 (0.06)	0.26 (0.78)	-0.14 (0.69)

***, ** and * denote significant at the 1%, 5% and 10% respectively and standard error in parentheses.

3.5.3.8 SYRIAN RESULTS

Portion (A) of Table 3-24 shows Syrian results of the long run beta parameters of the cointegrating equations CE1, CE2, CE3, CE4, and CE5 as the rank of cointegration is 5 as shown in Table 3-24. In all cases, beta coefficients are different from zero. Given that the rank of cointegration is five, 25 restrictions have been imposed on the system to normalize each vector in β matrix with respect to every first five variables for each equation. Portion (B) of Table 3-24 illustrates the identified cointegrating vectors; the normalised cointegrating coefficients only load on GMS, TT and GGDP series. The restriction that an individual variable can be excluded from the system (it has zero coefficients in the normalized cointegrating vectors) is tested using a likelihood ratio test, which is distributed as χ^2 with five degrees of freedom. This test statistic is reported under the exclusion test χ^2 column in portion (B) of Table 3-24. It is clearly seen that none of the investigated variables could be excluded from the system at any conventional level of significance.

Portion (C) of Table 3-24 shows that CAB long run Granger-cause GEX, GDS and GGDP while TAX causes GMS only, in the meantime GEX causes CAB, GDS, GI and TT, whereas GDS long run Granger-cause variables except TAX, finally GI causes CAB and TAX. Therefore, we can conclude that Syria is Recardian as there is no causation runs from TAX to CAB. Moreover, GEX negatively causes CAB supporting both the (REH) and (TDH). But, however can we consider this is the permenant situation i.e. there is any indirect relation between CAB and TAX? Portion (D) in Table 3-24 has the answer, which is CAB causes GGDP which found to contribute determining TAX. Additionally, TAX causes GMS which causes GDS which causes CAB directly and indirectly through GI and GGDP. Therefore, there is indirect feedback between CAB and TAX.

The estimated adjustment coefficients indicate different speed of adjustment towards the long run relationships of the variables. Individual p-values for all variables are significant at convenient significance levels in at least one cointegration vectors. For example, *CAB* adjusts to long run equilibrium by 1.55%, 0.72%, 0.85%, and 1.15% per year in CE1, CE3, CE4, and CE5 respectively at least at 5% significant level. Taxes adjust to long run equilibrium by 0.84% and 0.56% per year in CE2 and CE5 at 5% and 10% significant level respectively, while government expenditure speeds of adjustment

Table 3-24 Syrian Results of VECM

(A) - The Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$
CE1	1.00	4.50	-1.38	1.22	2.25	1.07	0.52	-0.18
CE2	2.13	1.00	0.33	-0.62	1.80	-2.21	0.26	-0.94
CE3	1.10	0.70	1.00	-0.95	0.83	-0.002	-0.44	0.20
CE4	-0.92	0.03	-0.18	1.00	-0.56	-0.21	0.32	0.07
CE5	-1.31	4.81	-7.10	-2.37	1.00	0.24	-0.92	-1.12

(B) - The Reduced form Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$	**Exclusion tests χ^2 (P-value)**
CE1	1	0	0	0	0	34.72***	-2.82**	8.11***	70.85 (0.00)
CE2	0	1	0	0	0	14.02***	-1.35***	3.54***	80.67 (0.00)
CE3	0	0	1	0	0	-4.91***	0.27	-0.83***	70.18 (0.00)
CE4	0	0	0	1	0	3.64***	0.19	0.75***	67.01 (0.00)
CE5	0	0	0		1	-48.0***	4.25**	-11.7***	74.51 (0.00)

(C) - Adjustment Coefficients Matrix α

Adjustment Parameters	α_{CAB}	α_{TAX}	α_{GEX}	α_{GDS}	α_{GI}	α_{GMS}	α_{TT}	α_{GGDP}
CE1	-1.55***	-0.55	-0.42*	-1.10***	0.58	0.07	2.53	2.52*
CE2	-0.58	-0.84**	-0.03	0.51	-0.96	-2.64***	-2.04	0.07
CE3	-0.72**	-0.50	-0.45**	-1.05***	0.77*	0.94	2.64**	-0.31
CE4	0.85**	0.37	0.46**	1.00***	-0.97*	-1.46*	-4.34***	-2.96**
CE5	-1.15***	-0.56*	-0.23	-0.47	-0.012	-0.89	0.63	1.66
Joint Weak Exogeneity Tests	33.16 (0.00)	13.17 (0.02)	7.66 (0.17)	22.03 (0.00)	8.05 (0.15)	26.16 (0.00)	11.58 (0.04)	12.60 (0.02)

(D) - Impact Parameters Matrix $\alpha\beta$

	CAB_{t-1}	TAX_{t-1}	GEX_{t-1}	GDS_{t-1}	GI_{t-1}	GMS_{t-1}	TT_{t-1}	$GGDP_{t-1}$
ΔCAB_t	-1.55***	-0.57	-0.72***	0.85***	-1.16***	0.15	0.20	0.12*
ΔTAX_t	-0.54	-0.84**	-0.49	0.37	-0.56*	-0.006	0.22	-0.15**
ΔGEX_t	-0.42*	-0.03	-0.44***	0.46**	-0.23	0.09	0.20**	-0.06
ΔGDS_t	-1.10***	0.51	-1.04***	1.00***	-0.47	0.35***	0.32***	0.01
ΔGI_t	0.58	-0.95	0.77*	-0.97*	-0.01	0.11	-0.38**	0.12
ΔGMS_t	0.07	-2.64***	0.94	-1.46*	-0.89	-1.5***	-0.46	-0.18
ΔTT_t	2.52	-2.04	2.64**	-4.34***	0.63	-0.20	-1.76***	0.37
$\Delta GGDP_t$	2.50*	0.07	-0.31	-2.96**	1.66	-0.70	-0.77	-0.73***

***, ** and * denote significant at the 1%, 5% and 10% respectively.

are 0.42%, 0.45% and 0.46% at 10%, 5% and 5% significance level in CE2, CE3 and CE4. GI adjusts to equilibrium by 0.77% and 0.97% in CE3 and CE4 at 10% level. In general, the speed of adjustment towards the long run equilibrium, as signified by the estimates in portion (C) of Table 3-24, is at least 0.42% per year and at most by 4.34% per year. The joint χ^2 tests reject weak exogeneity for all variables except government expenditure GEX and GI despite that adjustment speed for both of them are significant in more than one cointegrating vector as explained above and as confirmed in the impact parameters matrix. Therefore, proceeded with the order given in equation (3/12) to find out if there any direct caustion between GEX and CAB, and interestingly we obtain the same result when putting both variables on the end position

Table 3-25 Syrian Short Run Granger Non-Causality

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$
ΔCAB_t	0.80 (0.37)	1.61 (0.44)	0.84 (0.65)	1.02 (0.59)	0.83 (0.65)	2.29 (0.31)	3.78 (0.15)	3.37 (0.18)
ΔTAX_t	5.21 (0.07)	0.04 (0.84)	0.64 (0.72)	1.83 (0.40)	4.16 (0.12)	0.87 (0.64)	3.91 (0.14)	7.37 (0.02)
ΔGEX_t	2.84 (0.24)	1.64 (0.44)	0.00 (0.97)	0.71 (0.70)	2.99 (0.22)	0.15 (0.92)	3.84 (0.14)	2.88 (0.23)
ΔGDS_t	13.17 (0.00)	13.12 (0.00)	10.09 (0.00)	10.09 (0.00)	11.84 (0.00)	10.37 (0.00)	10.70 (0.00)	11.95 (0.00)
ΔGI_t	1.32 (0.51)	5.07 (0.07)	0.19 (0.91)	2.05 (0.35)	0.02 (0.87)	0.39 (0.82)	0.45 (0.79)	0.81 (0.66)
ΔGMS_t	6.75 (0.03)	8.92 (0.01)	4.86 (0.08)	7.76 (0.02)	4.17 (0.12)	4.06 (0.04)	8.14 (0.01)	4.27 (0.11)
ΔTT_t	7.20 (0.02)	6.83 (0.03)	8.06 (0.01)	6.83 (0.03)	7.56 (0.02)	6.90 (0.03)	6.83 (0.00)	6.96 (0.03)
$\Delta GGDP_t$	2.03 (0.36)	0.73 (0.69)	4.17 (0.12)	0.33 (0.84)	2.76 (0.25)	0.63 (0.72)	1.01 (0.60)	0.30 (0.58)

Numbers in parentheses p-values for the Wlad chi square Granger-non-causality test.

Based on the results in Table 3-25, we can conclude that CAB short run Granger-cause TAX, GDS, GMS and TT but no short run causality runs directly from TAX to CAB or from any variable to GGDP and GEX. Moreover, GDS and TT found to be caused by all variables in the short run, and GMS found to be caused by all variables except GI and GGDP, but the later causes TAX which causes GI. This result is contrary to the above mentioned long run bidirectional causality running between TAX and CAB, as one pecent increase in the current account surplus increases taxex by 0.55%, as shown in Table 3-26. Moreover, as CAB increases by one percent GMS declines by 1.13%, with the short run causality from the former to the later, which reflect the intervention by the Syrian monetary authorities in the exchange markes to keep its fixed exchange rate by decresing the local money supply and selling the dollar i.e. do sterilization in the short run.

Table 3-26 Syrian Short-Run Parameters Matrix

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$
ΔCAB_t	0.21 (0.24)	0.23 (0.30)	0.20 (0.39)	-0.34 (0.35)	0.16 (0.29)	-0.12 (0.09)	0.04 (0.10)	-0.07 (0.05)
ΔTAX_t	0.55** (0.25)	0.06 (0.31)	0.33 (0.41)	-0.40 (0.36)	0.52* (0.30)	-0.07 (0.10)	-0.21** (0.12)	0.15*** (0.06)
ΔGEX_t	0.25 (0.15)	0.25 (0.20)	0.007 (0.26)	-0.19 (0.23)	0.30 (0.19)	-0.02 (0.06)	-0.12** (0.07)	0.057 (0.04)
ΔGDS_t	0.88*** (0.25)	0.07 (0.32)	0.40 (0.41)	-1.10*** (0.36)	0.52* (0.30)	-0.04 (0.10)	-0.33*** (0.11)	-0.06 (0.06)
ΔGI_t	-0.39 (0.36)	0.77* (0.45)	0.17 (0.59)	0.75 (0.52)	-0.07 (0.44)	0.08 (0.14)	0.10 (0.16)	-0.07 (0.08)
ΔGMS_t	-1.13** (0.57)	2.11*** (0.73)	0.97 (0.96)	2.04*** (0.84)	0.66 (0.70)	0.46** (0.22)	0.52** (0.25)	0.03 (0.13)
ΔTT_t	-2.35*** (0.98)	0.62 (1.26)	0.19 (1.64)	3.12** (1.44)	-2.07* (1.21)	-0.08 (0.39)	1.14*** (0.43)	-0.04 (0.23)
$\Delta GGDP_t$	-1.10 (0.96)	-0.79 (1.23)	3.2** (1.60)	-0.31 (1.41)	-1.63 (1.18)	0.19 (0.38)	0.30 (0.43)	0.12 (0.22)

***, ** and * denote significant at the 1%, 5% and 10% respectively and standard error in parentheses.

3.5.3.9 TUNISIAN RESULTS

Depending on the results shown in portion (A) Table 3-27; the Tunisian long run cointegrating equations CE1, CE2, CE3, CE4 and CE5—as the rank of cointegration is 5, as shown in Table 3-27, illustrate that beta parameters for the investigated variables are different from zero in all cases. As the cointegration rank is five, 25 restrictions were imposed on the system to normalize each vector in β matrix with respect to every first five variables for each equation. Portion (B) of Table 3-27 illustrates the reduced form cointegrating vectors, the identified cointegrating coefficients only load on GMS, GDS and GI series. The restriction that an individual variable can be excluded from the system (it has zero coefficients in the normalized cointegrating vectors) is tested using a likelihood ratio test, which is distributed as χ^2 with three degrees of freedom. This test statistic is reported under the exclusion tests χ^2 column in portion (B) of Table 3-27. It is clearly seen that none of the examined variables can be excluded from the system at all conventional levels of significance.

Portion (C) of Table 3-27 presents alpha parameters which are the speeds of the adjustment of all variables towards the long run equilibrium cointegration vectors. Also, these parameters are the measures of the long run Granger-causality, according to their significance, from the identified variables into all other variables in the system. For example, CAB long run Granger-cause TAX, GEX, TT, GGDP and GI; while TAX Granger-cause GEX and GDS; and GEX long run causes TAX, GDS; also TT found to cause GGDP only; finally GGDP Granger-causes CAB, TAX, GEX and GI. Consequently, we can conclude that both (TDH) and (REH) are rejected for Tunisia,

Table 3-27 Tunisian Results of VECM

(A) - The Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,TT}$	$\beta_{5,GGDP}$	$\beta_{6,GMS}$	$\beta_{7,GDS}$	$\beta_{8,GI}$
CE1	1.00	-0.7328	0.8601	-0.3495	0.9735	0.0493	-0.6105	-0.6105
CE2	-1.1459	1.00	-1.4563	-0.14244	-0.14066	0.35433	0.57896	1.5042
CE3	-0.29691	-0.32445	1.00	-0.062592	-0.10695	0.094387	0.10565	0.10763
CE4	-2.6639	-5.4881	7.0460	1.00	-3.9736	-2.5573	-2.5483	-0.32247
CE5	0.59013	-0.95253	-0.38243	0.24646	1.00	-1.3837	0.91117	-0.9056

(B) - The Reduced form Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,TT}$	$\beta_{5,GGDP}$	$\beta_{6,GMS}$	$\beta_{7,GDS}$	$\beta_{8,GI}$	Exclusion tests χ^2 (P-value)
CE1	1	0	0	0	0	0.210*	-0.96***	0.872***	162.398 (0.00)
CE2	0	1	0	0	0	0.699***	0.884***	-1.55***	210.287 (0.00)
CE3	0	0	1	0	0	0.251*	0.490***	-1.10***	861.083 (0.00)
CE4	0	0	0	1	0	-1.46***	3.16***	-5.79***	2614.20 (0.00)
CE5	0	0	0	0	1	-0.385	1.729***	-1.62***	107.86 (0.00)

(C) - Adjustment Coefficients Matrix α

Adjustment Parameters	α_{CAB}	α_{TAX}	α_{GEX}	α_{TT}	α_{GGDP}	α_{GMS}	α_{GDS}	α_{GI}
CE1	-1.15***	0.437***	0.137**	-2.51***	-1.87***	-0.695	-0.032	0 .531**
CE2	-0.005	-0.481***	0.125**	0.731	0.202	-0.429	-0.474***	-0.20
CE3	0.216	0.4799**	-0.306***	-0.071	0.534	-0.07	0.834***	0.241
CE4	0.068	-0.019	-0.022	-0.212*	0.200**	0.175	0.057	0.047
CE5	-0.676***	0.202**	0.085**	-0.53	-0.945***	0.032	-0.136	0.297*
Joint Weak Exogeneity Tests	25.66 (0.00)	25.37 (0.00)	22.23 (0.00)	28.84 (0.00)	41.17 (0.00)	10.96 (0.05)	8.79 (0.11)	16.58 (0.00)

(D) - Impact Parameters Matrix $\alpha\beta$

	CAB_{t-1}	TAX_{t-1}	GEX_{t-1}	TT_{t-1}	$GGDP_{t-1}$	GMS_{t-1}	GDS_{t-1}	GI_{t-1}
ΔCAB_t	-1.15***	-0.005	0.22	0.07	-0.67***	-0.03	0.258	-0.54**
ΔTAX_t	0.44***	-0.48***	0.48**	-0.02	0.20**	-0.17**	-0.32***	0.39***
ΔGEX_t	0.14**	0.13**	-0.31***	-0.02	0.09**	0.04	-0.09***	0.25***
ΔTT_t	-2.50***	0.73	-0.07	-0.21*	-0.53	0.48	1.43***	-1.15***
$\Delta GGDP_t$	-1.87***	0.20	0.53	0.20**	-0.94***	-0.05	1.24***	-2.16***
ΔGMS_t	-0.70	-0.43	-0.07	0.18	0.03	-0.73**	0.86***	-0.92**
ΔGDS_t	-0.03	-0.47***	0.83***	0.06	-0.14	-0.16	-0.03	-0.32**
ΔGI_t	0.53**	-0.20	0.24	0.05	0.30*	-0.15	0.09	-0.25

***, ** and * denote significant at the 1%, 5% and 10% respectively.

one percent icrease in the current account balance to GDP ratio brings about 0.44% and 0.14% increase in taxes and government spending respectively. But, with the help of the impact parameters matrix, shown in (D) in Table 3-27, we can portrait the full picture in which TAX and GEX long run Granger-cause GDS which cuases TT which causes GGDP which causes CAB. Then, the direct long run causality runs from the current account balance to fiscal policy variable while it runs back from the later to the former indirectly.

Furthermore, the estimated adjustment coefficients show different speeds of adjustment towards the long run relationships of the variables. For example, CAB adjusts to long run equilibrium by 1.15% and 0.68% per year in CE1 and CE5 at 1% significant level; TAX adjusts to long run equilibrium by 0.44%, 0.48%, 0.48% and 0.20% per year in CE1, CE2, CE3, and CE5 at 1%, 1%, 5% and 1% significant level respectively, while government expenditure speed of adjustment is 0.14%, 0.13%, 0.31%, and 0.09% in CE1, CE2, CE3, and CE5 at 5%, 5%, 1%, and 1% significance level respectively. In general, the adjustment speed towards the long run equilibrium, as represented by the estimates in portion (C) of Table 3-27, is at least 0.09% per year and at most by 2.51% per year. The joint χ^2 tests reject weak exogeneity for all variables (except GDS which maginaly weakly exogenous at 11%). Therefor, and because GDS elements in all cointegration equations are very significant, we found more than one variable in the right hand side of the long run equation of GDS as shown in portion (D) in Table 3-27.

Based on the results in Table 3-28, we can conclude that CAB short run Granger-cause TT and GI only but no short run causality runs directly or indirectly from TAX to CAB or from any variable to CAB, GMS and GDS. Moreover, TT found to be caused by all variables in the short run, and GEX found to be caused by TT, therefore we conclude the existence of indirect short run Granger-causality from CAB to GEX. This result is contrary to the above mentioned long run unidirectional causality running between CAB and TAX. Moreover, there is no short run evidence of causality between the former and GMS, which reflects no direct intervention by the Tunisian monetary authorities in the exchange markes to keep its fixed exchange rate i.e. no sterilization in the short or long run. It seems to affect the exchange rate through the terms of trade which is negatively as shown in Table 3-29.

Table 3-28 Tunisian Short Run Granger Non-Causality

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$	ΔGMS_{t-1}	ΔGDS_{t-1}	ΔGI_{t-1}
ΔCAB_t	1.19 (0.27)	1.53 (0.46)	3.41 (0.18)	1.31 (0.51)	2.46 (0.29)	2.08 (0.35)	1.24 (0.53)	1.32 (0.51)
ΔTAX_t	2.49 (0.28)	1.10 (0.29)	1.33 (0.51)	2.41 (0.30)	3.80 (0.14)	3.48 (0.17)	6.92 (0.031)	2.65 (0.26)
ΔGEX_t	0.25 (0.88)	0.58 (0.74)	0.21 (0.64)	7.19 (0.02)	0.22 (0.89)	0.32 (0.85)	0.47 (0.79)	0.21 (0.89)
ΔTT_t	8.05 (0.01)	9.37 (0.00)	17.43 (0.00)	7.99 (0.00)	11.88 (0.00)	7.99 (0.01)	10.84 (0.00)	9.09 (0.01)
$\Delta GGDP_t$	3.95 (0.13)	1.69 (0.42)	3.58 (0.16)	7.66 (0.02)	1.58 (0.208)	1.59 (0.45)	2.35 (0.30)	3.43 0.18)
ΔGMS_t	1.59 (0.45)	2.06 (0.35)	3.48 (0.17)	0.11 (0.94)	0.59 (0.74)	0.06 (0.80)	0.09 (0.95)	2.10 (0.34)
ΔGDS_t	0.39 (0.82)	0.88 (0.64)	0.05 (0.97)	0.84 (0.65)	0.11 (0.94)	1.05 (0.59)	0.01 (0.92)	0.53 (0.769)
ΔGI_t	4.63 (0.09)	1.03 (0.59)	1.67 (0.43)	2.37 (0.30)	2.68 (0.26)	1.17 (0.55)	1.22 (0.54)	0.90 (0.34)

Numbers in parentheses p-values for the Wlad chi square Granger-non-causality test.

Table 3-29 Tunisian Short-Run Parameters Matrix

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$
ΔCAB_t	0.82 (0.75)	0.23 (0.32)	-1.68 (1.08)	-0.68 (0.65)	0.97 (0.84)	0.07 (0.12)	0. 002 (0.10)	0.10 (0.10)
ΔTAX_t	0.40 (0.38)	-0.17 (0.16)	-0.31 (0.55)	-0.76*** (0.33)	0.47 (0.43)	0.10 (0.06)	-0.05 (0.05)	-0.08* (0.05)
ΔGEX_t	0.04 (0.17)	-0.05 (0.07)	-0.12 (0.25)	-0.09 (0.15)	-0.02 (0.19)	-0.01 (0.03)	-0.06*** (0.02)	-0.00 (0.02)
ΔGDS_t	-0.20 (0.51)	0.20 (0.22)	0.16 (0.73)	0.04 (0.44)	0.23 (0.57)	0. 08 (0.08)	0.06 (0.07)	-0.02 (0.07)
ΔGI_t	-1.00 (0.64)	-0.13 (0.27)	0.75 (0.92)	0.59 (0.55)	-0.68 (0.72)	0.07 (0.10)	0.11 (0.08)	-0.10 (0.09)
ΔGMS_t	-1.90 (1.52)	0.89 (0.64)	-3.91* (2.19)	0.31 (1.30)	-2.47 (1.70)	0.058 (0.24)	0. 041 (0.197)	0.138 (0.20)
ΔTT_t	-1.52 (1.40)	0.68 (0.60)	-4.34** (2.04)	-0.12 (1.22)	-2.44 (1.58)	0.002 (0.22)	0.52*** (0.18)	0.26 (0.19)
$\Delta GGDP_t$	-1.52 (1.08)	0.09 (0.46)	-2.35 (1.56)	0.83 (0.93)	-1.43 (1.21)	0.05 (0.17)	0.37*** (0.14)	-0.18 (0.15)

***, ** and * denote significant at the 1%, 5% and 10% respectively and standard error in parentheses.

3.5.3.10 UAE RESULTS

Using the same sequences as befor, we estimated the model for the UAE, shown in Table 3-30. Unfortunately, the likelihood ratio exclusion test, as shown in portion (B) in Table 3-30, suggest (at 56% significance) that at least on variable has to be excluded from the system. Accordingly, we re-estimated the model with many exclusion alternatives in order to obtain the best fitted (VECM) in terms of the weak exogemiety, exclusion and the postestimation of autocorrelation and normality results, the best model was obtained without saving. Therefore, our analysis for the UAE is based on a seven-dimensional system as presented in Table 3-31. Portion (A) of the table illustrates the long run beta parameters of the four cointegrating equations as the rank of cointegration is four as shown in Table 3-1. In all cases, beta coefficients are statistically different from zero. As the cointegration rank is 4, then 16 restrictions have been imposed on the system to normalize each vector in β matrix with respect to every first four variables for each equation. Portion (B) of Table 3-31 illustrates the identified cointegrating vectors; the normalised cointegrating coefficients only load on GMS, TT and GGDP series. The restriction that an individual variable can be excluded from the system is tested using a likelihood ratio exclusion test, which is distributed as χ^2 with four degrees of freedom. This test statistics clearly conclude that none of the examined variables can be excluded from the system at conventional all significance levels.

Similar to the other oil dependant countries, the long-run components of the UAE equations, as shown in portion (D) Table 3-31, indicates that the relationship between the current account balance CAB and the government spending GEX is positive contrary to both (TDH) and (REH) i.e. increasing GEX improves CAB. That is, most of the Bahraini government's spending is related to the oil production infrastructure[37], therefore the more they spend the more they export oil which helps improving its current account position. On contrary, CAB is connected negatively with taxes TAX contrdicting the hypothesized relation in the (TDH). The plausible explanation is that the increasing government spending is not matched by increasing taxes and tariffs, as illustrated in sections 1.7 and 1.9, accompanied by huge public sector and social subsidies which restrict the government from gaining more revenues. The first look at the above result shows unidirectional causality between the current account balance CAB and TAX, but the deeper investigation reveals that this conclusion is far from the truth. The complete story can be captured using the adjustment paramters α in conjunction with the impact parameters matrix as shown in portions (C) and (D) of Table 3-31.

The long run Granger-non-causality, represented by the individual p-value of the adjustment parameters, illustrates that CAB causes TAX, GEX GI GMS and TT; while TAX causes GEX; meanwhile GEX and GI long run Granger-cause all variables. Therefore, the direct causality is running from the current account balance to TAX and GEX. But, the long run causality is running indirectly from TAX to CAB mainly through GEX. This result is strongly supported by the rejection of the joint weak exogeneity of all variables (except TT which is marginaly accepted yhe joint weak exogeneity) which entails feedback relationships between all those variables.

[37] In chapter 4 we found import elasticity to the government spending in the oil producing countries is the higher because most of their import is related to their oil production investment.

Table 3-30 UAE Results of VECM including all Variables

(A) - The Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$
CE1	1.00	-1.16	4.98	-1.90	3.05	0.62	-0.10	0.49
CE2	-1.96	1.00	-2.16	1.70	-1.71	0.30	0.56	-0.34
CE3	61.82	-103.38	1.00	-129.90	271.93	-16.53	8.35	-22.25
CE4	-1.33	0.49	-0.86	1.00	-1.14	0.06	0.35	-0.34
CE5	0.36	0.29	0.43	-0.46	1.00	-0.06	-0.11	0.24
CE6	4.83	1.04	-0.96	-6.49	7.39	1.00	-1.60	0.00

(B) - The Reduced form Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{4,GDS}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$	Exclusion tests χ^2 (P-value)
CE1	1	0	0	0	0	0	-0.28*	0.67***	7.25 (0.03)
CE2	0	1	0	0	0	0	-0.15***	0.24**	9.67 (0.01)
CE3	0	0	1	0	0	0	-0.20	0.15***	11.52 (0.00)
CE4	0	0	0	1	0	0	0.19	0.87**	6.66 (0.04)
CE5	0	0	0	0	1		0.13*	0.27**	9.40 (0.01)
CE6	0	0	0	0	0	1	0.22	0.22	1.18 (0.56)

(C) - Adjustment Coefficients Matrix α

Adjustment Parameters	α_{CAB}	α_{TAX}	α_{GEX}	α_{GDS}	α_{GI}	α_{GMS}	α_{TT}	α_{GGDP}
CE1	-0.93	0.28	0.15	0.58	0.15	0.43	-1.24	-2.27*
CE2	0.62	-0.18	0.06	0.03	-0.10	0.51	0.83	0.57
CE3	-0.80	-0.25	-0.14	0.12	0.08	-2.32	-0.80	-1.43
CE4	0.69	-0.18	-0.05	-0.76	-0.05	0.40	1.02	1.21
CE5	-0.06	0.05	-0.02	1.23	-0.36	-1.10	-1.22	-0.05
CE6	-0.17	0.01	0.03	-0.10	0.11	-1.18***	0.21	0.05
Joint Weak Exogeneity Tests χ^2	8.01 (0.24)	17.49 (0.00)	9.79 (0.13)	7.97 (0.24)	11.38 (0.07)	42.16 (0.00)	3.01 (0.81)	16.92 (0.00)

***, ** and * denote significant at the 1%, 5% and 10% respectively.

Table 3-31 UAE Results of VECM Excluding Saving

(A) - The Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$
CE1	1	0.09	1.48	1.066	-0.40	-0.08	0.30
CE2	-1.61	1	-15.05	-6.23	-0.156	-0.71	-1.75
CE3	0.039328	0.82946	1	2.5969	0.18972	0.29190	0.17983
CE4	1.1963	2.1467	2.3485	1	0.31296	-0.42575	0.96587

(B) - The Reduced form Matrix of Cointegrating Vectors β

Cointegrating Equations	$\beta_{1,CAB}$	$\beta_{2,TAX}$	$\beta_{3,GEX}$	$\beta_{5,GI}$	$\beta_{6,GMS}$	$\beta_{7,TT}$	$\beta_{8,GGDP}$	Exclusion tests χ^2 (P-value)
CE1	1	-	-	-	-0.54***	-0.25***	0.121***	378.93 (0.00)
CE2	-	1	-	-	0.35***	-0.13**	0.251***	45.60 (0.00)
CE3	-	-	1	-	0.12***	-0.0014	0.15***	89.96 (0.00)
CE4	-	-	-	1	-0.08	0.159***	-0.07	25.39 (0.00)

(C) - Adjustment Coefficients Matrix α

Adjustment Parameters	α_{CAB}	α_{TAX}	α_{GEX}	α_{GI}	α_{GMS}	α_{TT}	α_{GGDP}
CE1	0. 950***	-0.36***	-0.17*	-0.429***	3.56***	0.863**	0.552
CE2	0. 302	0.024	0.165*	-0.11	-0.104	0.513	-0.29
CE3	4.78***	-2.19***	-1.19***	-2.19***	8.96***	4.91***	6.06***
CE4	3.48***	-1.027***	-0.575***	-1.67***	4.96***	2.84***	4.69***
Joint Weak Exogeneity Tests χ^2	20.15 (0.00)	17.84 (0.00)	11.17 (0.02)	46.51 (0.00)	125.93 (0.00)	7.42 (0.11)	19.52 (0.00)

(D) – Impact Parameters Matrix $\alpha\beta$

	CAB_{t-1}	TAX_{t-1}	GEX_{t-1}	GI_{t-1}	GMS_{t-1}	TT_{t-1}	$GGDP_{t-1}$
ΔCAB_t	0.95***	0.30	4.78***	3.48***	-0.09	0.28***	0.66***
ΔTAX_t	-0.36***	0.02	-2.19***	-1.03***	0.01	-0.08**	-0.29***
ΔGEX_t	-0.17*	0.17*	-1.19***	-0.58***	0.05	-0.07***	-0.12*
ΔGI_t	-0.43***	-0.11	-2.19***	-1.67***	0.05	-0.14***	-0.29***
ΔGMS_t	3.56***	-0.10	8.96***	4.97***	-1.23***	-0.08	1.39***
ΔTT_t	0.86**	0.51	4.91***	2.84***	0.10	0.17	0.77***
$\Delta GGDP_t$	0.55	-0.29	6.06***	4.69***	-0.02	0.65***	0.57*

***, ** and * denote significant at the 1%, 5% and 10% respectively.

The estimated adjustment coefficients indicate different speed of adjustment towards the long run relationships of the variables. Individual p-values for the CAB, TAX, GI, GMS and TT variables are significant at 1% in the cointegrating equations CE1, CE3 and CE4. GEX adjustment speed is significant at 10% only in CE1 and CE2 while it is significant at 1% in CE3 and CE4, but GGDP is strongly significant in CE3 and CE4, which supports the aforementioned indirect feedback from TAX to CAB through GEX. Moreover, the joint χ^2 tests strongly reject the weak exogeneity in all of these variables except the TT supporting the individual p-values results and confirming the feedback between those variables. The magnitudes of the equilibrium adjustments as signified by the estimates can be fairly sizable, especially GMS which adjusts to equilibrium in CE3 by 8.96% per year and GGDP which adjust by 6.06% per year in CE3. On the other hand, the CAB, TAX, GEX and GI adjustments towards the equilibrium in the cointegrating relationships occur at much slower rates, typically from 0.17% to 4.96% per year.

Table 3-32 UAE Short Run Granger Non-Causality

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$
ΔCAB_t	8.79 (0.00)	15.86 (0.00)	24.70 (0.00)	8.90 (0.01)	11.79 (0.00)	9.44 (0.01)	13.59 (0.00)
ΔTAX_t	2.39 (0.30)	0.46 (0.49)	0.61 (0.74)	6.07 (0.05)	4.86 (0.09)	0.50 (0.78)	7.96 (0.02)
ΔGEX_t	6.89 (0.03)	5.67 (0.06)	4.06 (0.04)	10.38 (0.01)	5.94 (0.05)	4.44 (0.11)	4.21 (0.12)
ΔGI_t	15.74 (0.00)	22.62 (0.00)	35.97 (0.00)	13.02 (0.00)	29.68 (0.00)	13.82 (0.00)	22.82 (0.00)
ΔGMS_t	27.66 (0.00)	19.71 (0.00)	67.46 (0.00)	11.22 (0.00)	2.67 (0.10)	4.16 (0.12)	21.65 (0.00)
ΔTT_t	2.08 (0.35)	0.91 (0.63)	7.63 (0.02)	3.41 (0.18)	0.62 (0.73)	0.06 (0.81)	8.96 (0.01)
$\Delta GGDP_t$	15.29 (0.00)	11.01 (0.00)	19.01 (0.00)	9.79 (0.00)	16.36 (0.00)	9.73 (0.00)	8.95 (0.00)

Numbers in parentheses p-values for the Wlad chi square Granger-non-causality test.

Although, the marginal weak exogeneity of TT suggests long run non-causality from CAB, TAX, GEX and GI to TT, it does not imply short run non-causality. We also examine a related concept of Granger-non-causality in the (VECM) which relates to the short run parameters as illustrated in subsection 3.4.3. Based on the results of Table 3-32, particularly the first row, we can conclude that all variables Granger-cause CAB, GI and GGDP in the short run. Likewise, the short run Granger-causality runs from CAB to all variable except GEX and TT; it also runs from GMS, GI, GEX, TAX to both GEX and GMS; and TT found to be gGranger-caused by GEX and GGDP;

finaly TAX is caused by GMS, GI and GGDP. These results as well as the long run Granger-causality confirm the conclusion that we have strong causality in the model regarding all variables. Given the above short run Granger-causality and the related parameters in Table 3-33**Error! Not a valid bookmark self-reference.**, the current account surplus depreciates the currency forcing central banke to do sterilization, in order to keep the adopted fixed exchange rate, by buying the local currency and selling the dollar which redudes money supply as one percent increase in the current account balance decreases GMS by 3.21 percent.

Table 3-33 UAE Short-Run Parameters Matrix

	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$
ΔCAB_t	-1.64*** (0.57)	1.18*** (0.53)	-5.72*** (1.23)	-1.83** (0.92)	0.13 (0.08)	-0.09 (0.16)	-0.18** (0.087)
ΔTAX_t	-0.29 (0.20)	0.16 (0.19)	-0.34 (0.44)	-0.67** (0.33)	-0.04 (0.03)	0.01 (0.06)	0.07*** (0.03)
ΔGEX_t	0.008 (0.17)	-0.27* (0.16)	0.61* (0.36)	-0.18 (0.27)	-0.02 (0.02)	0.02 (0.05)	0.04 (0.03)
ΔGI_t	0.72*** (0.19)	-0.47*** (0.18)	2.45*** (0.41)	1.01*** (0.30)	-0.08*** (0.03)	0.04 (0.05)	0.10*** (0.03)
ΔGMS_t	-3.21*** (0.60)	2.42*** (0.56)	-10.4*** (1.28)	-2.79*** (0.96)	0.067 (0.08)	-0.28* (0.17)	-0.47*** (0.09)
ΔTT_t	-0.95 (0.78)	0.47 (0.73)	-4.18*** (1.67)	-3.03*** (1.24)	-0.02 (0.11)	-0.23 (0.22)	-0.41*** (0.12)
$\Delta GGDP_t$	-1.96*** (0.89)	1.91*** (0.82)	-7.2*** (1.90)	-2.81** (1.41)	0.32*** (0.12)	-0.59*** (0.25)	-0.47*** (0.13)

***, ** and * denote significant at the 1%, 5% and 10% respectively and standard error in parentheses.

3.5.4 RESULTS OF MODEL SPECIFICATION TESTS

Inferences from the parameters in α depend crucially on the stationarity of the cointegrating equations; therefore we must check the specification of the model. The first check is the checking whether we have correctly specified the number of cointegrating equations. Since the companion matrix of a (VECM) with p endogenous variables and r cointegrating equations has $p-r$ unit eigenvalues. If the process is stable, the moduli of the remaining r eigenvalues are strictly less than one. Also, we can plot the eigenvalues of the companion matrix. It is clearly seen from Figure 3-11 in APPENDIX H that the stability checks does not indicate misspecification for any of our models (i.e. for any country in the sample) as the graph of the eigenvalues shows that none of the remaining eigenvalues appears close to the unit circle i.e. the graphs indicate visually that these eigenvalues are well inside the unit circle for each country.

The second thing to check is the existing of serial correlation in the residuals. We employed Lagrange-multiplier test to test the null hypothesis of no autocorrelation at lag order, the results shown in Table 3-34 illustrate that at the 5% level, we cannot reject the null hypothesis that there is no autocorrelation in the residuals for any of the orders tested. Thus, this test finds no evidence of model misspecification for all countries except for Kuwait. However, the results for Kuwait accept the null hypothesis that of no autocorrelation in the residuals at 1% with 2 lags while its strongly accepted with one lag.

The assumption that the errors are independently, identically, and normally distributed with zero mean and finite variance allows us to derive the likelihood function. If the errors do not come from a normal distribution but are just independently and identically distributed with zero mean and finite variance, the parameter estimates are still consistent, but they are not efficient. The Jarque-Bera results present test statistics for each equation and for all equations jointly against the null hypothesis of normality. For the individual equations, the null hypothesis is that the disturbance term in that equation has a univariate normal distribution. For all equations jointly, the null hypothesis is that the K disturbances come from a K-dimensional normal distribution.

Table 3-34 Model Specification Tests

Countries	**Lagrange-Multiplier Test** ***H_0: No Autocorrelation***		**Jarque-Bera Normality Test**	**Skewness Test**	**Kurtosis Test**
	At (1) Lag	**At (2) Lag**			
Bahrain	63.88(0.48)	54.83(0.79)	10.8(0.92)	3.92(0.86)	6.91(0.55)
Egypt	55.56(0.76)	67.47(0.36)	8.91(0.92)	7.44(0.49)	1.47(0.99)
Jordan	75.88(0.15)	76.42(0.14)	14.9(0.52)	11.3(0.18)	3.65(0.88)
Kuwait	53.64(0.82)	94.52(0.01)	27.47(0.04)	5.95(0.65)	29.7(0.00)
Morocco	63.82(0.48)	68.92(0.31)	19.5(0.24)	9.36(0.31)	10.1(0.25)
Qatar	5.78(0.99)	9.58(0.88)	13.7(0.62)	8.56(0.38)	5.11(0.75)
Saudi Arabia	85.83(0.04)	66.47(0.39)	19.3(0.26)	10.1(0.27)	9.13(0.33)
Syria	65.19(0.43)	68.14(0.34)	13.3(0.65)	8.89(0.35)	4.36(0.82)
Tunisia	88.11(0.03)	81.98(0.07)	27.6(0.04)	15.4(0.50)	12.2(0.14)
UAE	47.51(0.53)	48.80(0.48)	5.16(0.98)	4.02(0.77)	1.13(0.99)

Test statistics for each equation are not reported in the table but for all equations jointly against the null hypothesis are reported, P-values for Chi2 are shown in parentheses.

The overall Jarque–Bera statistics do not reject the null of normality strongly for all countries and at 4% for Jordan and Kuwait as shown in Table 3-34. The single equation skewness test statistics are of the null hypotheses that the disturbance term in each equation has zero skewness, which is the skewness of a normally distributed variable. The results for the test that the disturbances in all equations jointly have zero skewness. The skewness results shown in Table 3-34 do not suggest non-normality for all countries. The kurtosis of a normally distributed variable is three, and the kurtosis statistics presented in the table test the null hypothesis that the disturbance terms have kurtosis consistent with normality. The results cannot reject the null hypothesis of normally distributed errors in all countries except for Kuwait as the errors are kurtotic; may be because of the big drop in its current account position in 1990-1991 because of the Iraqi invasion.

3.5.5 IMPULSE RESPONSE ANALYSIS

With the models that we now consider acceptably well specified, we can use the impulse response functions (IRFs) to sketch the dynamic adjustments of the current account balance and fiscal policy variables taxes and government expenditure to the shocks in the system. While (IRFs) from a stationary (VAR) model die out over time, (IRFs) from a cointegrating (VECM) do not always die out. Because each variable in a stationary (VAR) has a timeinvariant mean and finite, time-invariant variance, the effect of a shock to any one of these variables must die out so that the variable can revert to its mean. In contrast, the I(1) variables modeled in the cointegrating (VECM) are not mean-reverting, and the unit moduli in the companion matrix imply that the effects of some shocks will not die out over time. These two possibilities gave rise to new terms. When the effect of a shock dies out over time, the shock is said to be transitory. When the effect of a shock does not die out over time, the shock is said to be permanent (StataCorp. 2009).

Focusing on the response of the current account balance to taxes and government spending shocks and vice versa,[38] APPENDIX I Figure 3-12 sketches those responses in Bahrain. It demonstrates that, in response to a shock to taxes, the current account balance deteriorates in the first year and improves in the second year and deteriorates again in the rest of the period. On contrary, a shock to the current account balance decreases taxes in the first year and increases it slightly in the second year and decreases it a little again in year three and fluctuates less and less till it dies out over the rest of the period. Accordingly, taxes unexpected shock has permanent negative effect

[38] The responses of these variables to the shocks in the other variables such as saving, investment, growth rate of money supply, terms of trade and growth rate of GDP are not provided.

on the current account balance while the shock to the later has transitory effect on the former. Also, a current account shock decreases government spending initially and increases it permanently in the long run at lower rate, whereas the government expenditure shock increases at the bigining of the period and the permanently at higher rate. Consequently, unexpected shock to government expenditure has permanent positive effect on the current account balance, and likewise the shock to the later has the same effect on the former but with greater effect. These results come in support for the aforementioned long run results as illustrated in Table 3-2.

As shown in Figure 3-13, the response of Egyptian current account balance to a taxes shock, the current account improves at the beginning of the period and deteriorates afterwards and improves slightly again in the rest of the period. On the other hand, taxes fluctuate between increase and decrease in response to the current account shock in the beginning of the period and then improves permenantly over time. Generally, taxes shock has long run positive effect on the current account and vise versa. Nevertheless, a current account shock slightly increases government spending initially but it dies out over time i.e. transitory effect, whereas the opposite is true for current account balance response to the government expenditure shock i.e. permanent effect. For Jordan, Figure 3-14 depicts the response of the current account balance to taxes shock; the current account deteriorates permanently in the entire period, whereas the opposite is true as taxes increases permanently in response the a current account shock. In general, taxes shock has dramatic long run effect on the current account whereas current account shock has smaller long run effect on taxes. Furthermore, a current account shock has permanent positive effect on the government spending, whereas the government spending shock improves current account balance at the first two years and then deteriorates it in the remaining period.

Figure 3-15 shows that the Kuwaiti current account long run deterioration as a response to a taxes shock, likewise current account shock has negative but smaller long run effect on taxes. On contrary, a current account shock has permanent positive effect on the government spending, whereas the government spending shock improves current account balance at the beginning and then it deteriorates permanently. Figure 3-16 shows transitory impact on the Moroccan current account in response to an unexpected shock to government spending or taxes. On contrary, the current account account balance has long run negative effect on government expenditure and taxes.

Figure 3-17, sketches the long run improvement in the Qatari current account as a response to government shock. On contrast, there is permanent nigative impact of the current account shock on both taxes and government expenditure. Nevertheless, taxes affects current account negatively in the first two years after that it has very small positive impact impact on current account for one year and then a lasting negative impact for the rest of the period. Figure 3-18 illustrates a negative long run response of the Saudi current account to the shock in taxes. Similarly, an unexpected shock to the later has permanent negative, but higher, impact on the former. The current account response to government shock is permanently positive after the first four years and the same pattern holds in for the government expenditure response to current account shock. Likewise, Figure 3-19 shows long run positive response of the Syrian current account to taxes shock and while the response of taxes to current account shock is transitory. On the other hand, current account responses negatively and permanently to an unexpected shock in government spending, likewise the later respond negatively to a shock in the former but with less impact.

As shown in Figure 3-20, Tunisian taxes has transitory impact on the its current account balance as the unexpected shock to the former fluctuates the later positively and negatively at the first five years and the it dies out over time. Similarly, an unexpected shok to the current account increases government spending at the beginning and then dies over time. On contrary, there is permanent positive impact of current account shock on taxes. On the other hand, current account responds negatively to government spending shock in the first year and then it turn to positive in year two and then it becomes negative and permanent impact. Also, Figure 3-21 indicates that the UAE current account responds positively in the long run to taxes shock, while the later respond negatively to any unexpected shock in the former. On contrary, the current account balance has a transitory impact on government expenditure as its shock dies out over time while the later has permanent negative effect on the former. Interestingly, the results of the (IRFs) for all countries regarding the current account balance, taxes and government expenditure came in the same line with the results given by (VECM) and the long and short run Granger-causality.

3.6 ANALYSIS OF THE TRENDS BETWEEN COUNTRIES

In comparison to other studies, our results for Jordan and UAE, in the short run, support the (TDH) and come in the same line with a lot of researchers’ findings for the

US such as, Miller and Russek (1989), Jeffrey A. Rosensweig (1993), Hatemi-J and Shukur (2002) and Leachman and Francis (2002) and the result for the US and Canda by Normandin (1999) and the results for some EU, G7 and OECD countries such as (Piersanti 2000), Bartolini and Lahiri (2006) and Bagnai (2006). In conterary, increased taxes deteriorate the current account balance in Bahrain (short run), Kuwait and Saudi Arabia endorsing Kim and Roubini (2008) findings for the US in the 1973Q1-2004Q1.

Table 3-35 Long and Short Run Granger-causality Results Summary

Country	Long Run			Short Run		
Bahrain	CAB	$\xrightarrow{-}$	TAX	CAB	$\xrightarrow{-*}\xleftarrow{-}$	TAX
	CAB	$\xleftarrow{+}$	GEX	CAB	$\xrightarrow{-*}$	GEX
Egypt	CAB	$\xrightarrow{+}\xleftarrow{+}$	TAX	CAB	$\xrightarrow{+}\xleftarrow{-*}$	TAX
	CAB	$\xrightarrow{+}$	GEX	CAB	$\xleftarrow{-*}$	GEX
Jordan	CAB	$\neq$	TAX	CAB	$\xleftarrow{+*}$	TAX
	CAB	$\neq$	GEX	CAB	$\neq$	GEX
Kuwait	CAB	$\xrightarrow{-}\xleftarrow{-}$	TAX	CAB	$\xrightarrow{+}$	TAX
	CAB	$\xrightarrow{+}\xleftarrow{-}$	GEX	CAB	$\xrightarrow{-*}\xleftarrow{+}$	GEX
Morocco	CAB	$\xrightarrow{-}$	TAX	CAB	$\neq$	TAX
	CAB	$\xrightarrow{-}\xleftarrow{+}$	GEX	CAB	$\neq$	GEX
Qatar	CAB	$\xrightarrow{-}$	TAX	CAB	$\neq$	TAX
	CAB	$\xrightarrow{+}$	GEX	CAB	$\neq$	GEX
Saudi Arabia	CAB	$\xrightarrow{-}\xleftarrow{-}$	TAX	CAB	$\xrightarrow{+}\xleftarrow{+}$	TAX
	CAB	$\xleftarrow{-}$	GEX	CAB	$\neq$	GEX
Syria	CAB	$\neq$	TAX	CAB	$\xrightarrow{+}$	TAX
	CAB	$\xrightarrow{-}\xleftarrow{-}$	GEX	CAB	$\neq$	GEX
Tunisia	CAB	$\xrightarrow{+}$	TAX	CAB	$\neq$	TAX
	CAB	$\xrightarrow{+}$	GEX	CAB	$\neq$	GEX
UAE	CAB	$\xrightarrow{-}$	TAX	CAB	$\xleftarrow{+}$	TAX
	CAB	$\xrightarrow{-}\xleftarrow{+}$	GEX	CAB	$\xrightarrow{+*}\xleftarrow{-}$	GEX

Causality directionis determind by the head of the arrows and the signs above each arrow refers to the effect nature i.e. positive or negative. All causality relations are significant at the conventional levels. The asterisk besides + or – means that the parameter in the related equation insignificant while the causality is significant. Indirect or non-causality denoted by $\neq$, all details about the long and short run causality ellustrade in section 3.5.3.

On the other hand, as summarized in Table 3-35 we found that the current account balance shocks affect taxes positively in Kuwait and Syria in the short run and Tunisia in the long run which support Owoye (2006) findings for Nigeria, but it affects taxes negatively in Bahrain, Morocco, Qatar and UAE in the long run analogous to Baharumshah, Lau et al. (2006) for Indonesia. Moreover, the bidirectional long run causality between taxes and the current account balance receives strong empirical support in Egypt, Kuwait and Saudi Arabia, while the short run bidirectional causality found in Bahrain, Egypt and Saudi Arabia, such evidence is similar to both Darrat (1988), Abell (1990) for the US and Marinheiro (2008) who found evidence in favour of a reverse Granger-causality running from the external deficit to the budget deficit in Egypt. But, there is no causality found in the short run in Morocco, Qatar and Tunisaia while no causality found in the long run in Jordan and Syria, which comes very supportive to our results in chapter two in which the non oil countries advocates (REH), similar to the findings for the UK and Australia by Khalid and Guan (1999), but contrary to Khalid and Guan (1999).

The causality relationship between the current account balance and government expenditure is negative and running directly from government spending to the current account balance in the long run in Saudi Arabia and in the short run in Egypt supporting both (TDH) and (REH) and in the same line with Mohammadi (2004) results for both developed and developing countries, and Beetsma, Giuliodori et al. (2008) findings for fourteen Europian countries. Such evidence also endorses our findings from panel data analysis in chapter two. In contrary, we found positive long run causality running from the current account balance to government spending in Egypt, Qatar and Tunisia. Furthermore, there is long run bidirectional causality between the current account balance and government spending in Kuwait, Morroco, Syria and UAE while the short run bidirectional causality found in Kuwait and UAE. In addition, and contrary to many studies, we found no direct causality in any direction in Jordan in short and long run wile in Morocco, Qatar, Saudi Arabia, Syuria and Tunisia in short run only. However, in the short run, we found weak evidence that these relationships are closely linked and that the taxes and government expenditures cause the current account balance and vice versa. This evidences are conterary to Kim and Roubini (2008) findings, but it supports the results for some African countries investigated by Arize and Malindretos (2008). However, Table 3-36 provides a summary of some related empirical literature as well as the results obtained in chapter two and the current chapter to facilitate comparison.

Table 3-36 Summary of the Empirical Literature

Selected Studies	Sample and Time Span	Methodology	Fiscal Policy Variable	Effects on the current account	Notes
Darrat (1988)	US 1960Q1-1984Q4	Granger Causality	Budget Deficit	Budget deficit granger causes trade deficit	The findings show a feedback effect runs from trade deficit to budget deficit
Miller and Russek (1989)	US Quarterly data 1946-1987	Causality tests OLS Cointegration	Budget Deficit	Fiscal deficit causes trade deficit	The findings show no evidence of reverse causation
Abell (1990)	US 1979Q2-1985Q2	VAR	Budget Deficit	Trade deficit causes budget deficit	Budget deficits (indirectly) causes trade deficit
Kasa (1994)	US, 1950-1993 Japan, 1960-1992 Germany, 1968-1993	VAR Impulse Response	Budget Deficit	Fiscal deficit causes trade deficit	The implied planning horizon in the US is only about 3 to 4 years, in Japan and Germany are 71, 31 years respectively
Normandin (1999)	US and Canada Quarterly data 1950-1992	VAR	Budget Deficit	Fiscal deficit deteriorates current account balance by 0.21-0.98 units for the US and by 0.19-0.67 units for Canada.	The responses of current account to fiscal deficit are positively affected by the birth rate and by the degree of persistence of the budget deficit
Leachman and Francis (2002)	US 1948-1973 1974-1992	Cointegration Multi cointegration ECMs	Government Revenues and Expenditures	In the period of the fixed exchange rate (Bretton-Woods), government revenues and expenditures and imports and exports are multi cointegrated, but it does not exist with flexible exchange rate (1974 forward)	ECMs (recent period) suggest that causality runs from internal to external deficits in the dynamic adjustment process. For the whole period, the twin deficits relationship exists; but it is time specific and weak.
Hatemi-J and Shukur (2002)	US 1975Q1-1998Q2	Granger Causality	Budget Deficit	Budget deficit granger causes current account deficit in the first period while causality is reversed in second period.	

Selected Studies	Sample and Time Span	Methodology	Fiscal Policy Variable	Effects on the current account	Notes
Bagnai (2006)	22 OECD countries 1960-2005	Cointegration	Budget Deficit	Twin deficits can be ruled out in Denmark, Germany, Italy, Spain, Sweden, Switzerland and Turkey, while it's insignificant in both Austria and Netherlands, but in the other twelve countries a long-run twin deficits relation is identified.	In ten out of these twelve countries the twin deficits relation becomes statistically significant only once the presence of structural breaks is taken into account.
Bartolini and Lahiri (2006)	26 countries[39]	Panel Data with fixed effects	Fiscal deficit	Fiscal deficit deteriorates current account balance by 30 percent.	
Salvatore (2006)	G-7 countries 1973–2005	GLS	Budget Deficit	Fiscal deficit deteriorates current account.	This relationship is a lagged one, with budget deficits leading to current account deficits by one or more years.
Beetsma, Giuliodori et al. (2008)	14 EU countries[40] 1970-2004	Panel VAR	Public Spending	A 1 % increases in public spending to GDP produces a 1.2% -1.6% rises in output, increasing imports and falling exports which is responsible for a fall of the trade balance to GDP by 0.5%-0.8%.	The spending increase produces a 0.7% impact on budget deficit, thereby pointing to the potential relevance of the twin deficits hypothesis for the EU.
Anoruo and Ramchander (1998)	India, Indonesia, Korea, Malaysia and Philippines. 1957-1993[41]	VAR Granger causality	Fiscal deficit	Trade deficits cause fiscal deficits and not vice versa.	Worsening trade balance increases government spending. Several other macroeconomic variables that jointly influence the twin deficits.

[39] These countries are studied by Bernheim (1987), these are Belgium, Canada, Costa Rica, El Salvador, Finland, France, Germany, Guatemala, Iceland, India, Italy, Korea, Morocco, new Zealand, Norway, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Thailand, USA and Venezuela.

[40] These countries are Austria, Belgium, Denmark, Finland, France, Ireland, Italy, Germany, Greece, the Netherlands, Portugal, Spain, Sweden, and the U.K.

[41] The sample period is different for each country; India and Philippines: 1957-1993; Malaysia: 1960-1993; Korea: 1967-1993; and Indonesia: 1970-1993.

Selected Studies	Sample and Time Span	Methodology	Fiscal Policy Variable	Effects on the current account	Notes
Khalid and Guan (1999)	5 advanced[42] economies 1950-94 5 developing[43] countries 1955-93	Cointegration Granger Causality	Budget Deficit	No cointegration found between the current account and budget balance in advanced economies, but it is found in developing countries. For most of the countries, budget balance causes the current account balance.	UK and Australia (no causality in either direction). US, France, Egypt, and Mexico (causality from the budget balance to the current account balance). Canada and India (causality in both directions).
Kouassi, Mougoue et al. (2004)	10 developed[44] Countries 1969-1998 10 developing[45] countries 1969-1998	Granger Non-Causality	Budget Deficit	Causality (unidirectional or bi-directional) between the twin deficits is found for some developing countries. The results for developed countries are less convincing.	Causality from budget deficit to current account deficit for Israel, and causality from current account deficit to budget deficit for Korea and Italy, and a feedback relation for Thailand. No causal relations have been discovered for the other developing countries.
Parikh and Rao (2006)	India 1970-2000	Cointegration ECMs	Fiscal Deficit	Fiscal deficit causes external deficits.	There are long and short run relationships between the current account deficits and investment. The real exchange rate is found to be an important determinant of current account deficits.

[42] Advanced economies are US, UK, France, Canada, and Australia.
[43] Developing countries are India, Indonesia, Pakistan, Mexico, and Egypt.
[44] Developed countries are Australia, Austria, Canada, France, Italy, Netherlands, New Zealand, Sweden, United Kingdom and United States.
[45] The developing countries consist of Columbia, Dominican Republic, India, Israel, Korea, Malaysia, Singapore, South Africa, Thailand, and Venezuela.

Selected Studies	Sample and Time Span	Methodology	Fiscal Policy Variable	Effects on the current account	Notes
Owoye (2006)	Nigeria 1970-2001	Cointegration ECMs Granger causality	Budget Deficit	There is a positive relationship (with causality) running from trade deficits to budget deficits.	
Arize and Malindretos (2008)	10 African[46] countries 1973Q2–2005Q4	Cointegration analyses	Budget Deficit	There is a positive long run relationship (with bidirectional causality) between the trade deficit and the budget deficit. In the short run, there is weak evidence that these deficits are closely linked and that the budget deficit causes the trade deficit.	Budget deficit adjustment, not trade deficit adjustment, is shown to be the key engine governing the speed of budget-trade deficit convergence; that is, the budget deficit is the primary variable that changes in order to restore equilibrium.
Kim and Roubini (2008)	US 1973Q1-2004Q1	VAR	Budget Deficit	The government deficit shocks improve the current account and depreciate the real exchange rate in the short run.	This finding is robust under alternative measures of budget deficit and empirical models.
Enders and Lee (1990)	US 1947Q3-1987Q1	VAR	Taxes and government spending	Tax revenue is associated with an increase in consumption spending and a current account deficit.	
Kearney and Monadjemi (1990)	8 OECD countries47 1972Q1-1987Q4	VAR	Budget Deficit	The evidence is consistent with a temporary twin deficits relationship that is not invariant to the government's financing decision and does not persist over time.	This period covers the floating exchange rates.
Jeffrey A. Rosensweig (1993)	US 1961Q1-1989Q4	VAR	Fiscal Deficit	Fiscal deficit contributes to dollar appreciate and trade deficit.	These findings support the "twin deficits" notion.

[46] These countries are Botswana, Burundi, Kenya, Mauritius, Nigeria, Rwanda, Sierra Leone, South Africa, Togo and Tunisia.
[47] These countries are Australia, Britain, Canada, France, Germany, Ireland, Italy and the United States.

Selected Studies	Sample and Time Span	Methodology	Fiscal Policy Variable	Effects on the current account	Notes
Vamvoukas (1997)	Greece 1948-1993	Cointegration Granger Causality ECMs	Budget Deficit	Budget deficit causes current account deficit	
Chowdhury and Saleh (2007)	Sri Lanka 1970–2005	ARDL modeling	Budget Deficit	One percent increase in budget deficit increases the current account deficit by 0.20 percent.	One percent increase in the savings-investment gap increases the current account deficit by 0.67 percent.
Piersanti (2000)	OECD countries 1970–1997	Causality tests GMM estimates	Budget Deficit	The current account deficits have been associated with expected future budget deficits.	The estimation of the model is based on the forward-looking expectations model.
Mohammadi (2004)	20 advanced countries 43 developing countries 1975-1998	Panel Data Analysis	Budget Deficit Taxes Government Spending	If the spending is tax-financed, the current account balance to GDP worsens by 0.23-0.32 percent of for developing countries and 0.00-0.26 percent for advanced countries. If the spending is bond-financed, the current account balance to GDP worsens by 0.55-0.81 percent for developing countries and 0.22-0.50 for advanced countries.	An improvement in the budget balance to GDP by one percent improves the current account balance to GDP by 0.33-49 percent developing countries and 0.21- 0.24 percent for advanced countries.
Chinn and Prasad (2000)	18 advanced and 71developing countries 1971-1995	Cross-section Panel Data Analysis	Fiscal Balance	A one percent increase in the fiscal balance to GDP improves the current account balance to GDP by 0.25-0.46 percent in the cross-section regressions.	Panel data suggest that the effect of the fiscal balance is not significant for advanced countries. Both panel and cross section regressions suggest that the impact of the fiscal balance on the current account balance is larger in developing countries than in advanced ones.

Selected Studies	Sample and Time Span	Methodology	Fiscal Policy Variable	Effects on the current account	Notes
This study Chapter two	11 Developing countries[48] 1970-2007	Panel Data Analysis	Budget Deficit Taxes Government Spending	Positive relationship between the current account balance and budget deficit only in the oil exporting countries. Negative relationship between the current account balance and government expenditure in the all countries.	Also, there is a positive relationship between the current account balance and taxes only in the oil exporting countries. Several other macroeconomic variables that jointly influence the current account balance.
This study Chapter three	10 Developing countries 1970-2007	VECM Granger non Causality Impulse responses	Taxes Government Spending	See Table 3-35	

[48] These countries are mentioned in chapter one.

3.7 CONCLUSION

Cointegration analyses—based on Johansen's vector error correction model (VECM) proposed by Johansen (1988) and developed by Johansen and Juselius (1990) and Johansen (1991)–has been exploited in this chapter to provide new evidence on the long run and dynamic relationship between fiscal policy and the current account in the investigated developing countries over the period 1970–2007. In conformity with theoretical considerations of (TDH), the analysis reveals that there is a positive short-run relationship between the current account balance and taxes with causality running directly from the later to the former only in Jordan and UAE. On the other hand, and in contrary to (TDH), the causality is running in the opposit direction with negative effect in the long run in Bahrain, Morocco, Qatar, and UAE, but with positive effect in Tunisia while it is positive in the short run in Syria and Kuwait. Moreover, the bidirectional long-run causality between taxes and the current account balance receives strong empirical support in Bahrain, Egypt, Kuwait and Saudi Arabia. On contrary no long run causality was found in Jordan and Syria, while no short run causality found in Morocco, Qatar and Tunisia which supports the (REH).

Regarding the causality relationship between the current account balance and government expenditure, the analysis finds negative causality running directly from the later to the former in the long run in Saudi Arabia which support both (TDH) and (REH). In contrary, we found positive long run causality running from the current account balance to government spending in Egypt, Qatar and Tunisia. Furthermore, there is long run bidirectional causality between the current account balance and government spending in Kuwait, Syria and UAE while the short run bidirectional causality found in Kuwait, Morocco and UAE. In addition, we found no causality in any direction either directly or indirectly in Jordan in short and long run while in Qatar, Saudi Arabia, Syuria and Tunisia in short run only. However, in the short run, we found weak evidence that these relationships are closely linked and that the taxes and government expenditures cause the current account balance and vice versa.

In the light of the causality clarification and based on the represented results in the current account balance long run equation as represented in the impact parameter matrix for each country, one percent increase in the government expenditure to GDP ratio increases/decreases the current account deficit/surplus to GDP ratio by 4.54, 1.37 and 0.72 percent in Kuwait, Saudi Arabia and Syria respectively. These results—

irrespective of the reverse causality direction–support the panel data analysis' results from chapter two in which one percent increase in government expenditure to GDP ratio deteriorates current account balance to GDP ratio by 0.27–0.46 percent in both oil and non oil exporting countries. Furthermore, it supports the findings for the USA, UK, Canada and Australia by Monacelli and Perotti (2006) and Corsetti and Müller (2006) and for fourteen EU countries by Beetsma, Giuliodori et al. (2008). In contrary to these results, one percent increase (decrease) in the Bahraini, Moroccan and UAE government expenditure to GDP ratio decreases (increases) the current account deficit/surplus to GDP ratio by 1.27, 0.61 and 4.78 percent respectively.

Table 3-37 Current Account Long Run Equation for all Countries

Country	Right-hand Side variables							
Bahrain	CAB_{t-1}	TAX_{t-1}	GEX_{t-1}	GI_{t-1}	GMS_{t-1}	GDS_{t-1}	TT_{t-1}	$GGDP_{t-1}$
ΔCAB_t	-2.14***	-0.81	1.27***	-1.54***	0.17	1.70***	1.57***	-0.10
Egypt	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	ΔTT_{t-1}	$\Delta GGDP_{t-1}$
ΔCAB_t	-0.33*	2.09***	-0.10	-0.34	-0.04	1.27***	-0.09	-1.28***
Jordan	CAB_{t-1}	GDS_{t-1}	GMS_{t-1}	TAX_{t-1}	GI_{t-1}	GEX_{t-1}	$GGDP_{t-1}$	TT_{t-1}
ΔCAB_t	-0.56	0.06	-0.99***	-0.62	-0.49	0.40	0.28	0.11
Kuwait	ΔCAB_{t-1}	ΔTAX_{t-1}	ΔGEX_{t-1}	ΔGDS_{t-1}	ΔGI_{t-1}	ΔGMS_{t-1}	$\Delta GGDP_{t-1}$	ΔTT_{t-1}
ΔCAB_t	-7.19***	-1.19***	-4.54***	4.58***	-6.29***	3.69***	1.60**	1.35***
Morocco	TAX_{t-1}	GEX_{t-1}	GDS_{t-1}	$GGDP_{t-1}$	CAB_{t-1}	TT_{t-1}	GI_{t-1}	GMS_{t-1}
ΔCAB_t	-0.58	0.61**	-0.47**	-0.30	0.19	-0.16*	-0.22	0.37*
Qatar	CAB_{t-1}	TAX_{t-1}	GEX_{t-1}	GDS_{t-1}	GMS_{t-1}	TT_{t-1}	$GGDP_{t-1}$	GI_{t-1}
ΔCAB_t	-3.27***	-0.09	-1.43	3.06**	-1.00***	0.64***	-0.42*	-2.20*
Saudi Arabia	CAB_{t-1}	TAX_{t-1}	GI_{t-1}	GMS_{t-1}	TT_{t-1}	$GGDP_{t-1}$	GEX_{t-1}	GDS_{t-1}
ΔCAB_t	-2.04***	-1.15***	-1.38	-0.29	0.45***	-0.08	-1.37***	1.97***
Syria	CAB_{t-1}	TAX_{t-1}	GEX_{t-1}	GDS_{t-1}	GI_{t-1}	GMS_{t-1}	TT_{t-1}	$GGDP_{t-1}$
ΔCAB_t	-1.55***	-0.57	-0.72***	0.85***	-1.16***	0.15	0.20	0.12*
Tunisia	CAB_{t-1}	TAX_{t-1}	GEX_{t-1}	TT_{t-1}	$GGDP_{t-1}$	GMS_{t-1}	GDS_{t-1}	GI_{t-1}
ΔCAB_t	-1.15***	-0.005	0.22	0.07	-0.67***	-0.03	0.26	-0.54**
UAEA	CAB_{t-1}	TAX_{t-1}	GEX_{t-1}	GI_{t-1}	GMS_{t-1}	TT_{t-1}	$GGDP_{t-1}$	
ΔCAB_t	0.95***	0.30	4.78***	3.48***	-0.09	0.28***	0.66***	

***, ** and * denote significant at the 1%, 5% and 10% respectively

Also, one percent increase in taxes to GDP ratio improves the current account balance to GDP ratio, regardless of the running causality from current account balance to taxes, by 2.09 percent in Egypt. These results are dissimilar to the results of panel data analysis obtained in chapter two in which (TDH) holds only in oil countries (Bahrain, Kuwait, Qatari, Saudi Arabia, and the UAE). On the other hand, one percent increase in taxes to GDP ratio deteriorates the current account balance to GDP ratio by 1.19 and 1.15 percent in Kuwait and Saudi Arabia respectively. Accordingly, we can conclude that it is not necessary for the country to be oil exporting in order to be Keynesian or Ricardian. Moreover, taking into account these results with that of taxes and government spendin long run equations, it seems apparently clear that the current account and fiscal policy variables in the investigated developing countries have mixed results with evidence of causality running in both directions (i.e. from taxes and government expenditure to current account balance, either directly or indirectly, and vice versa).

Like panel data results, the wider the gap between saving and investment the greater the deterioration in the current account balance in Bahrain, Kuwait, Qatar, Saudi Arabia, Syria and Tunisia, whereas both the Egyptian's investment and saving are related negatively to its current account balance. On the other hand, an increase in the growth rate of money supply by one point improves the current account balance to GDP ratio by 1.27, 3.69 and 0.37 percent in Egypt, Kuwait, and Morocco respectively as shown in Table 3-37 whereas it deteriorates current account position by 0.99 and 1.00 percent in Jordan and Qatar respectively. Therefore, monetary authorities can play a very important role in order to resolve current account problems in these countries which support the results of chapter two for oil exporting countries but different from its result for the non oil countries. In addition, unlike panel data results, improved terms of trade improve the current account position in all countries. Moreover, one percent increase in GDP growth rate improves current account position by 1.60, 0.12 and 0.65, percent in Kuwait, Syria and UAE respectively while deteriorates it by 1.28, 0.42 and 0.67 in Egypt, Qatar and Tunisia.

3.8 APPENDICES

3.8.1 APPENDIX E

The Augmented Dickey-Fuller (ADF) Test

Dickey and Fuller (1979) developed a procedure for testing whether a variable has a unit root or, equivalently, that the variable follows a random walk. Consider a simple AR (1) process:

$$y_t = \rho y_{t-1} + x_t \delta + \varepsilon_t \qquad (1)$$

Subtracting y_{t-1} from both sides of the equation (1) gives;

$$\Delta y_t = \alpha y_{t-1} + x_t' \delta + \varepsilon_t \qquad (2)$$

Where $\alpha = \rho - 1$; the null and alternative hypotheses may be written as

$$\begin{aligned} H_0 &: \alpha = 0 \\ H_1 &: \alpha < 0 \end{aligned} \qquad (3)$$

And evaluated using the conventional t-ratio for α :

$$t_\alpha = \hat{\alpha} / \left(se(\hat{\alpha}) \right) \qquad (4)$$

$\hat{\alpha}$, denotes the estimate of α , and $se(\hat{\alpha})$ is the coefficient standard error.

The simple Dickey-Fuller unit root test described above is valid only if the series is an AR (1) process. If the series is correlated at higher order lags, the assumption of white noise disturbances ε_t is violated. The Augmented Dickey-Fuller (ADF) test constructs a parametric correction for higher-order correlation by assuming that the series y follows an AR (*p*) process and adding *p* lagged difference terms of the dependent variable y to the right hand side of the test regression:

$$\Delta y_t = \alpha y_{t-1} + x_t' \delta + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \cdots + \beta_p \Delta y_{t-p} + v_t \qquad (5)$$

This augmented specification is then used to test (3) using the t-ratio (4). An important result obtained by Fuller is that the asymptotic distribution of the -ratio for α is independent of the number of lagged first differences included in the ADF regression. Moreover, while the assumption that y follows an autoregressive (AR) process may seem restrictive, Said and Dickey (1984) demonstrate that the ADF test is asymptotically valid in the presence of a moving average (MA) component, provided that sufficient lagged difference terms are included in the test regression.

The DF-GLS Test

Conventional unit root tests are known to lose power dramatically against stationary alternatives with a low order (MA) process. Along the lines of the ADF test, a more powerful variant is the DF-GLS test proposed by Elliott, Rothenberg et al. (1996), this test is a simple modification of the Augmented Dickey-Fuller test. In DF-GLS test, the data are detrended so that explanatory variables are taken out of the data prior to running the test regression. Elliott, Rothenberg et al. (1996) define a quasi-difference of that depends on the value representing the specific point alternative against which we wish to test the null:

$$d(y_t|a) = \begin{cases} y_t \cdots\cdots\cdots\cdots\cdots if\ : t = 1 \\ y_t - ay_{t-1} \cdots\cdots if\ : t > 1 \end{cases} \tag{6}$$

Consider an OLS regression of the quasi differenced data $d(y_t|a)$ on the quasi differenced $d(x_t|a)$;

$$d(y_t|a) = d(x_t|a)\grave{}\delta(a) + \eta_t \tag{7}$$

Where x_t contains either a constant, or a constant and trend, and let $\grave{}\delta(a)$ be the OLS estimates from this regression. All that we need now is a value for a. Elliott, Rothenberg et al. (1996) recommend the use of $a = \bar{a}$, where

$$\bar{a} = \begin{cases} 1 - 7/T \cdots\cdots\cdots if\ : x_t = \{1\} \\ 1 - 13.5/T \cdots\cdots if\ : x_t = \{1, t\} \end{cases} \tag{8}$$

We now define the GLS detrended data y_t^d using the estimates associated with the $\bar{a}$;

$$y_t^d \equiv y_t - x_t'\hat{\delta}(\bar{a}) \tag{9}$$

Then the DF-GLS test involves estimating the standard ADF test [i.e. equation (5)] after substituting the GLS detrended y_t^d for the original y_t;

$$\Delta y_t^d = \alpha y_{t-1}^d + \beta_1 \Delta y_{t-1}^d + \cdots + \beta_p y_{t-p}^d + v_t \tag{10}$$

Since y_t^d are detrended, we do not include the x_t in the DF-GLS test equation. As with the ADF test, we consider the t-ratio for $\hat{\alpha}$ from this test equation. While the DF-GLS t-ratio follows a Dickey-Fuller (no constant) distribution in the constant only case, the asymptotic distribution differs when you include both a constant and trend.

The Phillips-Perron (PP) Test

Phillips and Perron (1988) propose an alternative nonparametric method of controlling for serial correlation when testing for a unit root. The (PP) method estimates the non-Augmented DF test equation (2), and modifies the t-ratio of the α coefficient so that serial correlation does not affect the asymptotic distribution of the test statistic. The (PP) test is based on the statistic;

$$\tilde{t}_{\alpha} = t_{\alpha}\left(\frac{\gamma_0}{f_0}\right)^{1/2} - \frac{T\left(f_0 - \gamma_0\right)\left(se(\hat{\alpha})\right)}{2 f_0^{1/2} s} \qquad (11)$$

Where $\hat{\alpha}$ is the estimate, and t_{α} the t-ratio of α, $se(\hat{\alpha})$ is coefficient standard error, and s is the standard error of the test regression. In addition, γ_0 is a consistent estimate of the error variance in equation (2) calculated as $\left((T-k)s^2/T\right)$, where k is the number of regressors. The remaining term f_0 is an estimator of the residual spectrum at frequency zero. There are two choices you will have make when performing the PP test. First, you must choose whether to include a constant, a constant and a linear time trend, or neither, in the test regression. Second, you will have to choose a method for estimating f_0.

KPSS Test

The KPSS test, proposed by Shin and Schmidt (1992), differs from the other unit root tests described above in that the series y_t is assumed to be stationary under the null. The KPSS statistic is based on the residuals from the OLS regression of y_t on the exogenous variables x_t;

$$y_t = x_t'\delta + u_t \qquad (12)$$

The LM statistic is be defined as;

$$LM = \sum_t S(t)^2 / \left(T^2 f_0\right) \qquad (13)$$

Where f_0, is an estimator of the residual spectrum at frequency zero and $S(t)$ is a cumulative residual function;

$$S(t) = \sum_{r=1}^{t} \hat{u}_r \qquad (14)$$

Based on the residuals $\hat{u}_t = y_t - x_t'\hat{\delta}(0)$, the estimator of δ used in this calculation differs from the estimator for δ used by GLS detrending since it is based on a regression involving the original data, and not on the quasi-differenced data. To specify the KPSS test, one must specify the set of exogenous x_t regressors and a method for estimating f_0.

3.8.2 APPENDIX F

Table 3-38 Bahraini Results of Unit Root Tests

Variables	KPSS test for data in its level				KPSS test for data in its first difference				DF-GLS Test (MAIC lags)		ADF Test		ADF Test for the first difference	
	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lag No.	tau test statistic	Test statistic With trend (p-value)	Test statistic Without trend (p-value)	Test statistic With trend (p-value)	Test statistic Without trend (p-value)
CAB	4	0.203****	4	0.712***	5	0.104	5	0.308	4	-0.912	-1.70 (0.75)	0.62 (0.99)	-4.64 (0.00)	-3.64 (0.00)
GDS	4	0.184***	4	0.519**	2	0.0467	3	0.219	4	-0.805	-0.78 (0.97)	0.58(0.99)	-4.20 (0.00)	-3.65 (0.00)
GI	4	0.10	4	0.373*	4	0.103	4	0.104	1	-2.068	-2.12 (0.54)	-1.84 (0.36)	-5.15 (0.00)	-5.23 (0.00)
GMS	3	0.155**	26	0.338	1	0.449	1	0.0607	8	-0.943	-0.06 (0.99)	-2.47 (0.12)	-5.29 (0.00)	-5.29 (0.00)
GDPG	4	0.153**	4	0.235	4	0.0786	4	0.0814	2	-1.697	-1.34 (0.88)	-1.69 (0.44)	-6.09 (0.00)	-5.59 (0.00)
GEX	4	0.192***	4	0.338	3	0.0979	2	0.348*	1	-0.725	-0.53 (0.98)	-1.32 (0.62)	-4.63 (0.00)	-4.19 (0.00)
TAX	7	0.119*	2	0.276	4	0.091	4	0.0996	5	-1.210	-2.82 (0.19)	-3.34 (0.01)	-4.27 (0.00)	-3.43 (0.00)
TT	4	0.095	4	0.386*	5	0.112	5	0.189	1	-1.840	-1.85 (0.68)	-1.16 (0.69)	-5.07 (0.00)	-4.93 (0.00)

Phillips-Perron (PP) test for unit root [Z(t)]

	Lags	Z(t) in level with trend (p-value)	Z(t) in level without trend (p-value)	Z(t) in first difference with trend (p-value)	Z(t) in first difference without trend (p-value)
GEX	3	-0.81 (0.96)	-1.48 (0.55)	-7.24 (0.00)	-6.83 (0.00)

For KPSS test, the null hypothesis is that the data in that series is stationary. Then, ****, ***, **, and * denote rejecting the null at 1%, 2.5%, 5%, and 10% significance level respectively. The null hypothesis in DF-GLS, ADF and PP tests is that the data in that series is non-stationary or the series has unit root. ###, ##, ad #, denote rejecting the null of DF-GLS at 1%, 5%, and 10% significance level respectively. Numbers in parenthesis are MacKinnon approximate p-values for ADF and PP test statistics.

Table 3-39 Egyptian Results of Unit Root Tests

Variables	KPSS test for data in its level				KPSS test for data in its first difference				DF-GLS Test		ADF Test		ADF Test for the first difference	
	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	MAIC lags	tau test statistic	Test statistic With trend (p-value)	Test statistic Without trend (p-value)	Test statistic With trend (p-value)	Test statistic Without trend (p-value)
CAB	4	0.169^{***}	4	0.427^{***}	5	0.105	5	0.194	3	-1.442	-3.93 (0.01)	-1.28 (0.63)	-5.04 (0.00)	-4.63 (0.00)
GDS	4	0.114	4	0.736^{***}	3	0.0457	1	0.0886	8	-0.913	-4.32 (0.00)	-2.10 (0.24)	-3.18 (0.08)	-3.15 (0.02)
GI	4	0.123^{*}	4	0.367^{*}	4	0.0841	4	0.139	8	-1.316	-1.66 (0.76)	-0.61 (0.86)	-2.99 (0.14)	-3.33 (0.01)
GMS	4	0.112	4	0.322	4	0.125^{*}	4	0.165	1	-1.929	-3.66 (0.02)	-2.40 (0.13)	-5.06 (0.00)	-5.13 (0.00)
GDPG	4	0.126^{*}	4	0. 252	4	0.107	4	0.116	2	-2.511	-2.74 (0.21)	-1.76 (0.39)	-3.63 (0.02)	-3.74 (0.00)
GEX	4	0.18^{***}	5	0.579^{***}	1	0.0667	1	0.126	1	-1.150	-1.30 (0.88)	-1.42 (0.57)	-4.71 (0.00)	-4.41 (0.00)
TAX	2	0.226^{****}	5	0.378^{**}	3	0.0885	3	0.102	3	-0.999	-0.90 (0.95)	-1.43 (0.56)	-4.34 (0.00)	-3.96 (0.00)
TT	4	0.141^{*}	4	0.674^{***}	4	0.0936	4	0.0915	2	-1.469	-2.56 (0.29)	-2.56 (0.29)	-5.47 (0.00)	-5.36 (0.00)

Phillips-Perron (PP) test for unit root [Z(t)]

	Lags	Z(t) in level with trend (p-value)	Z(t) in level without trend (p-value)	Z(t) in first difference with trend (p-value)	Z(t) in first difference without trend (p-value)
GDS	3	-2.13 (0.53)	-1.47 (0.54)	-4.51 (0.00)	-4.52 (0.00)
GI	3	-2.59 (0.28)	-2.00 (0.29)	-4.95 (0.00)	-4.93 (0.00)
GDPG	3	-3.29 (0.07)	-3.10 (0.03)	-9.61 (0.00)	-9.44 (0.00)
GMS	3	-3.26 (0.07)	-2.70 (0.07)	-7.89 (0.00)	-7.83 (0.00)

For KPSS test, the null hypothesis is that the data in that series is stationary. Then, ****, ***, **, and * denote rejecting the null at 1%, 2.5%, 5%, and 10% significance level respectively. The null hypothesis in DF-GLS, ADF and PP tests is that the data in that series is non-stationary or the series has unit root. ###, ##, ad #, denote rejecting the null of DF-GLS at 1%, 5%, and 10% significance level respectively. Numbers in parenthesis are MacKinnon approximate p-values for ADF and PP test statistics.

Table 3-40 Jordanian Results of Unit Root Tests

Variables	KPSS test for data in its level				KPSS test for data in its first difference				DF-GLS Test (MAIC lags)		ADF Test		ADF Test for the first difference	
	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lag No.	tau test statistic	Test statistic With trend (p-value)	Test statistic Without trend (p-value)	Test statistic With trend (p-value)	Test statistic Without trend (p-value)
CAB	4	0.105	4	0.385*	1	0.133*	1	0.133	1	-1.902	-1.71 (0.75)	-1.45 (0.56)	-4.14 (0.00)	-4.20 (0.00)
GDS	4	0.103	4	0.315	5	0.0915	5	0.105	1	-2.557	-2.51 (0.32)	-2.30 (0.17)	-5.27 (0.00)	-5.33 (0.00)
GI	4	0.0887	4	0.0897	3	0.0877	4	0.129	1	-2.210	-2.12 (0.54)	-2.53 (0.11)	-3.65 (0.03)	-3.70 (0.00)
GMS	4	0.0995	4	0.328	3	0.0955	3	0.10	1	-2.280	-2.58 (0.29)	-1.81 (0.37)	-3.45 (0.04)	-3.46 (0.00)
GDPG	4	0.0838	4	0.278	1	0.0725	1	0.072	1	-2.617	-2.31 (0.43)	-2.04 (0.27)	-4.33 (0.00)	-4.40 (0.00)
GEX	4	0.161**	4	0.709***	3	0.0541	3	0.114	1	-1.348	-1.72 (0.74)	-1.32 (0.62)	-4.57 (0.00)	-4.58 (0.00)
TAX	4	0.124*	4	0.349*	3	0.0626	3	0.0705	2	-1.480	-2.76 (0.21)	-3.14 (0.02)	-4.15 (0.00)	-4.07 (0.00)
TT	4	0.187***	4	0.24	5	0.0725	6	0.199	6	-0.931	-1.73 (0.73)	-1.06 (0.72)	-3.98 (0.00)	-2.99 (0.03)

Phillips-Perron (P) test for unit root [Z(t)]

	Lags	Z(t) in level with trend (p-value)	Z(t) in level without trend (p-value)	Z(t) in first difference with trend (p-value)	Z(t) in first difference without trend (p-value)
CAB	3	-2.23 (0.47)	-1.85 (0.36)	-7.13 (0.00)	-7.23 (0.00)
GI	3	-2.67 (0.25)	-2.69 (0.08)	-5.03 (0.00)	-5.10 (0.00)
GMS	3	-2.75 (0.21)	-2.33 (0.16)	-7.95 (0.00)	-8.01 (0.00)
TT	3	-2.46 (0.35)	-2.36 (0.15)	-6.15 (0.00)	-6.12 (0.00)

For KPSS test, the null hypothesis is that the data in that series is stationary. Then, ****, ***, **, and * denote rejecting the null at 1%, 2.5%, 5%, and 10% significance level respectively. The null hypothesis in DF-GLS, ADF and PP tests is that the data in that series is non-stationary or the series has unit root. ###, ##, ad #, denote rejecting the null of DF-GLS at 1%, 5%, and 10% significance level respectively. Numbers in parenthesis are MacKinnon approximate p-values for ADF and PP test statistics.

Table 3-41 Kuwaiti Results of Unit Root Tests

Variables	KPSS test for data in its level				KPSS test for data in its first difference				DF-GLS Test (MAIC lags)		ADF Test		ADF Test for the first difference	
	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lag No.	tau test statistic	Test statistic With trend (p-value)	Test statistic Without trend (p-value)	Test statistic With trend (p-value)	Test statistic Without trend (p-value)
CAB	4	0.162**	4	0.262	4	0.0737	4	0.0981	4	-1.633	-1.55 (0.81)	-1.92 (0.32)	-3.85 (0.01)	-3.65 (0.00)
GDS	4	0.18***	4	0.268	4	0.0634	4	0.128	2	-1.940	-2.27 (0.45)	-2.46 (0.12)	-4.67 (0.00)	-4.58 (0.00)
GI	4	0.153**	4	0.198	5	0.0886	5	0.0945	6	-1.082	-2.65 (0.25)	-2.50 (0.11)	-3.94 (0.01)	-3.77 (0.00)
GMS	4	0.126*	4	0.289	4	0.144*	4	0.144	2	-1.701	-1.61 (0.78)	-1.63 (0.46)	-5.53 (0.00)	-5.59 (0.00)
GDPG	5	0.136*	5	0.162	4	0.0901	4	0.0997	4	-1.208	-2.09 (0.55)	-2.37 (0.14)	-4.46 (0.00)	-4.00 (0.00)
GEX	4	0.131*	4	0.201	4	0.0674	4	0.0849	2	-2.376	-2.52 (0.31)	-2.57 (0.09)	-4.96 (0.00)	-5.00 (0.00)
TAX	4	0.123*	4	0.122	5	0.096	5	0.0949	2	-2.230	-2.09 (0.54)	-2.12 (0.23)	-4.52 (0.00)	-4.60 (0.00)
TT	4	0.115	4	0.215	4	0.159**	4	0.167	1	-1.509	-1.67 (0.76)	-1.52 (0.51)	-4.14 (0.00)	-4.19 (0.00)

Phillips-Perron (P) test for unit root [Z(t)]					
	Lags	Z(t) in level with trend (p-value)	Z(t) in level without trend (p-value)	Z(t) in first difference with trend (p-value)	Z(t) in first difference without trend (p-value)
GMS	3	-3.25 (0.07)	-2.84 (0.05)	-8.03 (0.00)	-8.14 (0.00)
TT	3	-1.56 (0.80)	-1.35 (0.61)	-5.24 (0.00)	-5.30 (0.00)

For KPSS test, the null hypothesis is that the data in that series is stationary. Then, ****, ***, **, and * denote rejecting the null at 1%, 2.5%, 5%, and 10% significance level respectively. The null hypothesis in DF-GLS, ADF and PP tests is that the data in that series is non-stationary or the series has unit root. ###, ##, ad #, denote rejecting the null of DF-GLS at 1%, 5%, and 10% significance level respectively. Numbers in parenthesis are MacKinnon approximate p-values for ADF and PP test statistics.

Table 3-42 Morocco Results of Unit Root Tests

Variables	KPSS test for data in its level				KPSS test for data in its first difference				DF-GLS Test (MAIC lags)		ADF Test		ADF Test for the first difference	
	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lags No.	Test statistics with trend	Lags No.	Test statistics with no-trend	Lag No.	tau test statistic	Test statistic With trend (p-value)	Test statistic Without trend (p-value)	Test statistic With trend (p-value)	Test statistic Without trend (p-value)
CAB	4	0.105	4	0.385^{*}	3	0.0786	3	0.0786	1	-1.902	-1.71 (0.75)	-1.45 (0.56)	-4.14 (0.00)	-4.20 (0.00)
GDS	4	0.103	4	0.315	4	0.074	4	0.0812	1	-2.557	-2.51 (0.32)	-2.30 (0.17)	-5.27 (0.00)	-5.33 (0.00)
GI	4	0.0887	4	0.0897	3	0.0867	3	0.0868	1	-2.210	-2.12 (0.54)	-2.53 (0.11)	-3.65 (0.03)	-3.70 (0.00)
GMS	4	0.0995	4	0.328	2	0.0828	2	0.0844	1	-2.280	-2.58 (0.29)	-1.81 (0.37)	-3.45 (0.04)	-3.46 (0.00)
GDPG	4	0.0838	4	0.278	2	0.0616	2	0.0694	1	-2.617	-2.31 (0.43)	-2.04 (0.27)	-4.33 (0.00)	-4.40 (0.00)
GEX	4	0.161^{**}	4	0.709^{***}	2	0.0752	2	0.0964	1	-1.348	-1.72 (0.74)	-1.32 (0.62)	-4.57 (0.00)	-4.58 (0.00)
TAX	4	0.124^{*}	4	0.349^{*}	3	0.0584	3	0.192	2	-1.480	-2.76 (0.21)	-3.14 (0.02)	-4.15 (0.00)	-4.07 (0.00)
TT	4	0.187^{***}	4	0.24	3	0.0559	3	0.105	6	-0.931	-1.73 (0.73)	-1.06 (0.72)	-3.98 (0.00)	-2.99 (0.03)

Phillips-Perron (P) test for unit root [Z(t)]

	Lags	Z(t) in level with trend (p-value)	Z(t) in level without trend (p-value)	Z(t) in first difference with trend (p-value)	Z(t) in first difference without trend (p-value)
GEX	3	-2.291 (0.44)	-2.26 (0.18)	-4.61 (0.00)	-4.65 (0.00)
TAX	3	-3.69 (0.02)	-0.30 (0.93)	-9.57 (0.00)	-9.11 (0.00)
TT	3	-2.21 (0.48)	-1.88 (0.34)	-4.40 (0.00)	-4.46 (0.00)

For KPSS test, the null hypothesis is that the data in that series is stationary. Then, ****, ***, **, and * denote rejecting the null at 1%, 2.5%, 5%, and 10% significance level respectively. The null hypothesis in DF-GLS, ADF and PP tests is that the data in that series is non-stationary or the series has unit root. ###, ##, ad #, denote rejecting the null of DF-GLS at 1%, 5%, and 10% significance level respectively. Numbers in parenthesis are MacKinnon approximate p-values for ADF and PP test statistics.

Table 3-43 Qatari Results of Unit Root Tests

Variables	KPSS test for data in its level				KPSS test for data in its first difference				DF-GLS Test (MAIC lags)		ADF Test		ADF Test for the first difference	
	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lag No.	tau test statistic	Test statistic With trend (p-value)	Test statistic Without trend (p-value)	Test statistic With trend (p-value)	Test statistic Without trend (p-value)
CAB	4	0.168**	4	0.209	6	0.0849	6	0.158	2	-1.564	-1.52 (0.82)	-1.71 (0.42)	-3.87 (0.01)	-3.77 (0.00)
GDS	4	0.178***	4	0.214	3	0.101	3	0.147	1	-1.628	-1.80 (0.70)	-1.65 (0.45)	-4.49 (0.00)	-4.48 (0.00)
GI	4	0.161**	4	0.447*	6	0.0941	7	0.179	4	-1.333	-1.66 (0.76)	-0.62 (0.86)	-3.54 (0.03)	-3.30 (0.01)
GMS	4	0.162**	4	0.242	5	0.116	5	0.118	2	-0.949	-1.20 (0.91)	-1.65 (0.45)	-3.970 (0.00)	-3.91 (0.00)
GDPG	4	0.194***	4	0.195	5	0.0703	5	0.157	4	-0.962	-1.24 (0.90)	-1.44 (0.55)	-5.02 (0.00)	-4.39 (0.00)
GEX	4	0.2***	4	0.204	6	0.0863	5	0.274	1	-0.837	-0.81 (0.96)	-0.77 (0.82)	-3.39 (0.05)	-3.10 (0.02)
TAX	3	0.0822	4	0.577***	3	0.0897	3	0.164	1	-4.458###	-3.44 (0.04)	-2.61 (0.08)	-4.68 (0.00)	-4.78 (0.00)
TT	4	0.134*	4	0.135	3	0.112	3	0.22	2	-1.084	-0.62 (0.97)	-0.80 (0.81)	-5.32 (0.00)	-5.14 (0.00)

Phillips-Perron (P) test for unit root [Z(t)]

	Lags	Z(t) in level with trend (p-value)	Z(t) in level without trend (p-value)	Z(t) in first difference with trend (p-value)	Z(t) in first difference without trend (p-value)
GI	3	-2.51 (0.32)	-1.85 (0.35)	-5.34 (0.00)	-5.38 (0.00)
GEX	3	-0.96 (0.95)	-1.04 (0.74)	-6.19 (0.00)	-5.88 (0.00)

For KPSS test, the null hypothesis is that the data in that series is stationary. Then, ****, ***, **, and * denote rejecting the null at 1%, 2.5%, 5%, and 10% significance level respectively. The null hypothesis in DF-GLS, ADF and PP tests is that the data in that series is non-stationary or the series has unit root. ###, ##, ad #, denote rejecting the null of DF-GLS at 1%, 5%, and 10% significance level respectively. Numbers in parenthesis are MacKinnon approximate p-values for ADF and PP test statistics.

Table 3-44 Saudi Arabian Results of Unit Root Tests

Variables	KPSS test for data in its level				KPSS test for data in its first difference				DF-GLS Test (MAIC lags)		ADF Test		ADF Test for the first difference	
	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lags No.	Test statistics with trend	Lags No.	Test statistics with no-trend	Lag No.	tau test statistic	Test statistic With trend (p-value)	Test statistic Without trend (p-value)	Test statistic With trend (p-value)	Test statistic Without trend (p-value)
CAB	4	0.196***	4	0.279	4	0.081	4	0.144	2	-0.955	-1.82 (0.69)	-2.12 (0.23)	-7.15 (0.00)	-5.68 (0.00)
GDS	4	0.168**	4	0.456**	3	0.0918	3	0.101	2	-1.279	-1.71 (0.74)	-1.80 (0.37)	-3.45 (0.04)	-3.36 (0.01)
GI	5	0.0987	5	0.109	2	0.0394	2	0.0426	4	-1.835	-3.05 (0.11)	-2.47 (0.12)	-4.15 (0.00)	-4.13 (0.00)
GMS	4	0.129*	4	0.387*	4	0.106	4	0.108	8	-1.012	-2.48 (0.33)	-1.89 (0.33)	-4.05 (0.00)	-1.47 (0.54)
GDPG	4	0.154**	4	0.335	3	0.0524	3	0.0578	2	-1.142	-2.66 (0.25)	-2.44 (0.13)	-9.38 (0.00)	-8.10 (0.00)
GEX	4	0.191***	4	0.354*	4	0.0839	4	0.189	1	-1.224	-1.39 (0.86)	-1.84 (0.36)	-4.77 (0.00)	-4.49 (0.00)
TAX	4	0.181***	4	0.182	4	0.0749	4	0.102	1	-1.537	-2.96 (0.14)	-3.02 (0.03)	-5.16 (0.00)	-5.19 (0.00)
TT	4	0.17**	4	0.452*	6	0.133*	6	0.371*	1	-0.732	0.43 (0.99)	1.22 (0.99)	-4.91 (0.00)	-3.95 (0.00)

Phillips-Perron (P) test for unit root [Z(t)]

	Lags	Z(t) in level with trend (p-value)	Z(t) in level without trend (p-value)	Z(t) in first difference with trend (p-value)	Z(t) in first difference without trend (p-value)
GDS	3	-1.66 (0.77)	-1.35 (0.61)	-4.78 (0.00)	-4.84 (0.00)
GMS	3	-2.69 (0.24)	-2.12 (0.23)	-5.52 (0.00)	-5.62 (0.00)
TT	3	0.95 (1.00)	2.20 (0.99)	-5.56 (0.00)	-4.92 (0.00)

For KPSS test, the null hypothesis is that the data in that series is stationary. Then, ****, ***, **, and * denote rejecting the null at 1%, 2.5%, 5%, and 10% significance level respectively. The null hypothesis in DF-GLS, ADF and PP tests is that the data in that series is non-stationary or the series has unit root. ###, ##, ad #, denote rejecting the null of DF-GLS at 1%, 5%, and 10% significance level respectively. Numbers in parenthesis are MacKinnon approximate p-values for ADF and PP test statistics.

Table 3-45 Syrian Results of Unit Root Tests

Variables	KPSS test for data in its level				KPSS test for data in its first difference				DF-GLS Test (MAIC lags)		ADF Test		ADF Test for the first difference	
	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lags No.	Test statistics with trend	Lags No.	Test statistics with no-trend	Lag No.	tau test statistic	Test statistic With trend (p-value)	Test statistic Without trend (p-value)	Test statistic With trend (p-value)	Test statistic Without trend (p-value)
CAB	4	0.138^{*}	4	0.528^{**}	4	0.0882	4	0.158	1	-2.168	-2.73 (0.22)	-1.38 (0.59)	-3.82 (0.01)	-3.82 (0.00)
GDS	4	0.112	4	0.593^{***}	5	0.0878	5	0.0935	1	-1.845	-1.95 (0.62)	-1.17 (0.68)	-3.33 (0.06)	-3.38 (0.01)
GI	4	0.0657	4	0.112	6	0.108	6	0.113	1	-2.385	-2.85 (0.17)	-2.68 (0.07)	-2.98 (0.13)	-3.18 (0.02)
GMS	13	0.162^{**}	4	0.537^{**}	3	0.0617	3	0.0858	9	-1.302	-2.49 (0.32)	-0.62 (0.86)	-4.11 (0.00)	-3.78 (0.00)
GDPG	3	0.0511	4	0.319	2	0.0376	2	0.0379	1	-2.598	-3.68 (0.02)	-3.21 (0.01)	-5.15 (0.00)	-5.23 (0.00)
GEX	4	0.115	4	0.61^{**}	0	0.0741	1	0.128	1	-1.772	-2.21 (0.47)	-0.88 (0.79)	-4.02 (0.00)	-4.02 (0.00)
TAX	4	0.157^{**}	4	0.556^{**}	4	0.0719	4	0.0961	4	-1.219	-1.98 (0.60)	-0.74 (0.83)	-5.05 (0.00)	-4.66 (0.00)
TT	4	0.0819	4	0.381^{*}	5	0.0741	5	0.0786	1	-2.342	-2.64 (0.26)	-2.12 (0.23)	-4.86 (0.00)	-4.94 (0.00)

Phillips-Perron (P) test for unit root [Z(t)]					
	Lags	Z(t) in level with trend (p-value)	Z(t) in level without trend (p-value)	Z(t) in first difference with trend (p-value)	Z(t) in first difference without trend (p-value)
GDS	3	-2.15 (0.52)	-1.24 (0.66)	-5.48 (0.00)	-5.56 (0.00)
GI	3	-2.81 (0.19)	-2.78 (0.06)	-5.66 (0.00)	-5.77 (0.00)

For KPSS test, the null hypothesis is that the data in that series is stationary. Then, ****, ***, **, and * denote rejecting the null at 1%, 2.5%, 5%, and 10% significance level respectively. The null hypothesis in DF-GLS, ADF and PP tests is that the data in that series is non-stationary or the series has unit root. ###, ##, ad #, denote rejecting the null of DF-GLS at 1%, 5%, and 10% significance level respectively. Numbers in parenthesis are MacKinnon approximate p-values for ADF and PP test statistics.

Table 3-46 Tunisian Results of Unit Root Tests

Variables	KPSS test for data in its level				KPSS test for data in its first difference				DF-GLS Test (MAIC lags)		ADF Test		ADF Test for the first difference	
	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lags No.	Test statistics with trend	Lags No.	Test statistics with no-trend	Lag No.	tau test statistic	Test statistic With trend (p-value)	Test statistic Without trend (p-value)	Test statistic With trend (p-value)	Test statistic Without trend (p-value)
CAB	4	0.114	4	0.254	5	0.0766	5	0.0972	1	-2.494	-3.06 (0.11)	-2.71 (0.07)	-4.67 (0.00)	-4.64 (0.00)
GDS	4	0.188***	4	0.397*	3	0.0737	2	0.171	1	-1.012	-1.71 (0.74)	-2.44 (0.13)	-5.86 (0.00)	-4.95 (0.00)
GI	4	0.106	4	0.14	4	0.083	4	0.152	4	-1.388	-2.98 (0.13)	-2.10 (0.24)	-3.17 (0.08)	-3.20 (0.01)
GMS	3	0.1	4	0.551**	4	0.0913	4	0.10	6	-1.552	-1.07 (0.93)	-1.13 (0.69)	-3.35 (0.05)	-3.30 (0.01)
GDPG	0	0.0657	5	0.606***	2	0.0423	2	0.0488	1	-2.858	-3.97 (0.00)	-2.69 (0.07)	-7.12 (0.00)	-7.25 (0.00)
GEX	4	0.168**	4	0.169	4	0.102	4	0.108	2	-1.566	-1.83 (0.68)	-2.05 (0.26)	-4.09 (0.00)	-4.00 (0.00)
TAX	4	0.153**	4	0.247	5	0.0925	5	0.104	3	-1.068	-1.51 (0.82)	-1.67 (0.44)	-3.59 (0.03)	-3.45 (0.00)
TT	4	0.0967	4	0.6***	2	0.0718	2	0.997	1	-2.571	-3.16 (0.09)	-1.44 (0.56)	-4.13 (0.00)	-4.15 (0.00)

Phillips-Perron (PP) test for unit root [Z(t)]

	Lags	Z(t) in level with trend (p-value)	Z(t) in level without trend (p-value)	Z(t) in first difference with trend (p-value)	Z(t) in first difference without trend (p-value)
GI	3	-2.65 (0.26)	-2.59 (0.09)	-5.20 (0.00)	-5.20 (0.00)
GMS	3	-4.88 (0.00)	-3.47 (0.01)	-9.74 (0.00)	-9.90 (0.00)
TAX	3	-2.63 (0.26)	-2.53 (0.11)	-7.34 (0.00)	-7.45 (0.00)

For KPSS test, the null hypothesis is that the data in that series is stationary. Then, ****, ***, **, and * denote rejecting the null at 1%, 2.5%, 5%, and 10% significance level respectively. The null hypothesis in DF-GLS, ADF and PP tests is that the data in that series is non-stationary or the series has unit root. ###, ##, ad #, denote rejecting the null of DF-GLS at 1%, 5%, and 10% significance level respectively. Numbers in parenthesis are MacKinnon approximate p-values for ADF and PP test statistics.

Table 3-47 UAE Results of Unit Root Tests

Variables	KPSS test for data in its level				KPSS test for data in its first difference				DF-GLS Test (MAIC lags)		ADF Test		ADF Test for the first difference	
	Lag No.	Test statistics with trend	Lag No.	Test statistics with no-trend	Lags No.	Test statistics with trend	Lags No.	Test statistics with no-trend	Lag No.	tau test statistic	Test statistic With trend (p-value)	Test statistic Without trend (p-value)	Test statistic With trend (p-value)	Test statistic Without trend (p-value)
CAB	4	0.2***	4	0.644***	5	0.118	5	0.304	2	-0.876	-0.95 (0.95)	-1.72 (0.42)	-4.65 (0.00)	-4.17 (0.00)
GDS	4	0.138*	4	0.689***	5	0.0906	5	0.0997	2	-1.547	-1.65 (0.77)	-0.74 (0.83)	-3.77 (0.01)	-3.82 (0.00)
GI	4	0.0738	4	0.252	5	0.0724	5	0.111	1	-3.199#	-3.05 (0.12)	-2.51 (0.11)	-4.65 (0.00)	-4.69 (0.00)
GMS	5	0.178***	5	0.29	4	0.118	4	0.415*	5	0.042	0.42 (0.99)	0.45 (0.98)	-6.96 (0.00)	-5.19 (0.00)
GDPG	4	0.164**	4	0.306	4	0.0746	4	0.0879	2	-0.994	-2.36 (0.39)	-2.50 (0.11)	-8.56 (0.00)	-6.98 (0.00)
GEX	4	0.193***	4	0.217	6	0.0819	7	0.22	2	-0.827	-0.55 (0.98)	-0.97 (0.76)	-3.94 (0.01)	-3.42 (0.01)
TAX	4	0.129*	4	0.129	2	0.0737	2	0.0818	3	-1.386	-2.43 (0.36)	-2.34 (0.15)	-3.95 (0.01)	-3.67 (0.00)
TT	4	0.143*	4	0.533**	4	0.101	4	0.299	1	-1.353	-1.17 (0.91)	-1.85 (0.35)	-4.71 (0.00)	-4.15 (0.00)

Phillips-Perron (PP) test for unit root [Z(t)]

	Lags	Z(t) in level with trend (p-value)	Z(t) in level without trend (p-value)	Z(t) in first difference with trend (p-value)	Z(t) in first difference without trend (p-value)
GI	3	-2.98 (0.14)	-2.69 (0.08)	-6.76 (0.00)	-6.74 (0.00)
GMS	3	-8.33 (0.00)	-9.09 (0.00)	-15.40 (0.00)	-13.32 (0.00)

For KPSS test, the null hypothesis is that the data in that series is stationary. Then, ****, ***, **, and * denote rejecting the null at 1%, 2.5%, 5%, and 10% significance level respectively. The null hypothesis in DF-GLS, ADF and PP tests is that the data in that series is non-stationary or the series has unit root. ###, ##, ad #, denote rejecting the null of DF-GLS at 1%, 5%, and 10% significance level respectively. Numbers in parenthesis are MacKinnon approximate p-values for ADF and PP test statistics.

Table 3-48 Results of Unit Root Tests of GFB and the Cointegration Test between GEX and TAX

(A) The results of theunit root tests for GFD

Variables	KPSS test for data in its level				KPSS test for data in its first difference				DF-GLS (MAIC lags)		ADF Test		ADF Test for the first difference	
	Lag No.	trend	Lag No.	no-trend	Lag No.	trend	Lag No.	no-trend	Lag No.	tau test statistic	trend	No trend	trend	No trend
Bahrain	1	0.163**	1	0.175	4	0.074	4	0.256	3	-0.755	-2.02 (0.59)	-2.16 (0.22)	-4.56 (0.00)	-4.57 (0.00)
Egypt	4	0.183***	4	0.526**	3	0.0773	3	0.255	1	-0.679	-2.19 (0.49)	-3.28 (0.01)	-6.86 (0.00)	-6.00 (0.00)
Jordan	4	0.0898	4	0.349*	4	0.065	4	0.0672	1	-1.930	-2.74 (0.22)	-2.46 (0.13)	-7.24 (0.00)	-7.29 (0.00)
Kuwait	4	0.139*	4	0.171	5	0.087	5	0.0934	2	-2.087	-2.08 (0.55)	-2.13 (0.23)	-4.56 (0.00)	-4.62 (0.00)
Morocco	4	0.0898	4	0.349*	5	0.089	5	0.20	1	-1.930	-2.74 (0.22)	-2.46 (0.13)	-7.24 (0.00)	-7.29 (0.00)
Qatar	4	0.142*	4	0.157	2	0.102	2	0.31	7	-1.142	-2.34 (0.40)	-0.69 (0.84)	-2.61 (0.27)	-2.97 (0.03)
Saudi	4	0.193***	4	0.238	4	0.078	4	0.134	2	-0.987	-1.49 (0.83)	-1.74 (0.40)	-5.58 (0.00)	-4.64 (0.00)
Syria	4	0.115	4	0.324	4	0.0873	4	0.086	1	-2.023	-2.52 (0.31)	-2.25 (0.18)	-5.44 (0.00)	-5.53 (0.00)
Tunisia	4	0.081	4	0.259	4	0.0768	4	0.0913	5	-2.184	-1.81 (0.69)	-1.99 (0.28)	-3.21 (0.02)	-3.14 (0.02)
UAE	4	0.0796	4	0.0786	2	0.0621	3	0.131	5	-1.047	-2.78 (0.20)	-2.17 (0.22)	-3.15 (0.09)	-3.35 (0.01)

(B) The Coinegration results between the government expindítures and revenues.

***H_0*:**	Bahrain	Egypt	Jordan	Kuwait	Morocco	Oman	Qatar	Saudi Arabia	Syria	Tunisia	UAE
$r = 0$	22.93	16.39	13.76	7.99$^{\#\#}$	4.6315$^{\#\#}$	22.1335	14.5674$^{\#\#}$	21.1984	9.8739$^{\#\#}$	7.6548$^{\#\#}$	20.8846
$r \leq 1$	1.73$^{\#\#}$	1.09$^{\#\#}$	1.28$^{\#\#}$	0.39	1.5167	8.8387$^{\#\#}$	0.0005	5.4431$^{\#\#}$	1.3477	0.0562	5.0468$^{\#\#}$
Trend	constant	none	none	none	none	R-constant	none	R-constant	none	none	R-constant
C- rank	**1**	**1**	**1**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**1**

The same notes as above tables for the unit root tests. ## denotes that the cointegration rank (λ_{trace}) is significant at 5%.

Table 3-49 Results of Unit Root Tests of GGDP before and after Break Point

		Bahrain	Egypt	Jordan	Kuwait	Morocco	Qatar	Saudi Arabia	Syria	Tunisia	UAE
Before	Lags	3	2	1	5	8	2	1	1	1	2
	Statistic	-0.98	-0.967	-1.518	-0.442	-0.595	-0.872	-2.109	-1.925	-1.256	-0.637
Break-Point		1987	1981	1981	1992	1992	1983	1981	1987	1986	1981
After	Lags	2	1	1	4	4	1	4	1	6	2
	Statistic	-1.07	-1.130	-1.430	-0.416	-0.982	-3.866	-1.872	-0.827	-0.706	-2.515

The null hypothesis in **DF-GLS** tests is that the data in that series is non-stationary or the series has unit root. $^{###}$, $^{##}$, and $^{#}$ denote rejecting the null of DF-GLS at 1%, 5%, and 10% significance level respectively. Numbers of lag was choen automatically according to the MAIC. Before means the sub-series before the inspected brak point and the sub-serieas for the after period denoted by After.

3.8.3 APPENDIX G

Figure 3-1 Bahraini Data in its Level and First Difference

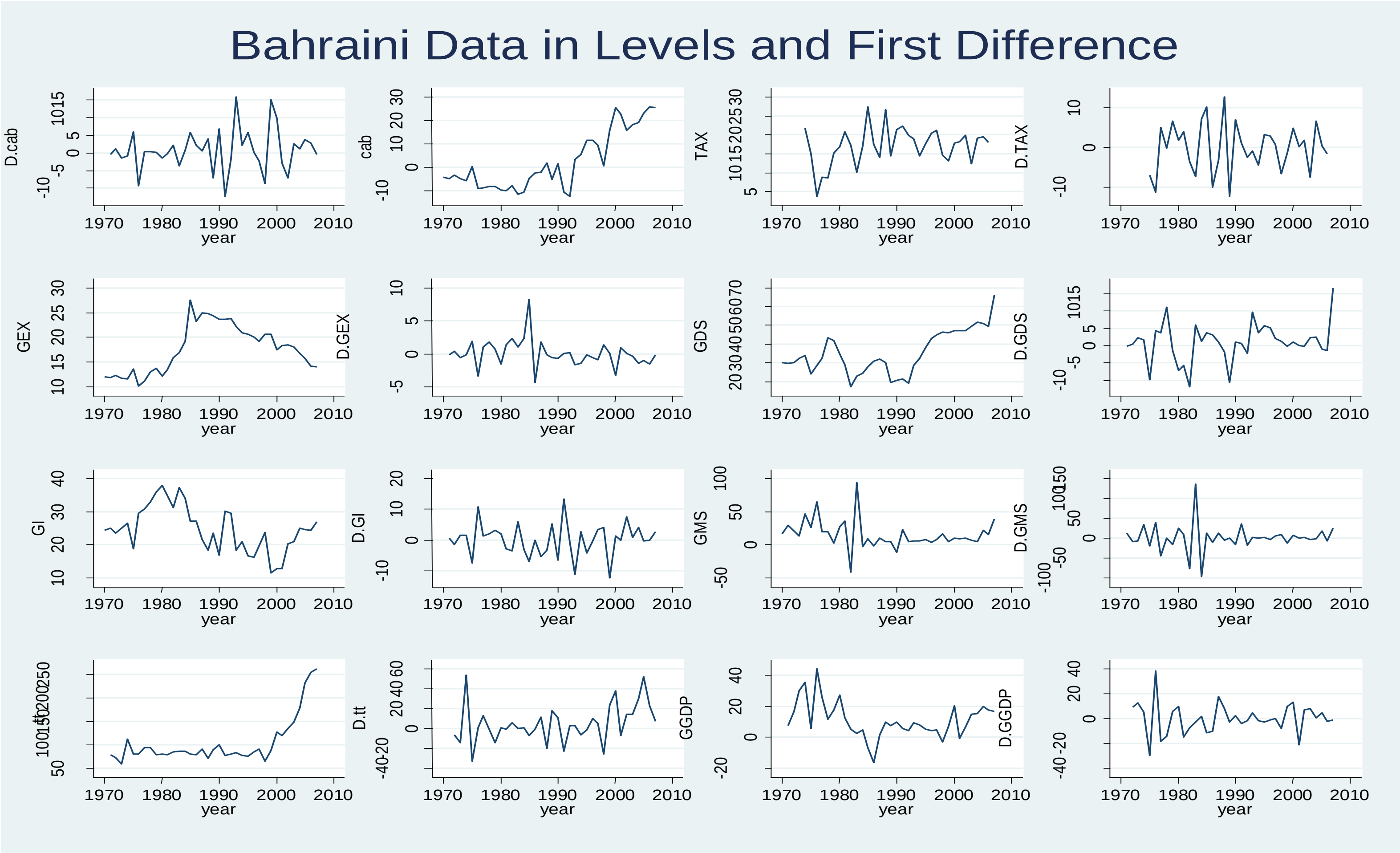


Figure 3-2 Egyptian Series in Levels and in First Difference

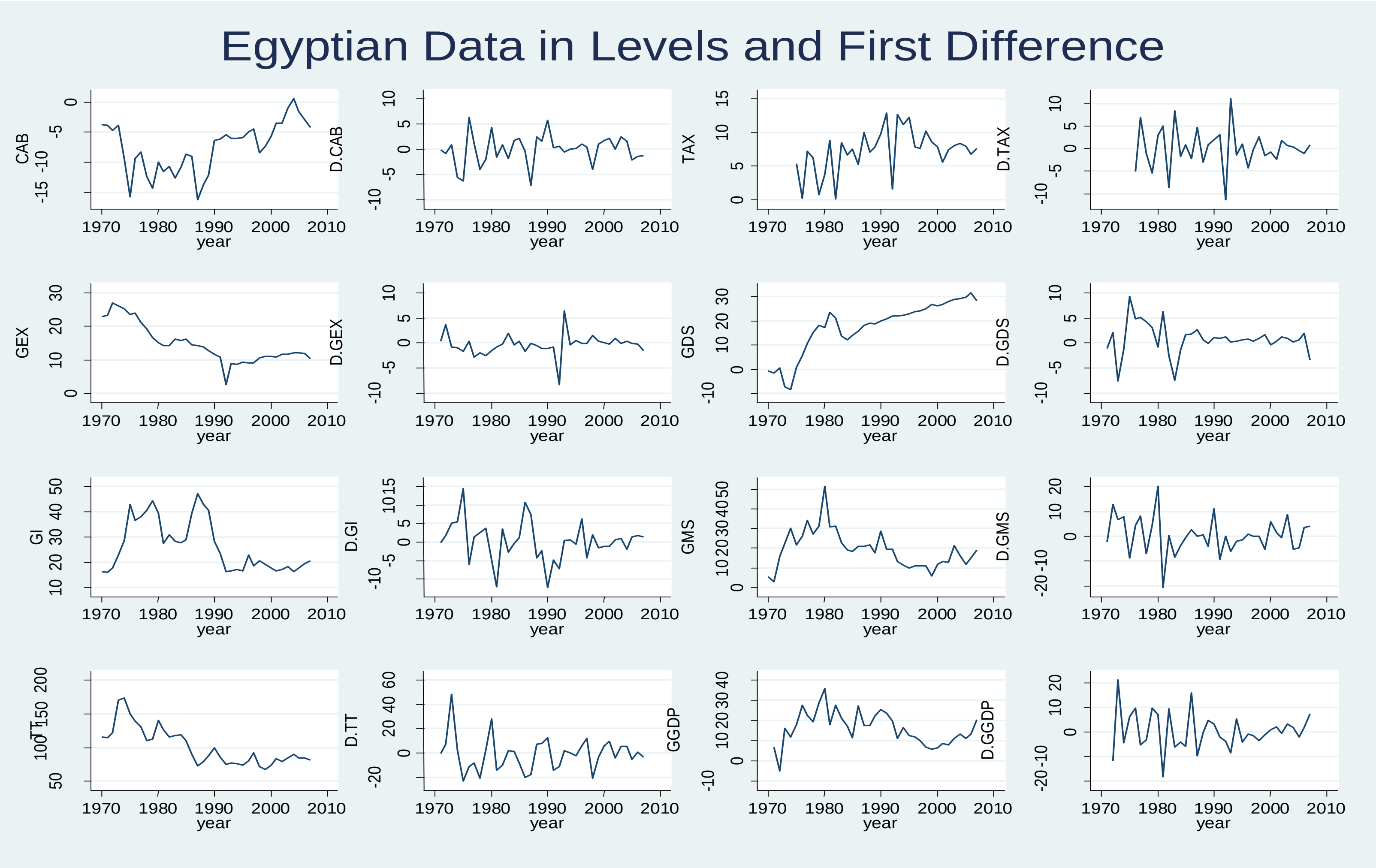


Figure 3-3 Jordanian Series in Levels and in First Differences

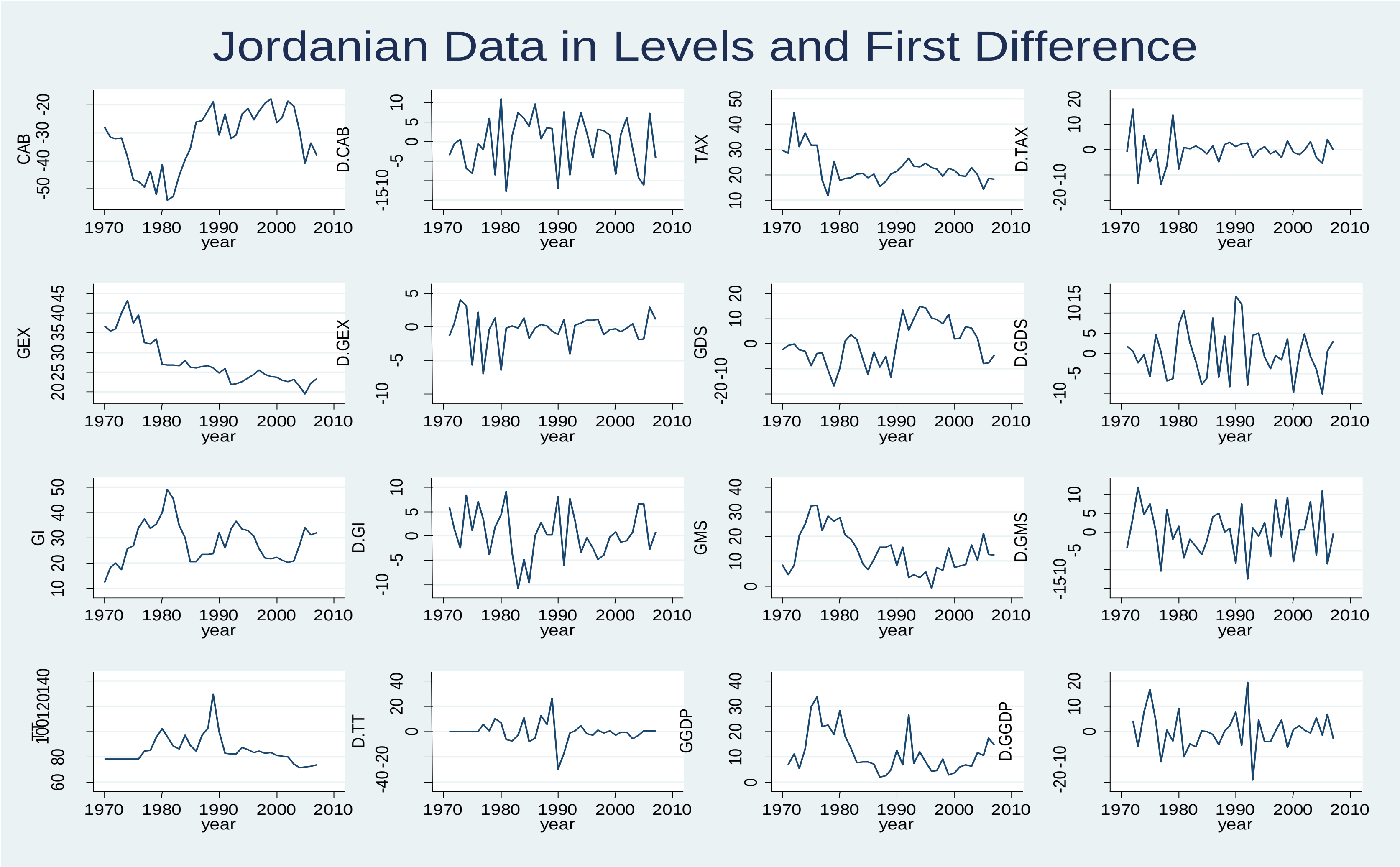


Figure 3-4 Kuwaiti Series in Levels and in First Differences

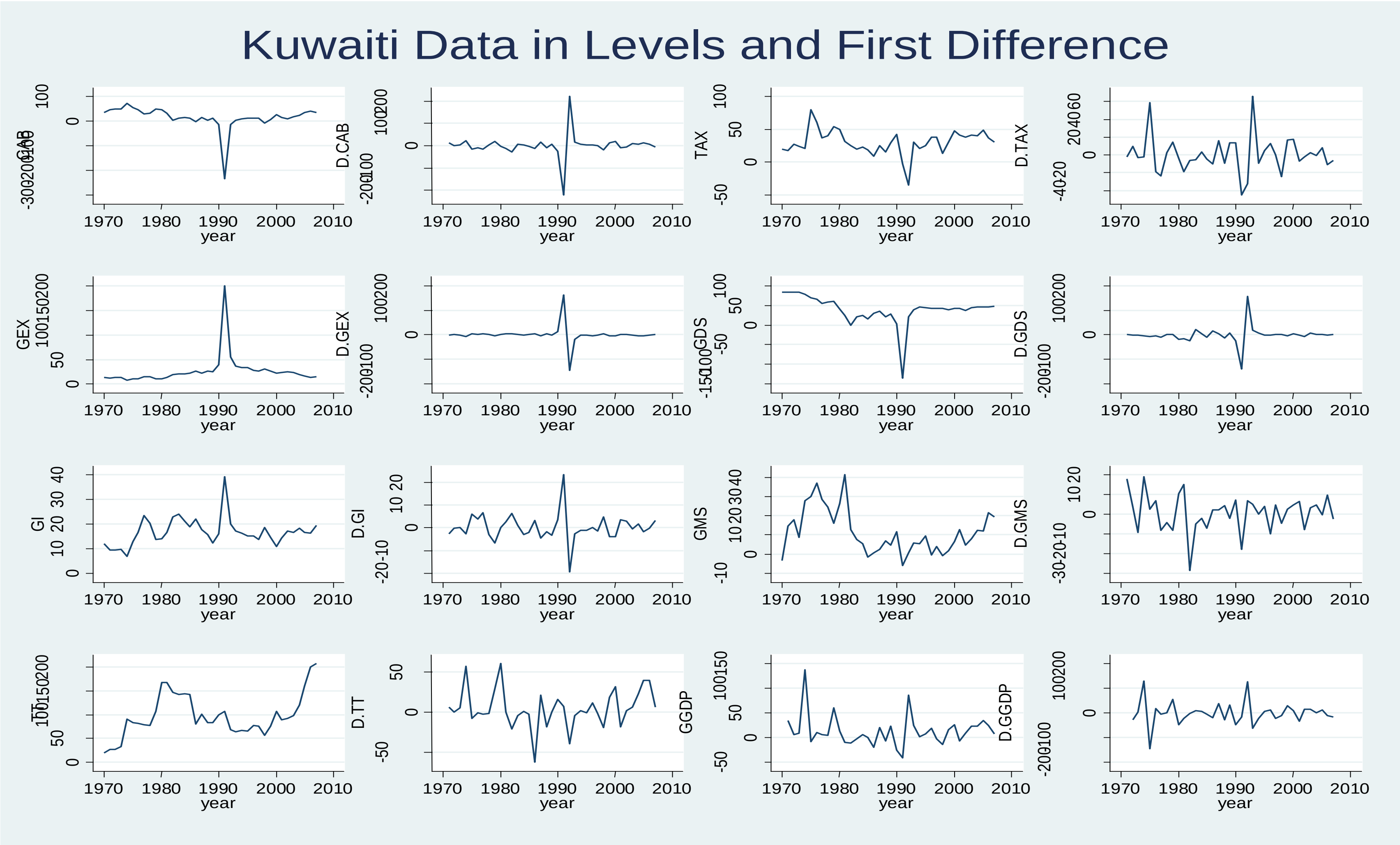


Figure 3-5 Morocco Series in Levels and in First Differences

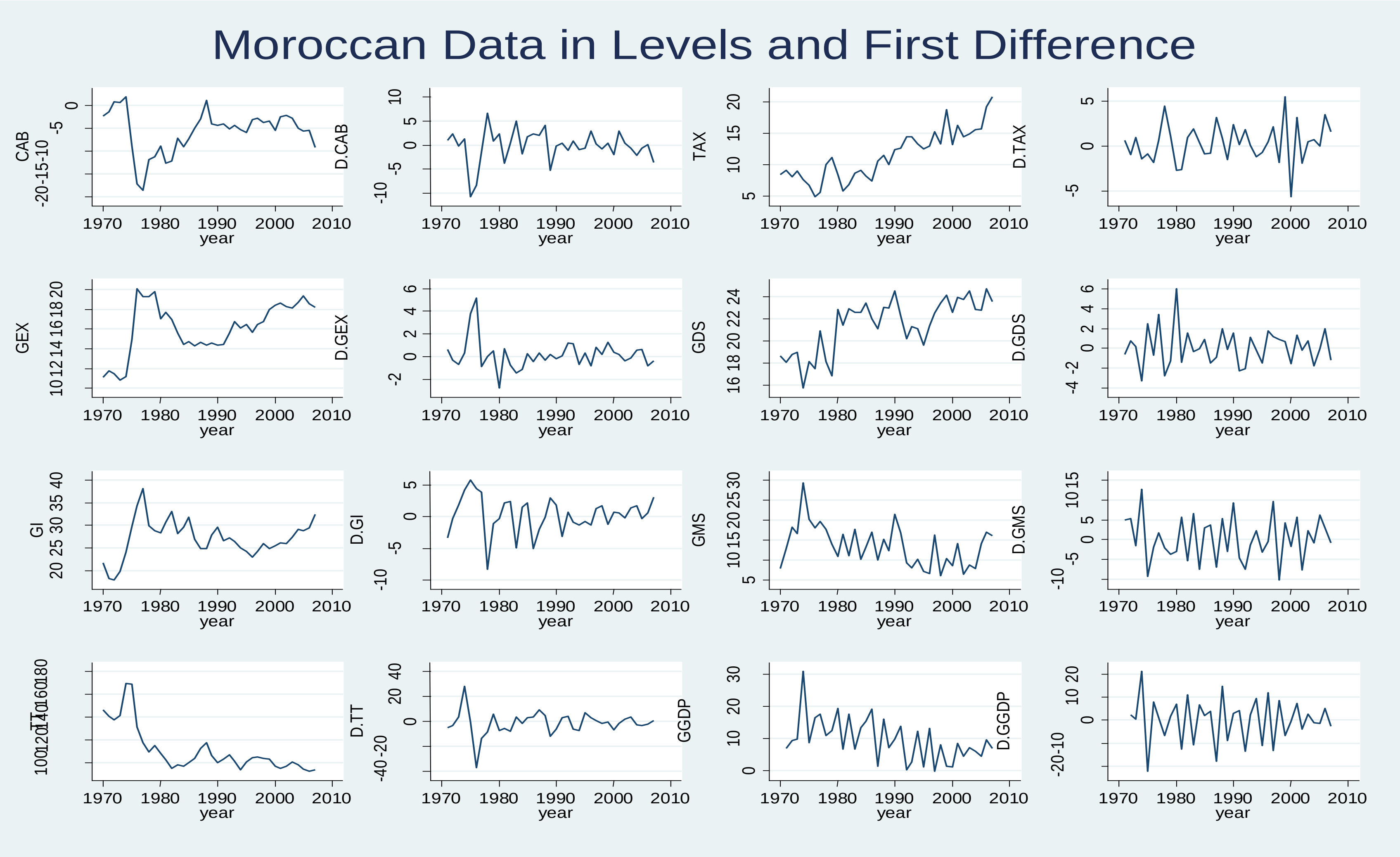


Figure 3-6 Qatari Series in Levels and in First Differences

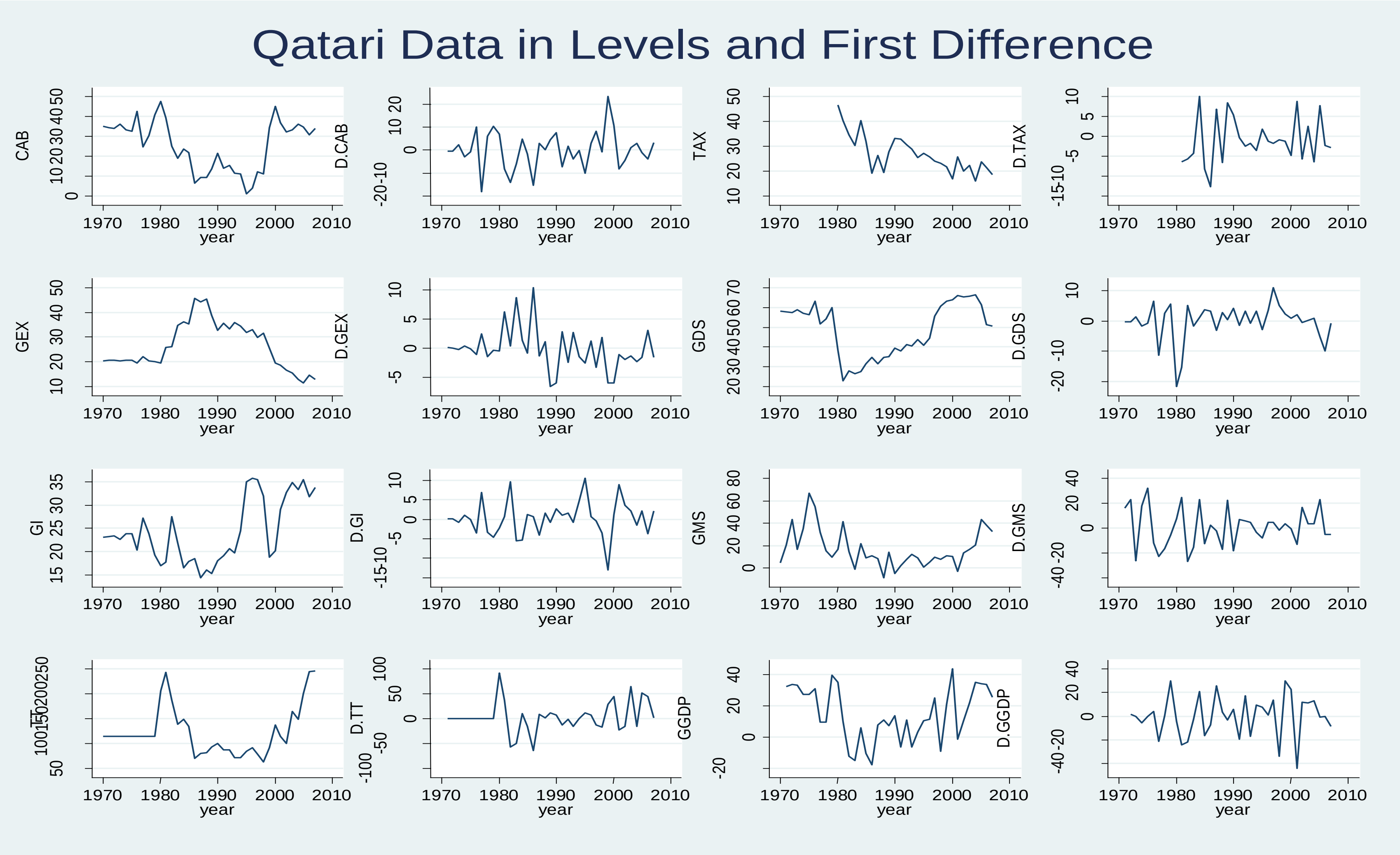


Figure 3-7 Saudi Series in Levels and in First Differences

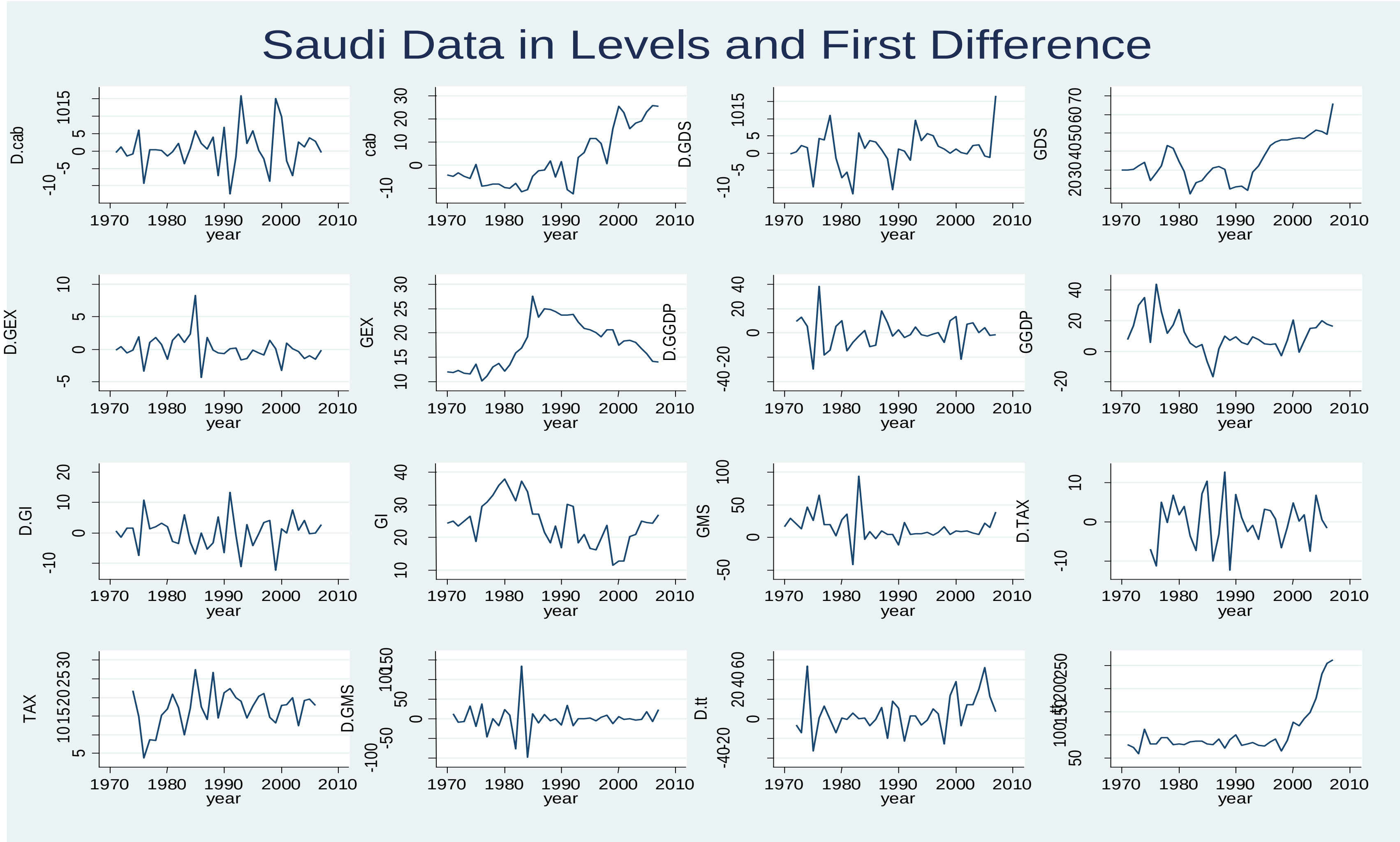


Figure 3-8 Syrian Series in Levels and in First Differences

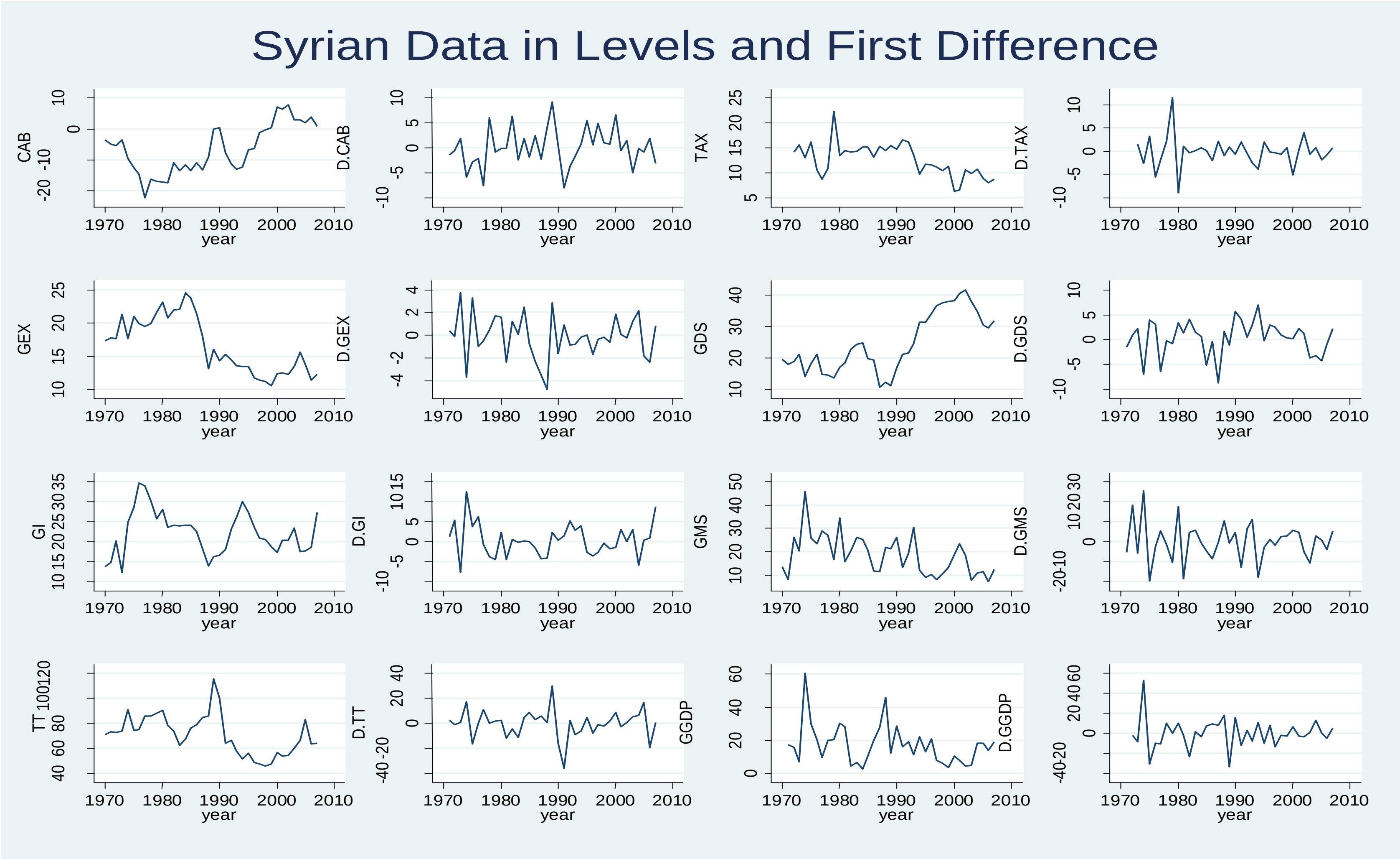


Figure 3-9 Tunisian Series in Levels and in First Differences

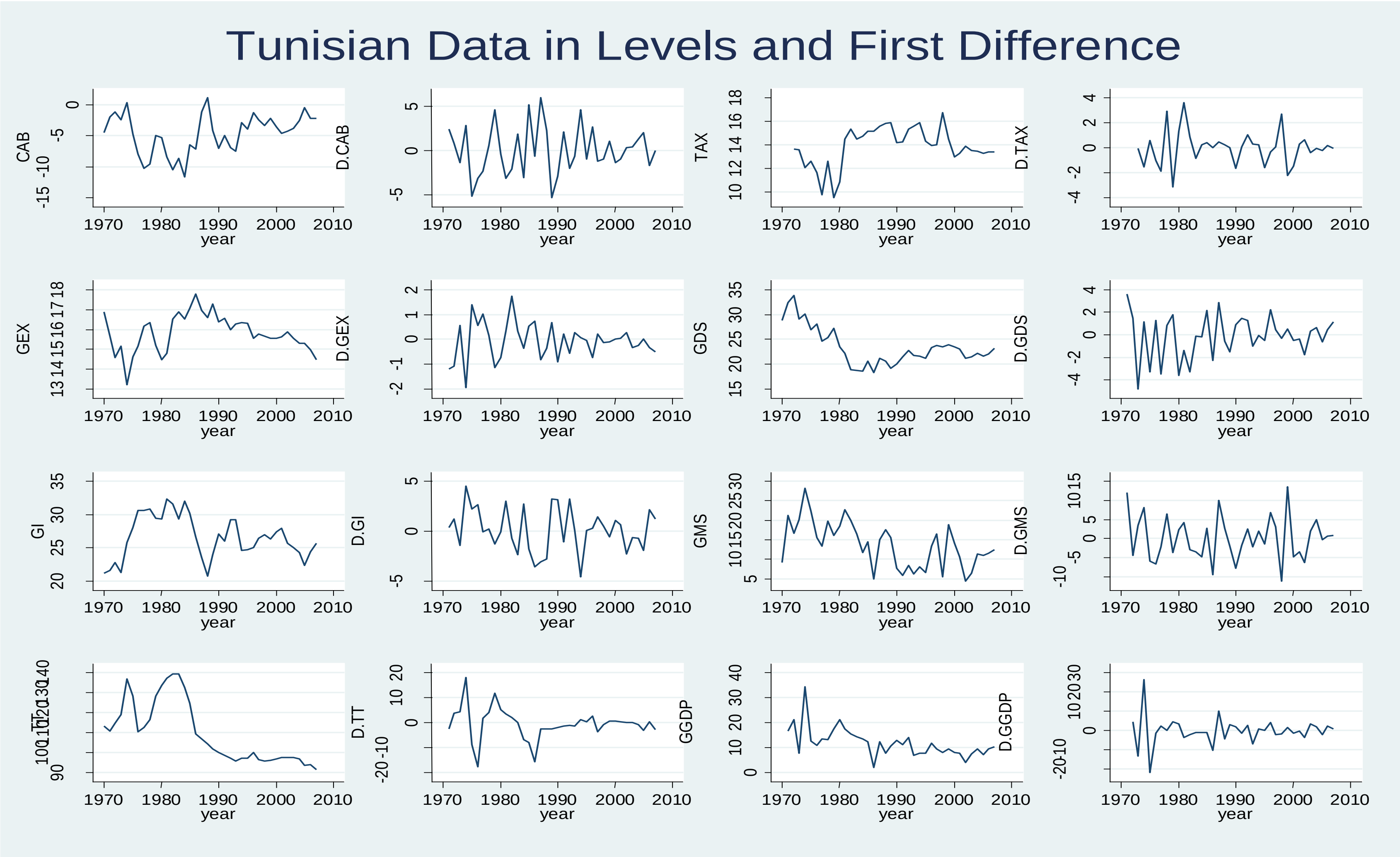
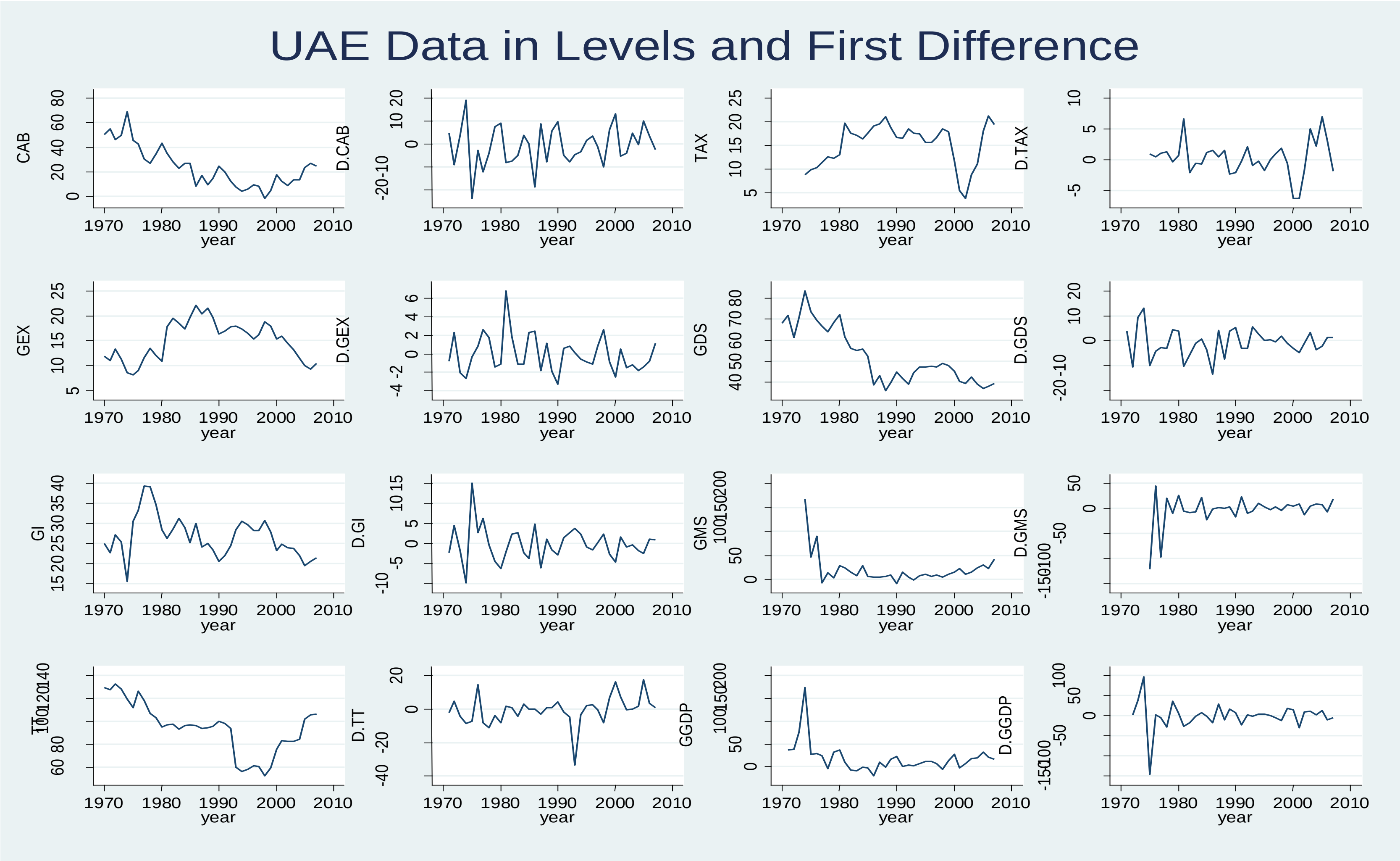
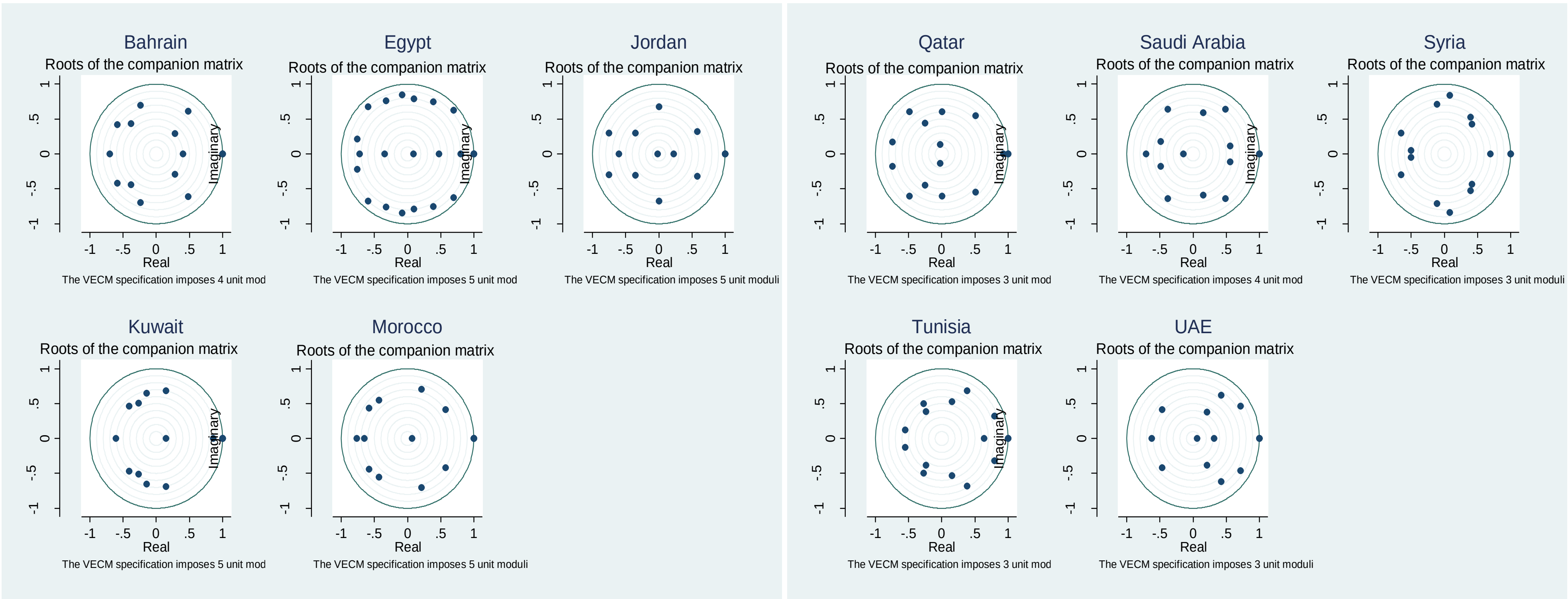


Figure 3-10 UAE Series in Levels and in First Differences



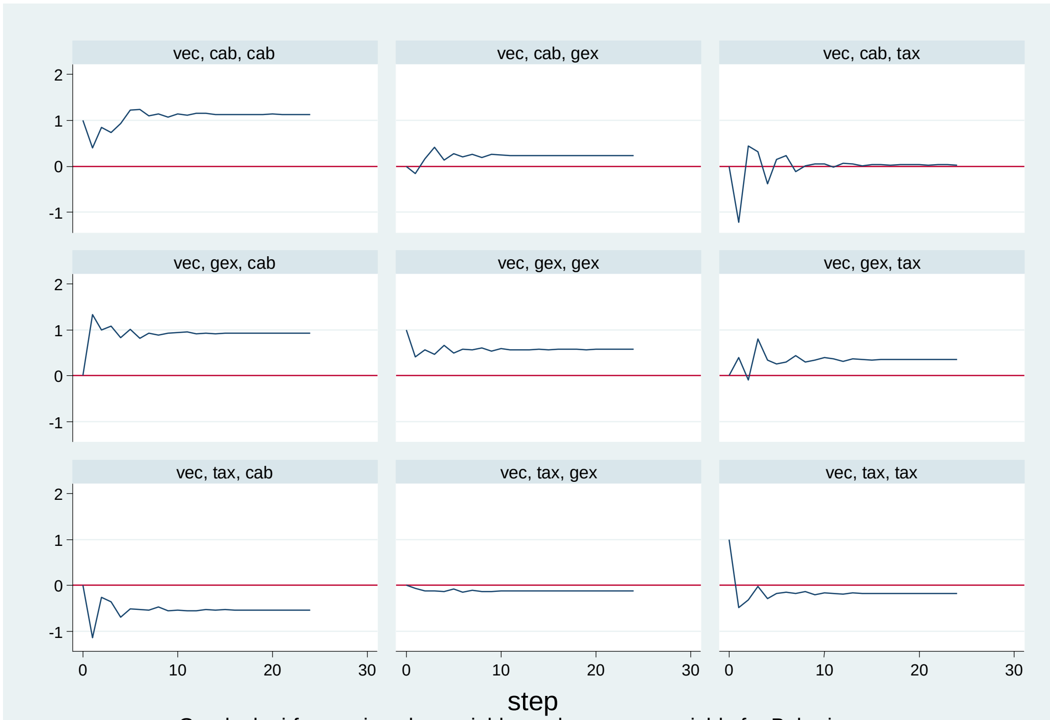
3.8.4 APPENDIX H

Figure 3-11 VECMs Stability Graphs for All Countries



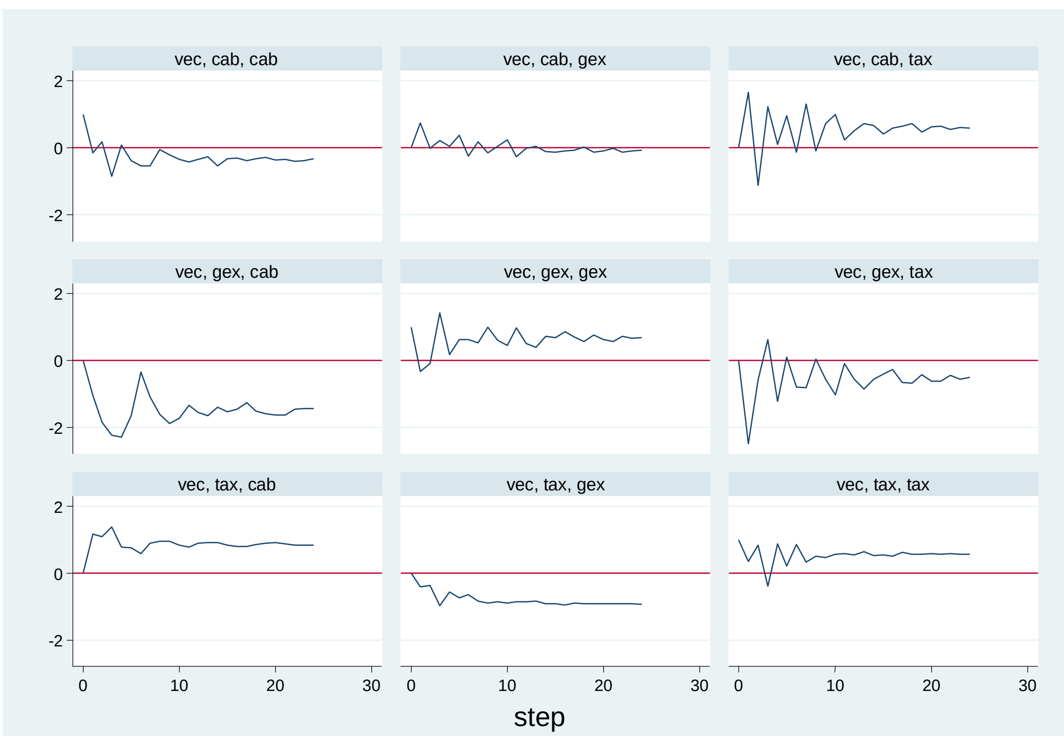
3.8.5 APPENDIX I

Figure 3-12 Bahraini Impulse-Response Functions IRFs for VECMs



Graphs by irfname, impulse variable, and response variable for Bahrain

Figure 3-13 Egyptian Impulse-Response Functions IRFs for VECMs



Graphs by irfname, impulse variable, and response variable for Egypt

Figure 3-14 Jordanian Impulse-Response Functions IRFs for VECMs

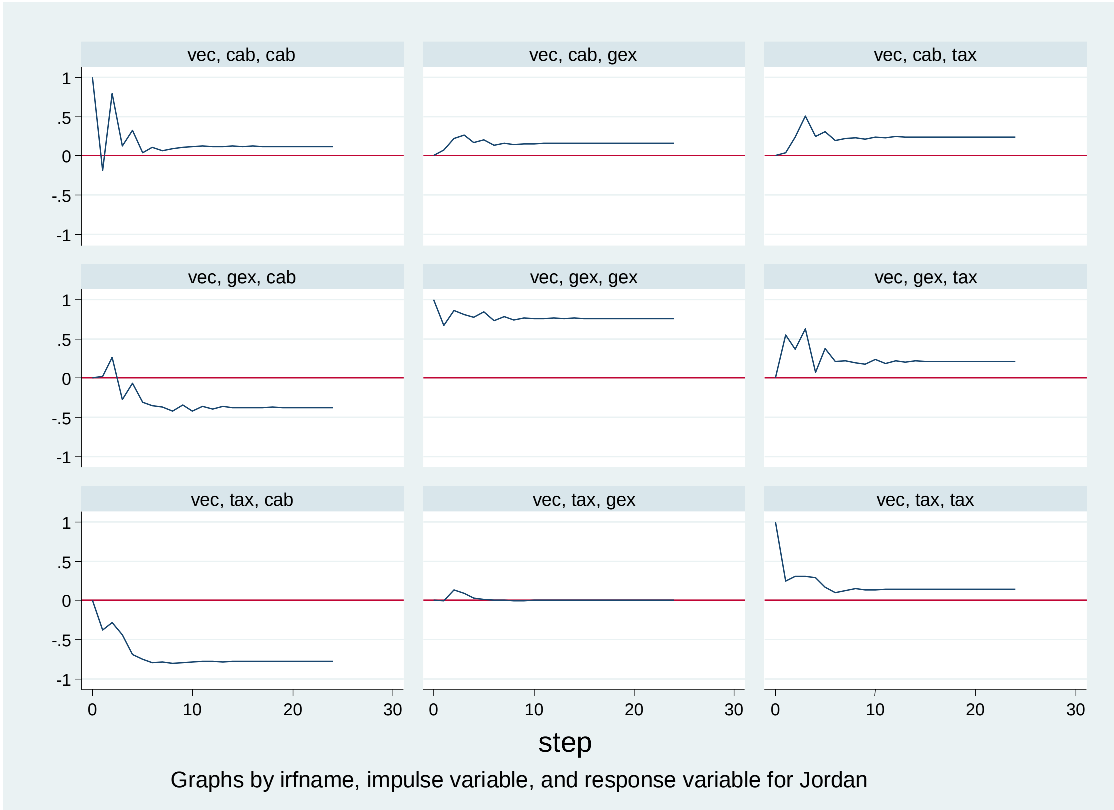


Figure 3-15 Kuwaiti Impulse-Response Functions IRFs for VECMs

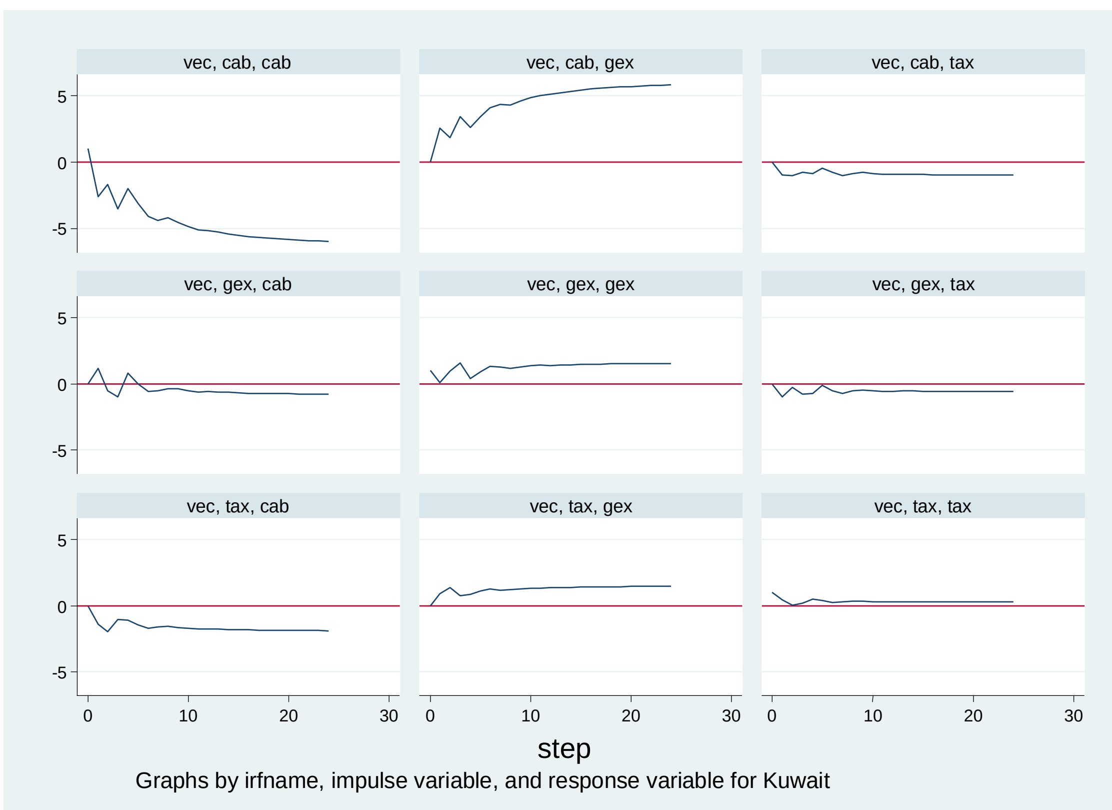


Figure 3-16 Morocco Impulse-Response Functions IRFs for VECMs

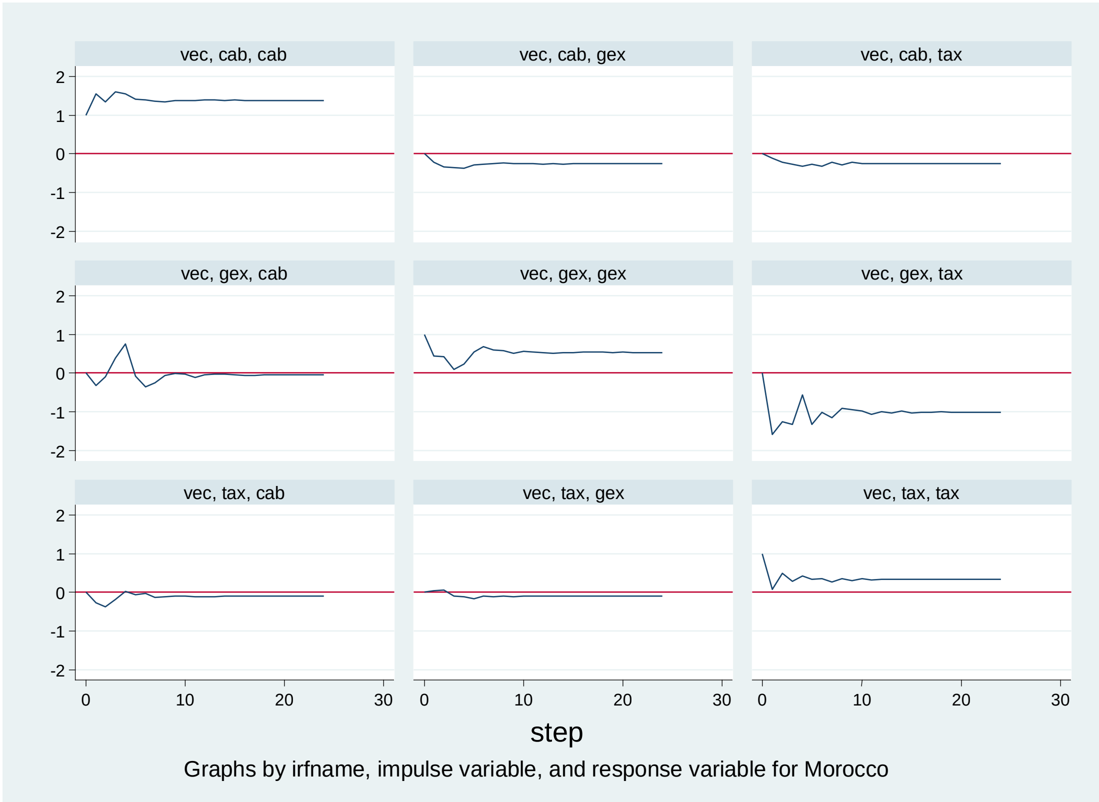


Figure 3-17 Qatari Impulse-Response Functions IRFs for VECMs

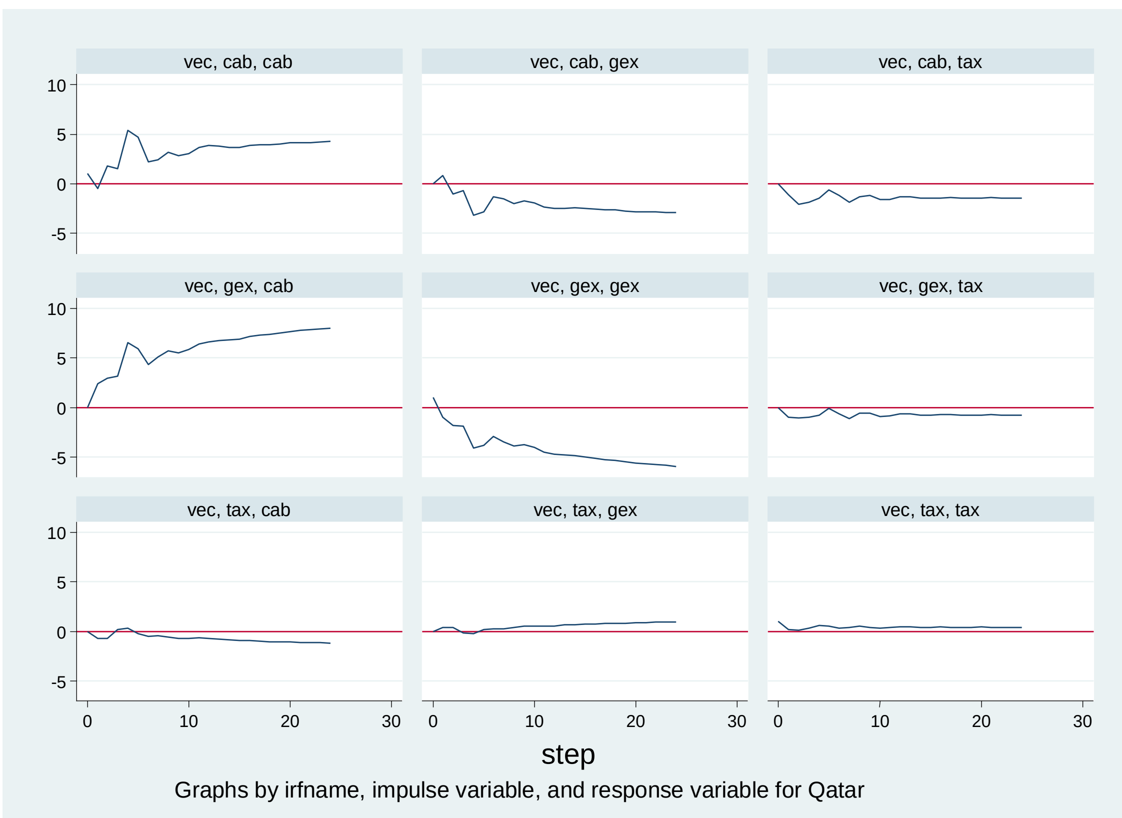
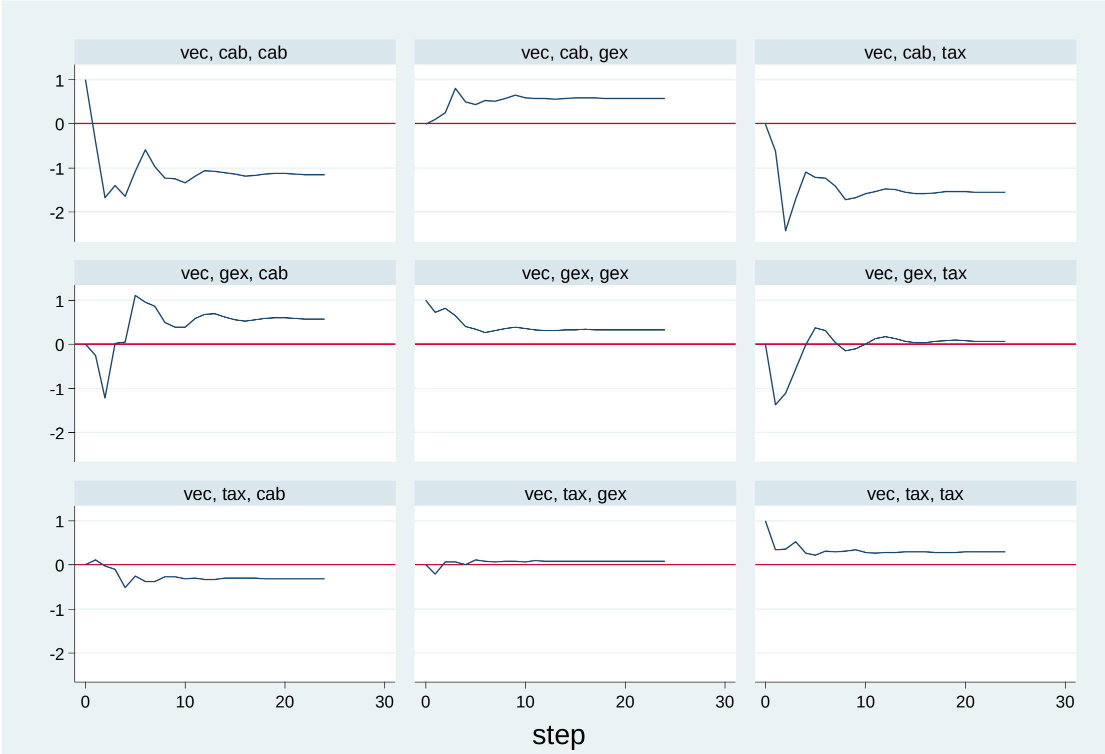
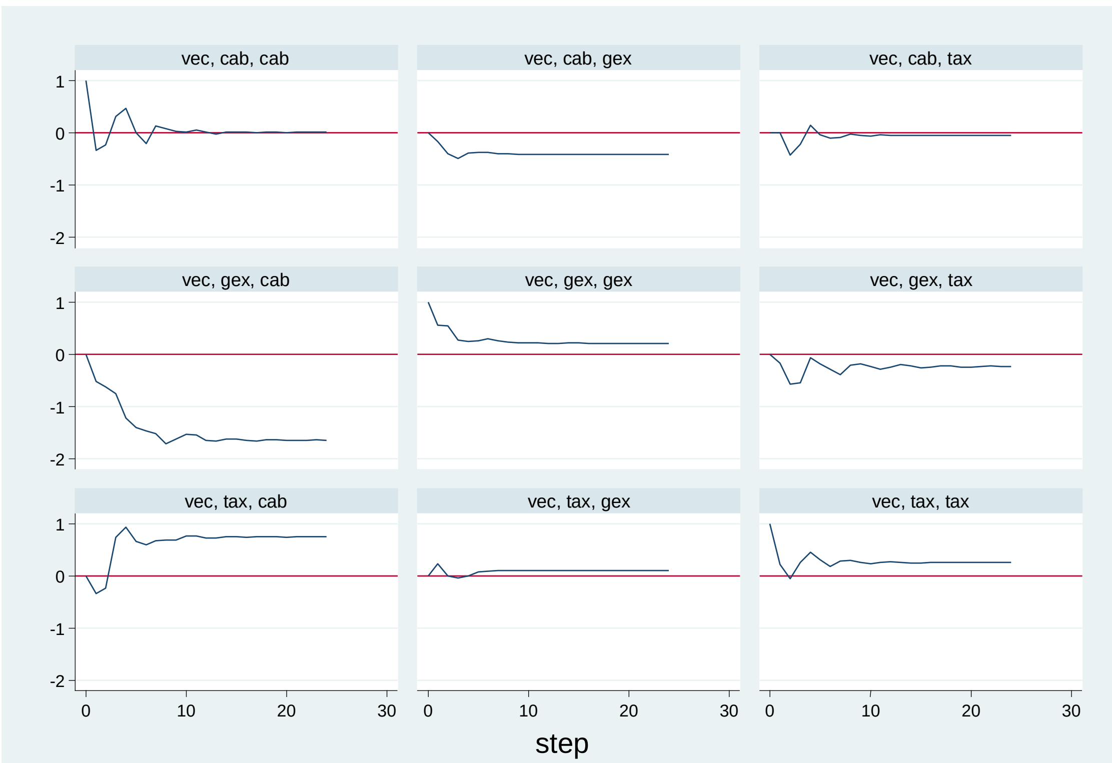


Figure 3-18 Saudi Impulse-Response Functions IRFs for VECMs



Graphs by irfname, impulse variable, and response variable for Saudi Arabia

Figure 3-19 Syrian Impulse-Response Functions IRFs for VECMs



Graphs by irfname, impulse variable, and response variable for Syria

Figure 3-20 Tunisian Impulse-Response Functions IRFs for VECMs

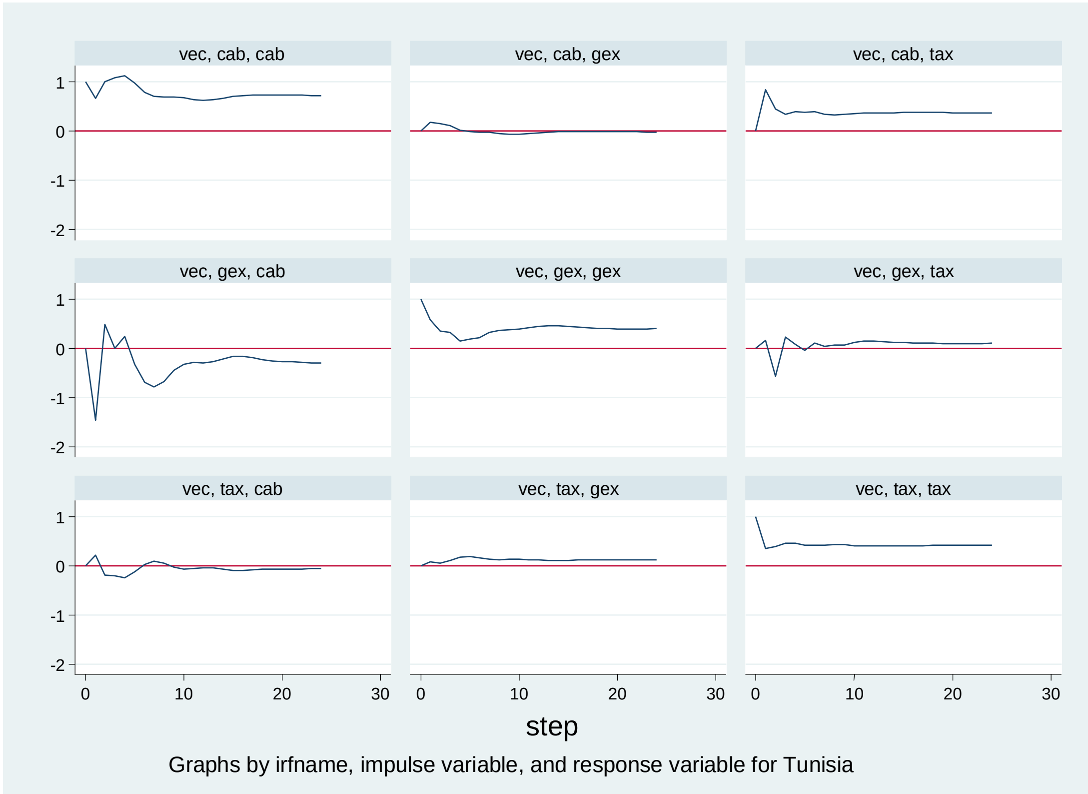
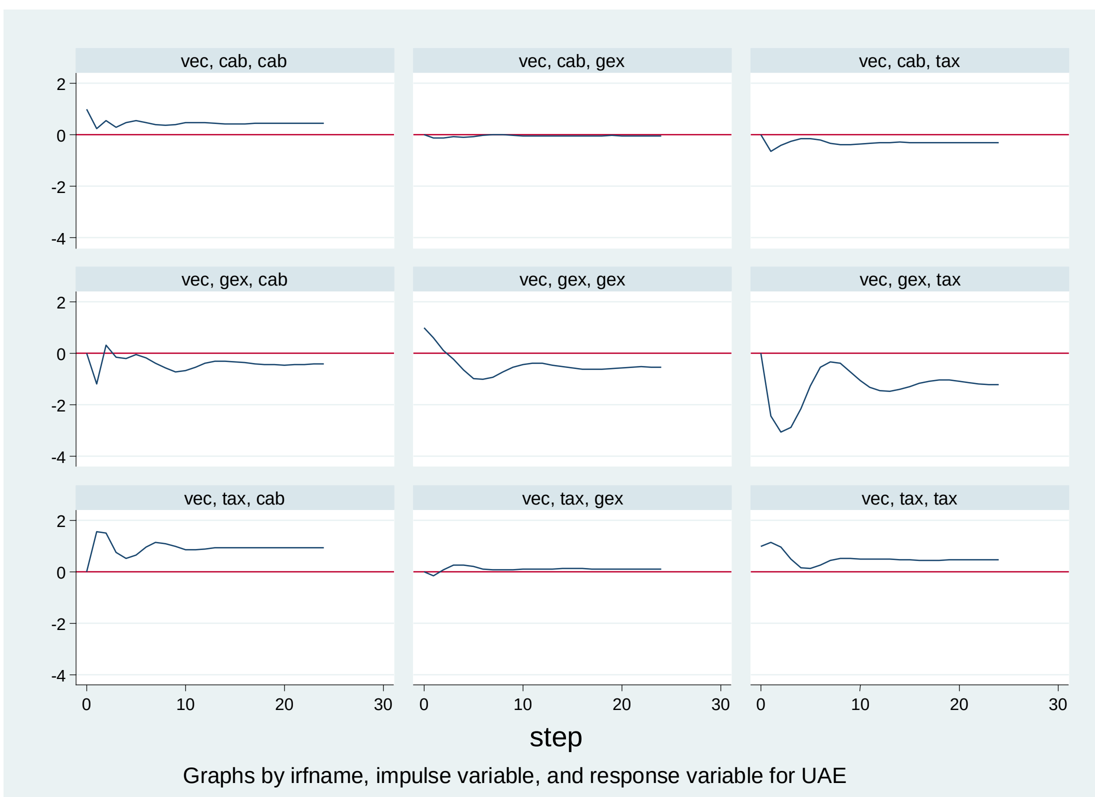


Figure 3-21 UAE Impulse-Response Functions IRFs for VECMs



CHAPTER 4

PANEL COINTEGRATION ANALYSIS OF FISCAL POLICY EFFECTS ON THE IMPOERS

CHAPTER 4: PANEL COINTEGRATIN ANALYSIS OF FISCAL POLICY EFFECTS ON THE IMPORTS

4.1 INTRODUCTION

Many empirical studies in the literature concerning the behaviour of aggregate imports have been carried out for many economies [see for example (Alias and Cheong 2000), (Abbott and Seddighi 1996), (Giovannetti 1989), (Dutta and Ahmed 1999), (Tang 2003), and (Tang 2003)] but few of them are relating fiscal policy to the aggregate imports and its effect on current account balance. These studies have been conducted using two specifications. First, they were conducted assuming that the import content of each macro component of final expenditure is the same, thus adopting a single demand variable in the import demand equation. But the use of a single demand variable in the aggregate import demand function would lead to aggregation bias, model misspecification, and poor forecasting performance. One possible explanation of these defects is that the different macro components of final expenditure have different import contents. Secondly, and to avoid the defects, other studies were conducted using a convenient functional form by decomposing that single demand variable into its different contents of private consumption, public expenditures, investment, and export demand. The second specification is very useful in investigating the relationship between fiscal policy and current account by analyzing the relationship between government expenditures and imports.

Despite the multitude of literature regarding aggregate import demand function, very few of studies are taking into account the effects of a lasting change in government expenditure on a country's aggregate imports and hence its current account balance. One strand of these literature, Nickel and Funke (2006) found that the increase in government expenditure has a significant positive impact on goods and services imports in the G-7 countries. An increase in government expenditures by 1 percent leads to an increase in goods imports of about 0.4 percent, and to an increase in service imports of almost 0.5 percent. There appears to be a unanimity that lower government spending and simultaneous enhancement in the fiscal balance lead to an improvement in the current account. Empirical studies until now, however, have led to confusing results. Some empirical research found that higher fiscal deficits lead to higher current account deficits; others provided evidence that the opposite is true or shown no significant impact at all. Furthermore, earlier studies experienced two shortcomings: (a) Poor econometric techniques that allow studying long-run equilibrium relationships between variables in time series and cross-sectional data. (b) Almost all of these studies took into account only the effect of different import contents of consumption, investment, and exports, but they do not distinguish between private and public consumption.

This chapter employs the recently developed econometric estimations of panel data[49] to investigate empirically the relationship between fiscal policy and the current account by analyzing the relationship between government spending and imports. Inside the current account, we focus on imports demand because it’s basically determined by domestic demand factors, whereas exports depend on external demand factors. In contrary to the conventional form of import equation which takes total demand (measured by GDP) as an explanatory variable, we decompose GDP to private consumption, government spending, investment, and exports. To illustrate the effects of fiscal policy on current account, we estimate the elasticities of import demand to these disaggregated components of economic activity. We expect that the government consumption elasticity is generally lower than the import content of other demand components.

The empirical examination in this chapter is based on annual panel data of the same investigated countries[50] in chapters two and three—with different series–for the years 1970 through 2008. We use Westerlund panel cointegration test, dynamic fixed-effects (DFE), pooled mean-group (PMG), and mean-group (MG) common correlated effect mean grpoup (CCEMG) and augmented mean group (AMG) techniques to estimate the elasticities of each component of total demand to the import. The following section presents the model and data specification.

---

[49] This estimation includes panel cointegration analyses, panel unit root tests, dynamic fixed-effects (DFE), pooled mean-group (PMG), mean-group (MG), common correlated effect mean grpoup (CCEMG) and augmented mean group (AMG) estimations.

[50] These countries are Bahrain, Egypt, Jordan, Kuwait, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, and UAE.

4.2 MODEL AND DATA SPECIFICATION

Using the Marshallian demand function which relates the total quantity of imports demanded by a country to its real income -or another scale variable that captures domestic demand component- and to the price of imports and domestic substitutes measured in the same currency (Carone 1996). We employ the traditional specification (Murray and Ginman 1976) and (Gafar 1988), which relates the quantity of imports demanded by country i to its real GDP and relative prices. Real GDP has been widely used in empirical studies as a proxy for real domestic activity (demand). Meanwhile, the relative prices term is the ratio of import prices to domestic prices (assuming a degree of substitutability between imports and domestic goods). The general function for import demand can be written as:

$$IM_t = f\left(Y_{it}, RP_{it}\right) \quad (4/1)$$

IM , denotes the volume of imports demanded, Y is the income which is delegated by real GDP, and RP is the relative price (the import price index measured by world consumer price index deflated by GDP deflator as an index of domestic prices). The logarithmic form model is specified as:

$$im_t = \gamma_0 + \gamma_1 y_{it} + \gamma_2 rp_{it} + \varepsilon_t \quad (4/2)$$

Where lowercase $im, y \,\&\, rp$ are the natural logarithmic forms and ε_t is the error term. Parameters $\gamma_0, \gamma_1, \gamma_2$ denote the constant term, income and relative price elasticity of imports respectively. Theoretically, there are two reasons why equation (4/2) and subsequently equation (4/4) is specified in logarithms: (1) it allows imports to react in proportion to a rise and fall in the explanatory variables; and (2) on the assumption of constant elasticities, it avoid the problem of drastic falls in the elasticity as imports rise (Khan 1974). Empirically, the data in use looks to be normally distributed in logs, whereas the unlogged data are skewed to the right. Moreover, when estimating the models in equations (4/2) and (4/4) using logged variables, the residual also appears to be distributed more normally than the residual of unlogged variables estimation despite the fact that both estimations (i.e. logged versus unlogged variables) provide the same sings and significances apart from the magnitudes. Furthermore, the log-log models of equations (4/2) and (4/4) have been supported by Box-Cox specification test proposed by Box and Cox (1964). Box-Cox test is based on Maximum Likelihood Estimation (MLE) to compare the linear and log specifications in order to obtain the best possible fit and choose between economically sensible specifications.

Following the Keynesian view, we expect that a rise in domestic income will stimulate imports resulting in positive income elasticity $(\gamma_1 > 0)$, (Bahmani-Oskooee and Niroomand 1998) and (Bahmani-Oskooee 1998). An increase in relative prices will hurt import volume resulting in negative import price elasticity, thus $(\gamma_2 < 0)$. Previous work suggests that final consumption expenditure is an important factor affecting import demand if the different components have different import contents (see among others: Giovannetti (1989), Abbott and Seddighi (1996) and Alias and Cheong (2000)). The intuition behind this argument is that, if the composition of demand changes, the aggregate import propensity would change although the disaggregated marginal propensities are unchanged. If this intuition is valid, the use of a single demand variable will lead to an aggregation bias. Following this argument, decomposing GDP into four components is an alternative to the traditional approach. These components are household consumption expenditure (HC), government spending (GS), investment expenditure (I), and exports (EX). The disaggregate import demand function is specified as:

$$IM_t = f\left(HC_{it}, GS_{it}, I_{it}, EX_{it}, RP_{it}\right) \tag{4/3}$$

The logarithmic form of Eq. (4/3) can be written:

$$im_t = \phi_0 + \phi_1 hc_{it} + \phi_2 gs_{it} + \phi_3 i_{it} + \phi_4 ex_{it} + \phi_5 rp_{it} + \varepsilon_t \tag{4/4}$$

Parameters $\phi_0, \phi_1, \phi_2, \phi_3, \phi_4, \phi_5$ denote the constant term, private consumption, government spending, investment, exports and price elasticities of imports respectively. To carry on with the analysis of data series for the investigated countries, variables covering the period from 1970 through 2008 are considered. The import equations (4/2) and (4/4) include the variables illustrated in Table 4-1. All data are measured in annual base and obtained from International Financial Statistics (IFS) of the International Monetary Fund (IMF) and United Nations Common Database (UNCD).

Table 4-1 Variables Explanation and Data Specification

Variable	*Explanation*	*Data Transformation*
IM	Real Imports of goods and services	Imports of goods and services in US dollars at constant prices (1990 prices)
Y	Real GDP	GDP in US dollars at constant prices (1990 prices)
HC	Real Household consumption	Household consumption expenditure in US dollars at constant prices (1990 prices)
I	Real investment	Gross capital formation in US dollars at constant prices (1990 prices)
GS	Real government spending	General government final consumption expenditure in US dollars at constant prices (1990 prices)
EX	Real export of goods and services	Exports of goods and services in US dollars at constant prices (1990 prices)
YDF	GDP deflator	Calculated by dividing GDP Index at current prices by GDP Index at constant 1990 prices times 100
WWPI	World wholesale price index	World wholesale price index as a measure of the price of the tradable goods or the Producer Price Index (PPI)*
RP	Relative price index	$\left(\frac{WWPI}{YDF} * 100\right)$

* Whole sale price index is a measure that reflects changes in the prices paid for the tradable goods at various stages of distribution up to the point of retail. It can include prices of raw materials for intermediate and final consumption, prices of intermediate or unfinished goods, and prices of finished goods. The goods are usually valued at purchasers' prices. For some countries the name Producer price index replaced the name Wholesale price index in the 1970s or 1980s after a change in methodology. For some countries, the name Wholesale price index is used for historical reasons and in fact refers to a price index following the same methodology as for a Producer price index. (Producer Price Indices: Sources and Methods, OECD, Paris, 1994, page 7)

4.3 ECONOMETRIC METHODOLOGY

4.3.1 PANEL UNIT ROOT TESTS

When estimating equations (4/2) and (4/4), panel unit root tests are applied to test for stationarity of the cross-units series. Basically, we tested for stationarity using two types of panel unit root tests, first the Levin–Lin–Chu LLC[51,52] test proposed by Levin, Lin et al.

[51] Levin and Lin proposed their test first time in 1992. In 1993 they generalised the analysis allowing for autocorrelation and heteroscedasticity. Their paper in 2002 (Levin, Lin and Chu, 2002) collect major results of their researches.

[52] LLC test is recommend to be used with panels of "moderate" size, which have between 10 and 250 panels and 25 to 250 observations per panel. (Baltagi 2008) mentions that the requirement $N/T \to 0$ implies that *N* should be small relative to *T*, our case exactly.

(2002) in which the null hypothesis of nonstationarty is being tested against the alternative of stationary data using the following model:

$$\Delta y_{it} = \rho y_{i,t-1} + z_{it}^{'}\gamma_i + \sum_{j=1}^{p}\theta_{ij}\Delta y_{i,t-j} + u_{it} \qquad (4/5)$$

Where $i = 1,\ldots,N$ indexes panels; $t = 1,\ldots,T_i$ indexes time; y_{it} is the tested variable; and u_{it} is a stationary error term. The number of lags p that minimizes Akaike Information Criterion AIC has been chosen. Because unit-root tests like LLC typically are not very powerful against alternative hypotheses of somewhat persistent of stationary processes, reversing roles and testing the null hypothesis of stationarity against the alternative of a unit root is appealing. For pure time series, the KPSS test of Kwiatkowski, Phillips et al. (1992) is one such test. The Hadri (2000) residual-based Lagrange multiplier LM[53] test uses panel data to test the null hypothesis that all panels are stationary versus the alternative that some panels contain unit roots. The LM test allows for heteroskedastic and serially correlated disturbance terms, cross-sectional dependence and heterogeneous errors across panels (Hadri 2000, Hadri and Larsson 2005). Using the following identity:

$$y_{it} = r_{it} + \beta_i t + \varepsilon_{it} \qquad (4/6a)$$

Where r_{it} is a random walk:

$$r_{it} = r_{i,t-1} + u_{it} \qquad (4/6b)$$

ε_{it} & u_{it} are zero-mean *i.i.d.* normal errors. If the variance of u_{it} were zero, then r_{it} would collapse to a constant; y_{it} would therefore be trend stationary. Using this logic, the Hadri LM tests the hypothesis

$H_0 : \lambda = \sigma_u^2 / \sigma_\varepsilon^2 = 0$ Against $H_a : \lambda > 0$

[53] The empirical sizes of the Hadri (LM) test are close to the true size even in small samples as it has approximately correct size for $T > 25$.

In accordance with Hlouskova and Wagner (2006), the Hadri (LM) test tends to over-reject the null hypothesis and thus may bring about contradictory results to those obtained using LLC test. Moreover, they reported that the empirical studies usually reject the null hypothesis of stationarity when using the tests of Hadri (2000) or Hadri and Larsson (2005). Therefore, we invoke the panel unit root test proposed by Breitung (2000) and developed by Breitung and Das (2005) for triple check. The Breitung's test is based on robust standard errors, allows for cross-sectional dependencies, adjust for short-run serial correlation of the errors using a pre-whitening procedure and accommodate individual specific intercepts and time trends. Under the null hypothesis of unit roots, this robust OLS t-statistic has a limiting standard normal distribution.[54]

4.3.2 PANEL COINTEGRATION TESTS

4.3.2.1 RESIDUAL-BASED PANEL COINTEGRATION TESTS

Given a result of nonstationarty, panel cointegration test is appealing to estimate the elasticities of the import equation in its conventional form (i.e. equation 4/2) as well as in the decomposed form (i.e. equation 4/4). Pedroni (1999) and Pedroni (2004) provides residual-based[55] cointegration tests for heterogeneous panels based on the two-step cointegration approach of Engle and Granger (1987). He uses the residuals from both the short-run dynamics and the long-run slope coefficients and constructs seven panel cointegration test statistics: four of them are panel statistics test (i.e. based on pooling within-dimension) which assumes homogeneity of the AR term, whilst the remaining are group statistics tests (i.e. between-dimension) which are less restrictive as they allow for heterogeneity. The tests also allow for individual heterogeneous fixed effects and trend terms. Consider the following regression:

$$y_{it} = \alpha_i + \delta_i t + \beta_1 x_{1i,t} + \beta_2 x_{2i,t} + \cdots\cdots + \beta_{Mi} x_{Mi,t} + \varepsilon_{i,t} \qquad (4/7)$$

For $t = 1,2,\ldots,T$, $i = 1,2,\ldots,N$ and $m = 1,2,\ldots,M$, where y and x are assumed to be integrated of order one, e.g. $\mathrm{I}(1)$. The parameters α and δ are individual and trend

[54] The robust OLS *t*-statistic performs well with respect to size and power, whereas the GLS t-statistic may suffer from severe size distortions in small and moderate sample sizes. The robust OLS test has relatively better power as compared to bootstrap tests when both *N* and *T* are relatively small.

[55] The residual based tests considered as first-generation panel cointegration tests.

effects. Under the null hypothesis of no cointegration, the residuals $\varepsilon_{i,t}$ will be $I(1)$. The general approach is to obtain residuals from (4/7) and then to test whether residuals are $I(1)$ by running the following auxiliary regression for each cross-section;

$$\varepsilon_{i,t} = \rho_i \varepsilon_{i,t-1} + u_{i,t} \qquad (4/8)$$

Or the augmented version of the pooled specification,

$$\varepsilon_{it} = \rho_i \varepsilon_{it-1} + \sum_{j=1}^{P} \psi_{ij} \Delta\varepsilon_{it-j} + v_{it} \qquad (4/9)$$

Pedroni describes various methods of constructing statistics for testing for null hypothesis of no cointegration $(\rho_i = 1)$. There are two alternative hypotheses: the homogenous alternative $(\rho_i = \rho) < 1$, for all i (which Pedroni terms the within-dimension test or panel statistics test), and the heterogeneous alternative, $\rho_i < 1$ for all i (also referred to as the between-dimension or group statistics test). The Pedroni panel cointegration statistic is constructed from the residuals from either (4/8) or (4/9).

Similarly, Kao (1999) proposes a residual-based panel cointegration test follows the same basic approach as the Pedroni tests, but specifies cross-section specific intercepts and homogeneous coefficients on the first-stage regressors. Specifically, Kao consider running the first stage regression in Equation (4/7) requiring α_i to be heterogeneous and β_i to be homogeneous across cross-sections, and setting all of the trend coefficients δ_i to zero. He then runs either the pooled auxiliary regression in (4/8) or the augmented version of the pooled specification or (4/9). Under the null of no cointegration, Kao uses the following Dickey-Fuller DF tests and an Augmented Dickey-Fuller ADF test statistics;

$$DF_\rho = \frac{T\sqrt{N}(\rho - 1) + 3\sqrt{N}}{\sqrt{10.2}} \qquad (4/10a)$$

$$DF_t = \sqrt{1.25}t_\rho + \sqrt{1.875N} \qquad (4/10b)$$

$$DF_{\rho}^{*} = \frac{\sqrt{N}T(\rho-1)+3\sqrt{N}\sigma_v^2/\sigma_{0v}^2}{\sqrt{3+36\sigma_v^4/(5\sigma_{0v}^2)}} \quad (4/10c)$$

$$DF_{t}^{*} = \frac{t_{\rho}+\sqrt{6N}\sigma_v/(2\sigma_{0v})}{\sqrt{\sigma_{0v}^2/(2\sigma_v^2)+3\sigma_v^2/(10\sigma_{0v}^2)}} \quad (4/10d)$$

And for $\rho > 0$ (i.e. the augmented version),

$$ADF = \frac{t_{\bar{\rho}}+\sqrt{6N}\sigma_v/(2\sigma_{0v})}{\sqrt{\sigma_{0v}^2/(2\sigma_v^2)+3\sigma_v^2/(10\sigma_{0v}^2)}} \quad (4/10e)$$

Converge to $N(0,1)$ asymptotically, where the estimated variance is $\sigma_v^2 = \sigma_v^2 - \sigma_{v\varepsilon}^2\sigma_{\varepsilon}^{-2}$ with estimated long run variance $\sigma_{0v}^2 = \sigma_{0v}^2 - \sigma_{0v\varepsilon}^2\sigma_{0\varepsilon}^{-2}$. Kao's test also converges to a standard normal distribution by sequential limit theory. Both and Pedroni tests assume the presence of a single cointegrating vector, although Pedroni test allows it to be heterogeneous across individuals.

4.3.2.2 ERROR CORRECTION-BASED PANEL COINTEGRATION TEST

On the other hand, Westerlund (2007) proposed errorcorrection-based panel cointegration test based on structural rather than residual dynamics and allow for a large degree of heterogeneity in both the long-run cointegrating relationship and in the short-run dynamics[56] (e.g. individual specific short-run dynamics, intercepts, linear trends and slope parameters), and dependence within as well as across the cross-sectional units and therefore do not impose any common factor restriction[57]. Westerlund (2007) suggests four cointegration tests that are panel extensions of those tests proposed in the time series context by Banerjee, Dolado et al. (1998). Per se, they are designed to test the null by inferring whether the error correction term in an error correction model ECM is equal to zero. If the null hypothesis of no error correction is rejected, then the null hypothesis of no cointegration is also rejected. Two test of Westerlund called grouped-mean tests (shown as

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[56] Westerlund (2007) does not only allow for various forms of heterogeneity, but also provides p-values which are robust against cross-sectional dependencies via bootstrapping.

[57] Westerlund test have good small-sample properties and high power relative to popular residual-based panel cointegration tests such as Pedroni test.

G_τ and G_α) test the null hypothesis of no cointegration for all cross-sectional units against the alternative hypothesis that there is cointegration for at least one cross-section unit (null hypothesis for all i versus for at least one i). Other two tests which are called panel tests (shown as P_τ and P_α) test the null hypothesis of no cointegration for all cross-sectional units against the alternative hypothesis of cointegration for all cross-sectional units (null hypothesis for all i versus for all i). Each test is able to accommodate individual specific short-run dynamics, including serially correlated error terms and weakly exogenous regressors, individual specific intercept and trend terms, and individual specific slope parameters. Bootstrap[58] tests are also proposed to handle applications with cross-sectional dependence (Persyn and Westerlund 2008, Demetriades and James 2011). Those tests are based on the following ECM;

$$\Delta y_{it} = \delta_i' d_t + \alpha_i \left(y_{i,t-1} - \beta_i' x_{i,t-1} \right) + \sum_{j=1}^{pi} \alpha_{ij} \Delta y_{i,t-j} + \sum_{j=-qi}^{pi} \gamma_{ij} \Delta x_{i,t-j} + e_{it} \qquad (4/11)$$

Where $i = 1, \ldots, N \;\&\; t = 1, \ldots, T$ index the cross-sectional units and time-series respectively, while d_t contains the deterministic components, for which there are three cases. In the first case, $d_t = 0$ so (4/11) has no deterministic terms; in the second case, $d_t = 1$ so Δy_{it} is generated with a constant; and in the third case, $d_t = (1, t)'$ so Δy_{it} is generated with both a constant and a trend. For simplicity, we model the K-dimensional vector x_{it} as a pure random walk such that Δx_{it} is independent of e_{it}, and we further assume that these errors are independent across both i and t. We can write (4/11) as

$$\Delta y_{it} = \delta_i' d_t + \alpha_i y_{i,t-1} + \lambda_i' x_{i,t-1} + \sum_{j=1}^{pi} \alpha_{ij} \Delta y_{i,t-j} + \sum_{j=-qi}^{pi} \gamma_{ij} \Delta x_{i,t-j} + e_{it} \qquad (4/12)$$

Where $\lambda_i' = -\alpha_i \beta_i'$. The parameter α_i determines the speed at which the system corrects back to the equilibrium relationship $y_{i,t-1} - \beta_i' x_{i,t-1}$ after a sudden shock. If $\alpha_i < 0$, then there is error correction, which implies that y_{it} and x_{it} are cointegrated; if $\alpha_i = 0$,

[58] In general, bootstrapping follows basic steps: resample a given data set a specified number of times; calculate a specific statistic from each sample; and then find the standard deviation of the distribution of that statistic.

then there is no error correction and, thus, no cointegration. Thus we can state the null hypothesis of no cointegration as $H_0 : \alpha_i = 0$ for all i. The alternative hypothesis depends on what is being assumed about the homogeneity of α_i. Two of the tests, called group-mean tests, do not require α_is being equal meaning that H_0 is tested versus $H_1^G : \alpha_i < 0$ for at least one i. The second pair of tests, called panel tests, assume that α_i is equal for all i and are, therefore, designed to test H_0 versus $H_1^P : \alpha_i = \alpha < 0$ for all i. Estimating (4/12) by least squares for each unit i to obtain $\hat{\alpha}_i$ Westerlund calculate the following group-mean test statistics;

$$G_t = \frac{1}{N}\sum_{i=1}^{N}\frac{\hat{\alpha}_i}{SE(\hat{\alpha}_i)}, \quad G_a = \frac{1}{N}\sum_{i=1}^{N}\frac{T\hat{\alpha}_i}{\hat{\alpha}_i(1)} \tag{4/13}$$

where $SE(\hat{\alpha}_i)$ is the conventional standard error of $\hat{\alpha}_i$ and $\hat{\alpha}_i(1) = \hat{\omega}_{ui} / \hat{\omega}_{yi}$, where $\hat{\omega}_{ui}$ and $\hat{\omega}_{yi}$ are the usual Newey and West (1994) long-run variance estimators based on $\hat{u}_{it} = \sum_{j=-qi}^{Pi}\hat{\gamma}_{it}\Delta x_{i,t-j} + \hat{e}_{it}$ and Δy_{it}, respectively. Using $\Delta\hat{y}_{it}$ and $\Delta\hat{y}_{it-1}$ estimated from (4/12) to obtain the common error correction parameter α , and its standard error as;

$$\hat{\alpha} = \left(\sum_{i=1}^{N}\sum_{t=2}^{T}\hat{y}_{i,t-1}^2\right)^{-1}\sum_{i=1}^{N}\sum_{t=2}^{T}\frac{1}{\hat{\alpha}_i(1)}\hat{y}_{i,t-1}\Delta\hat{y}_{it}, \text{ and } SE(\hat{\alpha}) = \left((\hat{S}_N^2)^{-1}\sum_{i=1}^{N}\sum_{t=2}^{T}\hat{y}_{i,t-1}^2\right)^{-1/2} \tag{4/14}$$

where $\hat{S}_N^2 = 1/N\sum_{i=1}^{N}\hat{\sigma}_i / \hat{\alpha}_i(1)$, with $\hat{\sigma}_i$ being the estimated regression standard error. The panel test statistics can be calculated as;

$$P_t = \frac{\hat{\alpha}}{SE(\hat{\alpha})}, \quad P_a = T\hat{\alpha} \tag{4/15}$$

4.3.3 PANEL ESTIMATION TECHNIQUES

Two features of our dataset determine the appropriate estimation technique. Firstly, the investigated panel consist of 11 cross-sections and 39 periods, i.e. moderate dimensions[59], which suggests that the coefficients might differ across units. Secondly, the variables are nonstationary.

4.3.3.1 PANEL ESTIMATION IN ABSENCE OF THE COMMON FACTORS EFFECTS

Accordingly, dynamic heterogeneous panels' techniques are appropriate in such cases (Pesaran and Smith 1995, Pesaran, Shin et al. 1999, Blackburne and Frank 2007). These techniques are based on the ARDL approach in which the dependent variable is regressed on its own lags and the current and lagged values of the explanatory variables;

$$y_{it} = \sum_{j=1}^{p} \lambda_{ij} y_{i,t-j} + \sum_{j=0}^{q} \delta_{ij} x_{i,t-j} + \mu_i + e_{it} \qquad (4/16)$$

Rewriting (4/16), i.e. the ARDL of order $(p, q, q, \ldots)$, in an ARDL ECM as;

$$\Delta y_{it} = \phi_i \left(y_{i,t-1} + \theta_i x_{it-1} \right) + \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta y_{i,t-1} + \sum_{j=0}^{q-1} \delta_{ij}^{*} \Delta x_{i,t-j} + \mu_i + e_{it} \qquad (4/17)$$

Where, $\phi_i = -(1 - \sum_{j=1}^{p} \lambda_{ij}), \theta_i = \sum_{j=0}^{q} \delta_{ij} \big/ (1 - \sum_{k} \lambda_{ik}), \lambda_{ij}^{*} = -\sum_{m=j+1}^{p} \lambda_{im}, \ j = 1,2,\ldots, p-1,$ and $\delta_{ij}^{*} = -\sum_{m=j+1}^{q} \delta_{im}, \ j = 1,2,\ldots, q-1.$ Also, μ denotes the fixed effects, e are the residuals, p are the lags of the dependent variable y in the regression and q are the lags of the explanatory variables x (it is not required that all explanatory variables are included with same number of lags). Again, if $\phi_i = 0$ there would be no evidence for a long-run relationship. This parameter is expected to be significantly negative under the prior assumption that the variables show a return to a long-run equilibrium. Of particular importance is the vector θ_i which contains the long-run relationships between the variables.

Generally, there are two extreme ways for estimating (4/17). At one extreme, one can estimate separate equation for each cross-section unit and examine the distribution of the estimated coefficients across those units. Particularly, the mean group MG estimator

[59] Panel of moderate dimensions are those of N = 10 and T = 50, or N = 25 and T = 25.

proposed by Pesaran and Smith (1995), which produces consistent estimates of the (unweighted) average of the parameters but it does not take account of the fact that certain parameters may be the same across groups (i.e. $\phi_i, \theta_i, \lambda_{ij}^*$ and δ_{ij}^* are different for all i). At the other extreme are the traditional pooled estimators, such as the dynamic fixed effects DFE, where the intercepts are allowed to differ across groups while all other coefficients and error variances are constrained to be the same across panels (i.e. $\phi_i, \theta_i, \lambda_{ij}^*$ and δ_{ij}^* are the same for all i). The middle ground between the strong pooling assumptions of DFE estimator and the flexibility of the MG estimator is pooled mean group PMG estimator which involves both pooling and averaging and allows the intercepts, short-run coefficients, and error variances to differ freely across groups, but constrains the long-run coefficients to be the same (i.e. ϕ_i and θ_i are the same, but λ_{ij}^* and δ_{ij}^* are different for all i). Accordingly, with maximum lag order of one, we can rewrite equation (4/2) as an error correction ARDL(1,1):[60]

$$\Delta im_{it} = \phi_i\left(im_{i,t-1} - \theta_{1i} y_{it-1} - \theta_{2i} rp_{it-1}\right) - \delta_{1i}\Delta y_{it} - \delta_{2i}\Delta rp_{it} + \mu_i + e_{it} \qquad (4/18)$$

And equation (4/4) can be written as an error correction ARDL(1,1,1,1,1);

$$\begin{aligned}\Delta im_{it} &= \phi_i\left(im_{i,t-1} - \gamma_{1i} hc_{it-1} - \theta_{2i} gs_{it-1} - \theta_{3i} i_{it-1} - \theta_{4i} ex_{it-1} - \theta_{5i} rp_{it-1}\right) \\ &\quad - \delta_{1i}\Delta hc_{it} - \delta_{2i}\Delta gs_{it} - \delta_{3i}\Delta i_{it} - \delta_{4i}\Delta ex_{it} - \delta_{5i}\Delta rp_{it} + \mu_i + e_{it}\end{aligned} \qquad (4/19)$$

The crucial question is whether the assumption of long-run homogeneity (i.e. DFE and PMG) is justified,[61] given the threat of inefficiency and inconsistency noted by Pesaran and Smith (1995). Because we cannot decide on theoretical basis which of the estimates are more appropriate, we will decide on statistical grounds. We employ the—well known– Hausman test[62] on the difference between MG, DFE and PMG estimates of long-run

[60] Using ARDL with the first lag of the dependent variabl as well as the independent variable helps overcoming the possible endogeneity.

[61] There are often good reasons to expect the long-run equilibrium relationships between variables to be similar across countries, due to location, language, culture, religion, stage of development…etc. which are influencing all countries in a similar way. The reasons for assuming that short-run dynamics and error variances should be the same tend to be less compelling.

[62] The application of the Hausman test is based on testing the difference between two estimators, one efficient and consistent under the null hypothesis, while the other estimator is consistent under the null and the alternative. If the difference between the two estimators is statistically significant i.e. rejecting the null,

coefficients to test the long-run homogeneity. While the MG estimator is consistent under both the null hypothesis and the alternative hypothesis, the restricted models PMG and DFE are inconsistent under the alternative but efficient (and consistent) under the null. Thus, a low p-value suggests rejection of the null, i.e. the unrestricted MG model is preferred. On the other hand, DFE models are subject to a simultaneous equation bias from the endogeneity between the error term and the lagged dependent variable. Therefore, Hausman test can be performed, between PMG and DFE estimators, to measure the extent of this endogeneity.

4.3.3.2 PANEL ESTIMATION IN PRESENCE OF THE COMMON FACTORS EFFECTS

Recall that in DFE estimator the time-series data for each group are pooled and only the intercepts are allowed to differ across panels. If the slope coefficients are in fact not identical, however, then the DFE produces inconsistent and potentially misleading results. Also, PMG estimator constrains the long-run slope to be equal across all cross-section units. This pooling across panels yields efficient and consistent estimates only when the restrictions are true. Often, however, the hypothesis of slope homogeneity is rejected empirically. Therefore, if the true model is heterogeneous, the PMG estimates are inconsistent. On contrary, MG estimator is consistent in either case, but it is also more sensitive to the outliers and severely affected by its failure to account for cross-sectional dependence and the unobservable common factors[63] (Coakley, Fuertes et al. 2006, Eberhardt and Bond 2009). When common factors are allowed, Pesaran (2006) proposes common correlated effects mean group estimator CCEMG which uses OLS to estimate an auxiliary regression for each cross-section unit in which, unlike MG, the weighted[64] cross sectional averages of the dependent variable and the individual specific regressors are added, and then the coefficients and standard errors are computed as usual. Assume the following simple model;

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this means that the consistent estimator is preferred. But, if the difference between the two estimators is not statistically significant i.e. accepting the null, this means that the efficient estimator is preferable.

[63] These common factors could include shocks which are common to all countries, e.g. representing the global dissemination of non-rival scientific knowledge or global shocks, such as the recent financial crisis or the 1970s oil crises.

[64] This weighting process puts less emphasis on outliers in the computation of the average coefficient.

$$y_{it} = \beta_i' x_{it} + u_{it} \quad (4/20)$$

$$x_{it} = a_i + \Gamma_i f_t + \nu_i g_t + \varepsilon_{it} \quad (4/21)$$

$$u_{it} = b_i + \Gamma_i f_t + e_{it} \quad (4/22)$$

Where $i = 1,2,\ldots,N$ groups, $t = 1,2,\ldots,T$ years, x_{it} and y_{it} are observables, β_i' are country-specific slopes on the observable regressors and u_{it} contains the unobservable common factors and the error terms e_{it}. The unobservable common factors in (4/22) are made up of standard group fixed effects a_i, which capture time-invariant heterogeneity across units, as well as an unobserved common factor f_t with heterogeneous factor loadings Γ_i, which can capture time-variant heterogeneity and cross-section dependence. Note that the factors (f_t and similarly g_t) are not limited to linear evolution over time, but can be non-linear and also nonstationary, with obvious implications for cointegration[65]. ε_{it} and e_{it} are assumed white noise (Coakley, Fuertes et al. 2006).

The CCEMG exhibits considerable advantages; it does not involve estimation of unobserved common factors and factor loadings. It allows unobserved common factors to be possibly correlated with exogenous regressors and exert differential impacts on individual cross-section units. It permits unit root processes amongst the observed and unobserved common effects. The CCEMG estimators have been shown to be asymptotically unbiased and consistent as N and $T \rightarrow \infty$, and to have generally satisfactory finite sample properties. More importantly, the CCEMG is robust to the presence of a limited number of *strong* unobserved common factors which related to local spillover effects as well as an infinite number of *weak* factors which can signify global shocks such as the recent global financial crisis (Chudik, Pesaran et al. 2011, Huang 2011). Furthermore, as shown in Kapetanios, Pesaran et al. (2011), the CCEMG estimator is robust to the nonstationary common factors. On the other hand, the augmented mean group estimator AMG was introduced first by Eberhardt and Bond (2009) and developed by

[65] For simplicity the model only includes one covariate and one unobserved common factor in the estimation equation (4/20)

Eberhardt and Teal (2010) as an alternative to the Pesaran (2006) CCEMG. The AMG procedure is implemented in three steps:

(1) - A pooled regression model augmented with year dummies D is estimated by first difference OLS and the coefficients on the (differenced) year dummies (relabelled as $\hat{\mu}_t^{\bullet}$) are collected as;

$$\Delta y_{it} = b'\Delta x_{it} + \sum_{t=2}^{T} c_t \Delta D_t + e_{it} \qquad \Rightarrow \hat{c}_t \equiv \hat{\mu}_t^{\bullet} \qquad (4/23)$$

This is referred to as the common dynamic processes.

(2) - The group-specific regression model is then augmented with this estimated process either as an explicit variable, or imposed on each group member with unit coefficient by subtracting the estimated process from the dependent variable. Like in the MG case each regression model includes an intercept, which captures time-invariant fixed effects.

$$y_{it} = a_i + b_i' x_{it} + c_i t + d_i \hat{\mu}_t^{\bullet} + e_{it} \qquad \hat{b}_{AMG} = N^{-1} \sum \hat{b}_i \qquad (4/24)$$

(3) - Like in the MG and CCEMG estimators the group-specific model parameters are averaged across the panel “weights may be applied”.

The AMG performed similarly well as the CCEMG in terms of bias or RMSE in panels with nonstationary variables “cointegrated or not” and multifactor error terms “cross-section dependence” (Eberhardt and Bond 2009, Eberhardt and Teal 2010).

4.4 THE EMPIRICAL RESULTS

4.4.1 PANEL UNIT ROOT RESULTS

The first step in our analysis is to test whether the investigated variables in modelling import elasticities are nonstationary. Table 4-2 presents the panel unit root results based on three tests; the tests proposed by Levin, Lin et al. (2002) LLC and Breitung and Das (2005) which use as null hypothesis that all cross-section units contain unit roots. We also use the Hadri (2000) LM test which uses the stationarity of all cross-section units as null hypothesis. Both LLC and Breitung tests indicate that we should strongly accept the null that all countries data contain unit roots for all variables' level. On the other hand, both tests strongly reject the null of nonstationarty for all variables in their first difference which means that our data are integrated of order one i.e. $I(1)$. Analogously, Hadri LM test rejects the null of stationarity for all variables in their level which support the results of LLC and Breitung tests.

Table 4-2 Panel unit root test for all variables in their log

Variables	**Levin–Lin–Chu unit root test (*Ho*: Panels contain unit roots)**				**Hadri LM unit root test** (Ho: All panels are stationary)**		**Breitung and Das unit-root test** (Ho: Panels contain unit roots)**	
	Lags	**Cross-sectional means not removed**	**Lags**	**Cross-sectional means removed***	**Cross-sectional means not removed**	**Cross-sectional means removed***	**Cross-sectional means not removed**	**Cross-sectional means removed***
im	3	3.17 (0.99)	2	-0.85 (0.20)	24.55 (0.00)	24.32 (0.00)	0.63 (0.74)	-0.32 (0.37)
Δim	1	-13.2 (0.00)	3	-8.41 (0.00)	2.02 (0.02)	0.69 (0.24)	-8.16 (0.00)	-7.72 (0.00)
ex	3	0.67 (0.75)	4	3.54 (0.99)	26.64 (0.00)	27.37 (0.00)	-1.02 (0.15)	0.88 (0.19)
Δex	2	-14.5 (0.00)	2	-12.7(0.00)	1.19 (0.12)	1.30 (0.12)	-8.56 (0.00)	-8.39 (0.00)
hc	4	5.12 (1.00)	3	0.16 (0.56)	29.84 (0.00)	28.50 (0.00)	-0.15 (0.44)	-0.55 (0.29)
Δhc	2	-12.4 (0.00)	2	-7.88 (0.00)	1.31 (0.09)	0.43 (0.33)	-9.11 (0.00)	-10.42 (0.00)
gs	5	2.31 (0.99)	5	5.94 (1.00)	36.63 (0.00)	24.72 (0.00)	0.94 (0.83)	-0.06 (0.47)
Δgs	4	-4.97 (0.00)	4	-3.73 (0.00)	4.78 (0.00)	2.54 (0.01)	-5.55 (0.00)	-5.67 (0.00)
i	3	9.07 (1.00)	3	-0.37 (0.36)	25.15 (0.00)	21.27 (0.00)	0.36 (0.64)	-0.01 (0.49)
Δi	3	-6.52 (0.00)	3	-9.28 (0.00)	2.90 (0.00)	0.93 (0.18)	-6.69 (0.00)	-6.44 (0.00)
y	3	7.15 (1.00)	4	6.50 (1.00)	35.15 (0.00)	29.97 (0.00)	0.94 (0.83)	0.95 (0.83)
Δy	2	-9.74 (0.00)	2	-8.58 (0.00)	5.17 (0.00)	4.63 (0.00)	-7.69 (0.00)	-7.45 (0.00)
rp	5	7.82 (1.00)	5	9.38 (1.00)	27.75 (0.00)	21.72 (0.00)	1.17 (0.88)	-0.45 (0.32)
Δrp	4	-5.28 (0.00)	3	-10.4(0.00)	5.48 (0.00)	0.55 (0.29)	-5.01 (0.00)	-8.81 (0.00)

* The LLC test exhibits severe size distortions in the presence of cross-sectional correlation, and then LLC (2002) suggested removing cross-sectional averages from the data to help control for this correlation. For each time period panel unit root test computes the mean of the series across panels and subtracts this mean from the series. Levin, Lin, and Chu suggest this procedure to mitigate the impact of cross-sectional dependence.

** Both LM and Breitung tests are performed with robust variance which account for heteroskedasticity and cross-sectional dependence respectively. P-values are in parentheses.

Nevertheless, LM test gives mixed results regarding the differenced data as it accepts the null of stationarity for all first-differenced variables, at one percent level of significance, except GDP and government spending.[66] We can, therefore, conclude that these variables are mostly integrated of order one meaning that a long-run cointegrating relationship may exist among these variables (these results are to be judged by examining the sign and significance of error correction term ϕ_i in equations 4/18 and 4/19).

4.4.2 PANEL COINTEGRATION RESULTS

Given that our variables are integrated of order one, we first proceed to test if those variables have long run relationship i.e. cointegrated. In general, it can be regarded as a sign of robustness if several of different test statistics lead to the same test decision. Therefore, we first rely on the residual-based panel cointegration tests, namely the seven tests proposed by Pedroni (1999, 2004) as well as the Kao (1999) test which are all based on the null hypothesis of no cointegration. Among the Pedroni's 7 tests, 4 are based on the within dimension (panel cointegration tests) and 3 on the between dimension (group-mean panel cointegration tests). Group-mean panel cointegration statistics are more general in the sense that they allow for heterogeneous coefficients under the alternative hypothesis.

Table 4-3 Residual-Based panel cointegration tests

Tests / Model	Pedroni				Kao	
	Within dimension		**Between dimension**			
Model 1: Eq. (4/2)	Panel v	9.04(0.00)	Panel rho	0.45(0.67)	ADF	-11.67 (0.00)
	Panel rho	-2.36(0.00)	Panel PP	0.17(0.57)		
	Panel PP	-1.54(0.06)	Panel ADF	-1.56(0.06)		
	Panel ADF	-2.66(0.00)	-	-		
Model 2: Eq. (4/4)	Panel v	5.48(0.00)	Panel rho	2.09(0.98)	ADF	-20.67(0.00)
	Panel rho	-0.34(0.37)	Panel PP	-2.07(0.01)		
	Panel PP	-3.22(0.00)	Panel ADF	-2.18(0.01)		
	Panel ADF	-3.15(0.00)	-	-		

Notes: (1) Between parentheses: p-values. (2) For Pedroni's tests, all statistics are computed with no intercept or time trends. (3) Kao's test statistic is computed with intercept and no trend. (4) Statistics are standard Normal.

As reported in Table 4-3, all tests conclude that import and the economic activity and its components, except rho for both models and PP for model 1 i.e. equation (4/2), are strongly cointegrated. The Pedroni and Kao tests use the Akaike information criterion

[66] As shown above in section 4.3.1, according to Hlouskova and Wagner (2006), the Hadri test tends to over-reject the null hypothesis and thus may yield results that directly contradict those obtained using alternative test.

AIC and Schwarz information criterion SIC to automatically select the appropriate lag length for both models in equations (4/2) and (4/4) respectively (maximum set to 2). Moreover, estimation is undertaken by the Bartlett and Parzen kernel with the bandwidth selected by the Newey-West algorithm for Kao and Pedroni tests respectively.

Table 4-4 Error Correction Based Panel Cointegration tests (Westerlund 2007)

Statistics / Model	Group-mean statistics		Panel statistics	
	G_t	G_a	P_t	P_a
Model 1: Eq. (4/2)	-1.30(0.00)	0.69(0.00)	-1.40(0.00)	-1.54(0.00)
Model 2: Eq. (4/4)	-5.44(0.03)	4.72(0.21)	0.89(0.08)	2.91(0.04)

Notes: (1) Between parentheses: p-values are robust to the presence of cross-section dependence and common factors based on bootstrapped distribution (400 and 350 bootstrap replications done for equations 2 and 4 respectively). (2) Deterministic time trends are not included in the specifications since these are generally found to weaken cointegration results. (3) The Bartlett kernel window width set according to $4(T/100)^{2/9} \approx 3$ is used for the semi-parametric corrections. (4) The leads and lags in the error correction test are chosen using Akaike information criterion.

Whilst the Pedroni and Kao tests are based on the residuals of the long run static regression, the four panel error correction-based cointegration tests proposed by Westerlund (2007) rely on structural dynamics by assessing the significance of the adjustment coefficient in the ECM specification. Among the four Westerlund's tests, two $(P_t \text{ and } P_a)$ consider a homogeneous cointegrating relation under the alternative (i.e. the panel is cointegrated as a whole), while the other two $(G_t \text{ and } G_a)$ allow for a heterogeneous long run relationship (i.e. cointegration at least for one country). Result reported in Table 4-4 shows that the import elasticities represented by equation (4/2) are strongly cointegrated and those represented in equation (4/4) are cointegrated at conventional significance levels. Therefore, we conclude that there is a long-run relationship between import demand and the other variables for models in equations (4/2) and (4/4) which imply that ϕ_i parameter in equations (4/18) and (4/19) be negatively significant.

4.4.3 ESTIMATED IMPORT ELASTICITIES

4.4.3.1 IMPORT ELASTICITIES IN ABSENCE OF THE COMMON FACTORS EFFECTS

As we investigate a group of countries which are closely related in many aspects, we start our estimation of the import elasticities using the data from all countries (i.e. the eleven countries) as a whole in one panel, and then we divide that panel into two sub panels referred to thereafter as oil countries panel, and the non oil countries panel. The oil countries' panel includes the six Gulf Cooperation Council GCC countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates. The non oil countries' panel includes five countries, namely: Egypt, Jordan, Morocco, Syria and Tunisia. By doing that, we can avoid the expected heterogeneity between low and high income countries caused by the effects of the oil exports revenues.[67] Firstly, we estimate our models for all panels using the standard estimators DFE, MG and PMG techniques. The DFE estimators assume homogeneity as it constrains the short and long run elasticities as well as its adjustment speed to be equal across all countries, while the PMG estimators allow for short-run heterogeneity as it restricts only the long-run elasticities and its speed of adjustment to be equal across all countries. The unrestricted and flexible MG estimator relies on estimating *N* time-series regressions and averaging the coefficients, whereas the PMG estimator relies on a combination of pooling and averaging of coefficients. (Pesaran and Smith 1995, Pesaran, Shin et al. 1999, Blackburne and Frank 2007). Therefore, we conduct the Hausman test to verify if the differences between DFE, MG and PMG estimations are not systematic.

For model (4/2), the Hausman test, for all countries i.e. panel 1, strongly accept the null hypothesis that DFE estimator is preferred over both MG and PMG (the test statistics are 0.01 and 0.02 with P value of 0.99 for both), while MG is preferred over PMG at 5 percent significance level, and almost the same conclusions for the other two panels, i.e. oil and non-oil countries, as clearly seen in Table 4-5. Moreover, the Hausman test results for model (4/4), as shown in the last three rows of the table, strongly support DFE over both MG and PMG for all panels, while it's in favour of PMG against MG for panel 3, but the opposite is true for panel 2. Consequently, we can conclude that the DFE is the appropriate

[67] The same strategy is applied in chapter 2.

Table 4-5 Dynamic Panel Error-Correction Estimates of Import Elasticities

Model		Variables	Panel 1: All Countries			Panel 2: Oil Countries			Panel 3: Non-Oil Countries		
			DFE	PMG	MG	DFE	PMG	MG	DFE	PMG	MG
Model 1: Eq. (4/2)	Long-run	μ	**0.16**	-0.34***	-0.76*	**0.11**	1.15**	-1.34**	**0.49**	-0.25**	-0.06
		y_{it}	**0.87*** **	1.21***	1.25***	**0.91** **	1.77***	1.59***	**0.53**	1.13***	0.84*
		rp_{it}	**-0.05**	-0.19***	-0.08	**-0.02**	-0.22***	0.09	**0.09**	-0.17***	0.08
	Adjustment parameter ϕ		**-0.12*** **	-0.17***	-0.22***	**-0.13*** **	-0.15**	-0.22***	**-0.11*** **	-0.19***	-0.24***
	Short-run	Δy_{it}	**0.13***	0.46***	0.57***	**0.06**	0.39	0.41	**0.56*** **	0.71***	0.76***
		Δrp_{it}	**-0.15*** **	-0.07	-0.02	**-0.24*** **	-0.13	-0.10	**-0.008**	0.09	0.08
Hausman, H test: MG vs. DFE: 0.01 (0.99)…. **DFE**				***DFE is preferable***		MG vs. DFE = 0.01 (0.99)… **DFE**		***DFE is preferable***	MG vs. DFE = 0.00 (0.99)…. **DFE**		***DFE is preferable***
Hausman, H test: MG vs. PMG: 6.24 (0.04)….**MG**						MG vs. PMG = 2.19 (0.34)… **PMG**			MG vs. PMG = 2.74 (0.25)... **PMG**		
Hausman, H test: PMG vs. DFE: 0.02 (0.99)…**DFE**						PMG vs. DFE = 0.04 (0.98)…**DFE**			PMG vs. DFE = 0.02 (0.99)…**DFE**		
Model 2: Eq. (4/4)	Long-run	μ	**-0.15**	-0.47***	-0.57**	**-0.13**	0.17**	-0.65	**-0.26**	-0.43**	-0.46
		hc_{it}	**0.48*** **	0.38***	0.34***	**0.58*** **	0.66***	0.50***	**0.02**	0.06	0.15
		gs_{it}	**0.31** **	0.33***	0.28***	**0.25***	-0.34***	0.33*	**0.55*** **	-0.16	0.23**
		i_{it}	**0.24*** **	0.30***	0.19***	**0.27*** **	0.19***	0.14	**0.03**	0.39***	0.26***
		ex_{it}	**0.07**	0.23***	0.36***	**-0.02**	0.40***	0.20	**0.62*** **	1.02***	0.55***
		rp_{it}	**-0.01**	-0.13***	-0.12**	**0.06**	0.05*	-0.07	**-0.23*** **	-0.25***	-0.19**
	Adjustment parameter ϕ		**-0.17*** **	-0.24***	-0.48***	**-0.19*** **	-0.24**	-0.50***	**-0.17*** **	-0.17**	-0.45***
	Short-run	Δhc_{it}	**0.47*** **	0.52***	0.50***	**0.45*** **	0.45***	0.51***	**0.57*** **	0.46***	0.49**
		Δgs_{it}	**0.36*** **	0.27***	0.25***	**0.47*** **	0.27***	0.27*	**0.19** **	0.21***	0.23**
		Δi_{it}	**0.33*** **	0.29***	0.31***	**0.31*** **	0.29***	0.32***	**0.28*** **	0.30***	0.30***
		Δex_{it}	**0.06** **	0.33***	0.35***	**-0.02**	0.25**	0.27**	**0.46*** **	0.44***	0.45***
		Δrp_{it}	**-0.13*** **	-0.07	-0.10	**-0.23*** **	-0.11	-0.20***	**0.002**	0.05	0.05
Hausman, H test: MG vs. DFE = 0.00(1.00)… **DFE**				***DFE is preferable***		MG vs. DFE = 0.00 (1.00)…. **DFE**		***DFE is preferable***	DFE vs. MG = 520.46 (0.00)... **DFE**		***DFE is preferable***
Hausman, H test: PMG vs. MG = 94.88(0.00) **PMG**						MG vs. PMG = 11.65(0.04)… **MG**			MG vs. PMG = 7.33 (0.20)… **PMG**		
Hausman, H test: PMG vs. DFE: 0.01(1.00)… **DFE**						PMG vs. DFE = 0.05(1.00)…. **DFE**			PMG vs. DFE = 0.02 (0.99)… **DFE**		

Note: (1) The order of the estimators in H test is very important as Stata command is: hausman estimator-(b)-consistent estimator-(B)-efficient, e.g. when MG vs. DFE = 0.00(1.00), it means that MG is the consistent estimator while DFE is the efficient and we accept the null (H_0: the difference in coefficients not systematic), which indicates that DFE is preferred over MG. (2) On contrary, Stata allows reversing the order of the two estimators but with careful interpretation of the result, if DFE vs. MG = 520.46(0.00), we reject the null which means DFE is preferable as it still the efficient estimator. (3) The reason for reversing the estimators is that H test statistic is sometimes negative because small sample properties; one solution is to interpret it as indicator to a failure to reject the null hypothesis as in case (1). The other solution allowed by Stata is to reverse the order of the estimators i.e. hausman estimator-(B)-efficient estimator-(b)-consistent. For more details see help Hausman in Stata and Schreiber (2008). (4) ***, **, * denote significance at 1%, 5% and 10% levels, respectively. (5) P values for H test are in parenthesis beside the Chi square. (6) H test done with sigmamore option which forces the variance-covariance matrix from the efficient model to be used in calculating the test statistic.

estimator for both models for all investigated panels according to Hausman test; therefore our discussion will concentrate mostly on the results of DFE comparing it with other estimators.

The first insight we gather from Table 4-5 is that the Hausman test has provided some evidence in favour of the DFE estimators. In addition, the usage of the three different estimators provides indications on the specification of the long run relationships i.e. the cointegrating vectors. Interestingly, the results are robust in that the signs of the long run variables coefficients are always confirmed, except the relative price variable for model (4/2) in panels 2 and 3 and government spending as well as relative prices for model (4/4) in panel 2; only their size is in some cases affected by the estimation technique. The short-run relative price elasticities are significantly -0.15, -0.13, -0.24 and -0.23 for models (2/4) and (2/4) in panels 1 and 2 respectively, whereas it is insignificant in both models and improperly signed for model (4/2) in panel 3. On contrary, the long-run relative price elasticities are insignificant for all models in all panels except for model (4/4) in panel 2 which is significantly equal -0.24. Those elasticities considered small comparing to those for other countries like UK, Malaysia, Italy, China, India, Sri Lanka and many others [see: Abbott and Seddighi (1996), Alias and Cheong (2000), Giovannetti (1989), Tang (2003), Hamori and Matsubayashi (2001), Narayan and Narayan (2005) and Emran and Shilpi (2010)], which means the investigated countries have price inelastic demand of import.

The plausible explanation for inelastic price of import might be the relatively low substitutability of imports and domestically-produced goods due to the lack of economic diversification in these countries. For example, oil exporting countries tend to import mostly investment goods (such as machinery equipment for oil production, transport facilities and army equipment) or luxury goods which are not produced domestically, so they may marginally postpone these imports for short periods but they cannot avoid it in the long run. On contrary, non oil countries tend to import mainly fuels, foodstuff, cereals, chemicals, machinery and electric equipment, army machinery … etc; they do not react to higher import prices by reducing their imports in short run, but in the long run they may find, to some extent, cheaper substitutes with lower quality or produce some of their needs domestically. Moreover, Heien (1968) argued that for any country a value of price elasticity between -0.5 and -1.0 is necessary to ensure success of exchange depreciation. Since the average price elasticity is between -0.13 and -0.24, we conclude that exchange rate policies, which directly influence the relative price, will have no impact on the import demand; therefore any currency depreciation in the investigated countries will only enlarge the import bills and deteriorates the current account balances.[68]

Another interesting result is that the error correction terms ϕ_i are all significantly negative with very close sizes, according to the preferable DFE, as it is -0.12, -0.13 and -0.11 for model 2 and -0.17, -0.19 and -0.17 for model 4 in panels 1, 2 and 3 respectively. Consequently, the import elasticities show a return to its long-run equilibrium which confirms the results of Pedroni, Kao and Westerlund's cointegration tests presented in section 4.4.2. For models (4/2) and (4/4), the elasticities require almost seven and five years respectively to converge to its long run equilibrium in all panels. This outcome is in the same line with the results for 24 oil exporting countries, including the investigated countries in panel 2, estimated by Beck and Kamps' (2009) for the period from 1980 to 2005, but less than the UK, Fiji and China's speed of adjustment (-0.72, -0.39 and -1.15 respectively) estimated by Tang (2003), Narayan and Narayan (2005) and Abbott and Seddighi (1996).

The long run income elasticity of import demand is 0.87, 0.91 and 0.53 for panels 1, 2 and 3 respectively, but it is not significant in panel 3, while the short run income elasticities are 0.13, 0.06 and 0.56 for panels 1, 2 and 3 respectively, but it is only significant in panels 1 and 3. Those less than one income elasticities signify that the demand for imports increases less than proportionately to the increase in real GDP. In other words, increasing income in these countries will create fewer tendencies to import suggesting that these countries were confined to importing necessities which support the aforementioned results of price inelastic demand of imports.[69] Consequently, its economic growth will, ceteris paribus, contribute in the current account improvement. This results of income inelastic demand of imports are close to the results for: 19 different countries[70] estimated (between 0.03 and 0.98) by Senhadji (1998), Saudi Arabia's income elasticity

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[68] This may be the reason for these countries to adopt fixed exchange rate.

[69] For more details about these countries see CHAPTER 1:.

[70] Those countries investigated among 77 countries and they are: Algeria, Belgium-Luxembourg, Congo, Cote d'Ivoire, Dominican Rep., Honduras, Iceland, Indonesia, Madagascar, Mauritius, Myanmar, Nicaragua, Norway, Pakistan, Peru, South Africa, Switzerland and Zaire.

(0.22 in the short run and 0.47 in the long run) found by Doroodian, Koshal et al. (1994), Mexico (0.52) estimated by Houthakker and Magee (1969), Thailand (0.62 in the short run) reported by Sinha (1997), Pakistan (0.26 in the short run and 0.69 in the long run) estimated by Rehman (2007) and for 8 developing countries found by Arize and Afifi (1987). But it is contradictory to the results for Argentina, Iran, Malaysia, Bangladesh and 44 different countries found by Duarte, Nicolini-Llosa et al. (2006), Motallebi (2009), Alias and Cheong (2000), Dutta and Ahmed (1999) and (Senhadji 1998) respectively.

Regarding the components of the economic activity i.e. the disaggregated import equation, the results shown in Table 4-5 indicate that the long and short-run elasticities have the expected signs except the export for panel 2; most of them are significant and show positive effects on the import in all panels. The magnitude of the elasticity differs among the demand components confirming that the composition of aggregate demand matters for the import equation and therefore using a single aggregate economic activity variable might misrepresent the result. Similar to Nickel and Funke (2006), the long-run government spending elasticity to import is less than the elasticity of the household consumption, as we anticipated, in panels 1 and 2 while the opposite is true for panel 3. On the other hand, it is higher than the elasticity of investment in panels 1 and 3 whereas it is slightly lower in panel 2. The export elasticity to import is not significant for panels 1 and 2 while it is positively significant for panel 3, that is, the non oil countries depend more on their export revenues to pay for their import while the oil exporting countries depend on the accumulated reserve resulted from exporting oil over years. In the short run, the import elasticities in panel 1 have the same pattern as the long run while the elasticity of the government spending is the highest one in panel 2 and the private consumption elasticity to import is higher than the other component in panel 3. This result confirm our idea that the non oil countries cannot reduce their imports of the necessary consumption products in the short run, while they can produce some of it domestically in the long run.

As we concern about the effects of fiscal policy, represented by the government spending, on the current account balance throughout its effect on the import, detailed explanation of the government spending elasticity to import is required. Our empirical results show that an increase in government spending has positive influence on the aggregate import demand. A lasting increase in the government expenditure of one percent will lead to a significant increase of demand for imported goods and service by 0.31, 0.25 and 0.55 percent for panels 1, 2 and 3 respectively. Also, a one percent increase in the short-run government spending brings about a significant increase in import by 0.36, 0.47 and 0.19 percent for panels 1, 2 and 3 respectively. An increase in the government spending will thus, ceteris paribus, lead to a deterioration of the current account simply because the government consumes more from abroad in line with its import content. For instance, in the non oil countries such as Egypt, Morocco and Jordan the governments mostly import fuel and cereal with the world market prices and provide them to its people with very low prices and pay the difference as subsidise with no future return, while in the oil exporting countries a considerable part of the governments' import is the machinery goods especially those related to the oil production which generate more future income. Then, as the large relative weight of the trade in the current account, the current account would improve if government expenditure were reduced. This result comes in the same line with CHAPTER 3: results for: Egypt and UAE in the short run; in Kuwait, Saudi Arabia and Syria in the long run. Also, supports the result for: the G7 countries by Nickel and Funke (2006), Pakistan (short-run 0.42 and long-run 0.62 for the period 1970-2008 and short-run 0.29 and long-run 0.23 for the period 1972-2008) found by Ahmed (2011) and Chani and Chaudhary (2012), and significantly less than the results for 11 Asian economies estimated by Tang (2012)[71] but opposing the results for GCC countries (long run -1.008 for the period 1994 to 2008) found by Aljebrin and Ibrahim (2012)[72].

4.4.3.2 IMPORT ELASTICITIES IN PRESENCE OF THE COMMON FACTORS EFFECTS

The countries under investigation are closely related geographically, religiously, linguistically, and in terms of stage of economic development, but they differ to the extent of the impact of oil export revenues on their fiscal and current account balances and their

[71] The elasticity of the government spending to import in these Asian economies (Hong Kong, China, India, Indonesia, Japan, the Republic of Korea, Malaysia, the Philippines, Singapore, Taipei, China and Thailand from 1991Q1 to 2011Q2) was estimated first without taking into account the nineteenth Asian financial crises and was found insignificant (0.67) and re-estimated with Asian financial crisis dummy and found it is significantly (2.34) because of the fiscal contractions implemented during the crisis would have reduced imports more than otherwise been the case.

[72] Our results differ for these countries i.e. panel 2 because Aljebrin and Ibrahim's model included GDP, international reserves, gross capital formation, private consumption expenditure, public consumption expenditure and the relative price as explanatory variables as well as the investigated periods.

economic activities[73]. Therefore we expect the data collected from those economies to exhibit both cross sectional dependence and heterogeneity which brings about uncertainty about the estimated results by the preferred DFE estimator and PMG as well. Moreover, the MG parameters reported in Table 4-5 are unweighted averages of the country-specific values; as a result this average can be heavily influenced by a few extreme values. Accordingly, we tested for cross-sectional independence using the CD test proposed by Pesaran (2004) and Lagrange multiplier LM test provided by Breusch and Pagan (1980). The results shown in Table 4-6 indicate that the null of cross-sectional independence is rejected for all panels. Therefore, the estimation techniques which are robust to cross-sectional dependence, heterogeneity and can accommodate outliers and the unobservable common factors are appealing.

Consequently, we re-estimate the model in equation (4/4), as we are interested in the relationship between fiscal policy proxied by government spending and the current account balance through the imports, using the CCEMG proposed by Pesaran (2006) and the AMG developed by Eberhardt and Teal (2010) which were illustrated in section 4.3.3. Despite this evidence in favour of the CCEMG with no trend are preferred for panel 1 and AMG without imposing common dynamic process CDP models are preferred for panels 2 and 3, Table 4-6 suggests that the relationship between the disaggregated demand and import found using the AMG and the CCEMG are broadly similar to each other and close to those from the DFE, PMG and MG models as well. The weighted averages of country parameter estimates as presented Table 4-6 for all panels show the results as the DFE in terms of the signs except for the price elasticity which has reversed i.e. positive in panel 3 and negative in panel 2; however, these countries still have price inelastic demand for import[74]. Also, the elasticity of the government spending has become higher in panel 2 as a one percent increase in the government spending push import to increase by 0.22, 0.62 and 0.21 for panels 1, 2 and 3 respectively comparing to 0.31, 0.25 and 0.55 from the DFE. This result could be interpreted as, ceteris paribus, the government in the oil exporting

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[73] Some of these countries are very rich in oil and gas like Saudi Arabia and Qatar and some countries that are resource-scarce in relation to population, such as Egypt and Morocco.

[74] The small positive price elasticity in the non oil countries could be due the fact that most of these countries are highly populated such as Egypt and they import the necessities required for the growing population regardless of the price such as cereals.

Table 4-6 Import Elasticities Estimation in Presence of the Common Factors Effects

Country Group	**Panel (1): All Countries**				**Panel (2): Oil Countries**				**Panel (3): Non Oil Countries**			
cross-sectional independence tests	CD - Pesaran		2.03(0.04) [0.31]		Pesaran		0.86(0.39) [0.24]		Pesaran		-2.39(0.02) [0.30]	
	CD - Friedman		48.72(0.00) [0.31]		Friedman		36.65(0.00) [0.24]		Friedman		19.87(0.00) [0.30]	
	Breusch-Pagan LM		299.28(0.00)		Breusch-Pagan LM		47.55(0.00)		Breusch-Pagan LM		44.74(0.00)	
estimator	**(1) AMG**	**(2) AMG**	**(3) CCEMG**	**(4) CCEMG**	**(1) AMG**	**(2) AMG**	**(3) CCEMG**	**(4) CCEMG**	**(1) AMG**	**(2) AMG**	**(3) CCEMG**	**(4) CCEMG**
dep. V	$im - \widehat{\mu}_t^{va\bullet}$	im	im	im	$im - \widehat{\mu}_t^{va\bullet}$	im	im	im	$im - \widehat{\mu}_t^{va\bullet}$	im	im	im
hc	0.38***	0.40***	0.46***	0.39***	0.41***	0.41***	0.51***	0.49***	0.38	0.41	0.71***	0.52***
gs	0.27***	0.27***	0.20*	0.22*	0.48***	0.62***	0.45***	0.43***	0.33***	0.21**	0.04**	0.31*
i	0.32***	0.31***	0.26***	0.25***	0.19***	0.07***	0.20**	0.23***	0.36***	0.37***	0.23***	0.38***
ex	0.15*	0.15**	0.28***	0.24**	0.09	0.04	0.20	0.21	0.38***	0.39***	0.31***	0.49**
rp	-0.10*	-0.04	0.001	-0.02	0.16***	-0.19***	0.11	-0.12	0.003	0.11***	0.17***	0.002
CDP	0.87***	-	-	-	0.76***	-	-	-	0.99***	-	-	-
Trend	-	-	-0.01***	-	-	-	-0.01*	-	-	-	-0.01	-
Intercept	-0.45	-2.92	-3.70	-0.03	-0.75	-0.65	-2.70	-0.27	-3.97***	-3.85***	0.12	0.14
# of sign. Trends	n/a	n/a	4	n/a	n/a	n/a	3	n/a	n/a	n/a	2	n/a
RMSE	0.0311	0.0357	0.0214	0.0234	0.0299	0.0334	0.0212	0.0226	0.0262	0.0292	0.0187	0.0200
Hausman test	**(1) vs. (2) : 1.41 (0.96)** ***(2) is preferable***		**(3) vs. (4): 6.73(0.87)** ***(4) is preferable***		**(1) vs. (2): 3.52 (0.74)** ***(2) is preferable***		**(3) vs. (4): 1.84(0.99)** ***(4) is preferable***		**(1) vs. (2): 2.82(0.83)** ***(2) is preferable***		**(4) vs. (3): 179.86 (0.00)** ***(4) is preferable***	
	(2) vs. (4): 6.03 (0.42) …. *(4) is preferable*				**(4) vs. (2): 5.88 (0.43) …. *(2) is preferable***				**(4) vs. (2): 2.78 (0.83) …. *(2) is preferable***			

Notes: (1) Statistical significance at the10%, 5% and 1% level is indicated with *, ** and *** respectively. (2) $\widehat{\mu}_t^{va\bullet}$ Signifies the common dynamic process (CDP). (3) All coefficients represent the weighted averages across groups and computed as outlier-robust. (4) Trend refers to a group-specific linear trend. (5) RMSE uses residuals from group-specific regressions. (6) # of sign. Trends indicate the group-specific trends significant at 5% level. (7) we test for cross-sectional independence by Pesaran's (2004) CD test (with 2 options: Pesaran and Friedman) and Breusch-Pagan LM statistic where H0: cross-sectional independence. The LM test follows a chi-square distribution with $N(N-1)/2$ degrees of freedom but requires $T > N$, whilst the Pesaran test is asymptotically normal. (8) The numbers in parentheses are the P values for the CD tests while the numbers inside the square brackets are the Average absolute value of the off-diagonal elements. (9) The rule applied for Hausman test in table 5 is applied here.

countries care less about the deterioration which may occur due to the increasing its import because they expect more future funds from their current expenditure which is not true for the non oil counties.

However, in our calibration, the ceteris paribus assumption, implies careful reading of the results, since an increase (decrease) in government expenditure is likely to crowd out (crowd in) the investment while private consumption is likely to increase as public expenditure rises (Blanchard and Perotti 2002). The effects on import become less expected if an increase in government expenditure crowds out investment but positively affect private consumption. If public expenditure crowds out investment, given that high elasticities of both private consumption and public expenditure, the reduction in import demand due to the decline in investment might or might not be compensated by the enhancement in import demand caused by the increase in public expenditure and private consumption. Table 4-6 may show some of this crowding out effect, the increase in the government spending in the oil exporting countries was accompanied by a reduction the private investment which has been fully compensated by the increase in the government spending on import. On the other hand we cannot see this effect in the non oil countries. Commonly, the overall effect of such a demand shift on imports depends on the relative size of the changes in public spending and private consumption (Nickel and Funke 2006). Generally, the impact of fiscal policy, measured by public spending, on import demand depends on the interaction between the public and the private sector.

To sum up, our empirical results support the idea that the expansionary fiscal policy implemented by means of increasing government spending increases country's imports, given that country's exports are determined by external factors, leading to trade deficit, hence deteriorating current account position because trade account is the substantial part of current account. Then, in order to improve current account position through the imports, tight fiscal policy and low government spending is needed for these countries.

4.5 CONCLUSION

This chapter investigates empirically the relationship between fiscal policy and the current account. It sheds some light on how fiscal policy affects current account, it is clearly seen that fiscal policy has a role to play in dealing with current account problems. Applying Pedroni (1999), Kao (1999) Westerlund (2007) panel cointegration tests, dynamic fixed-effects DFE, mean-group MG, pooled mean-group PMG, common correlated effects mean group CCEMG and augmented mean group AMG estimations on the investigated countries in the period 1970-2008, we found that an increase in government expenditures has a significant positive impact on goods and services imports. A one percent increase in government spending increases goods and services imports of about 0.21—0.61 percent. Accordingly, an increase in government expenditure would also bring about a deterioration of the current account position. However, the ceteris paribus assumption in our perspective might lead to improper policy conclusions if an increase (decrease) in government expenditure crowds out (crowds in) the private demand components. If this crowding-out/in effect is strong enough, an increase in government expenditure could cause the opposite result (Nickel and Funke 2006). Moreover, as government expenditure found to affect the current account balance positively in Bahrain, Morocco and UAE in the long run and in Kuwait in the short run, one has to be cautious when interpret the positive import elasticicty of the government spending. That is, the content of the government import is very important because some of these countries' import may be directed to their infant export industries, re-exportation and import substitution industries etc which may improve the current account.

This chapter presents theoretically consistent and empirically implementable fiscal policy propositions for the investigated countries which have a history of economic interventions, scarcity of such studies and lack of time series data. The estimates of the long run GDP, its components and price elasticities derived from the model satisfy the theoretical signs and are highly significant, both economically and statistically. Our empirical results expose that a difference between the import elasticities of private and public demand exists. Further research could determine the overall impact (i.e. the direct impact of a change in expenditure and the indirect impact through the reaction of private demand) that a change in government expenditure could have on the current account of a particular country.

4.6 APPENDIX J

Figure 4-1 Import in Levels and First Differences

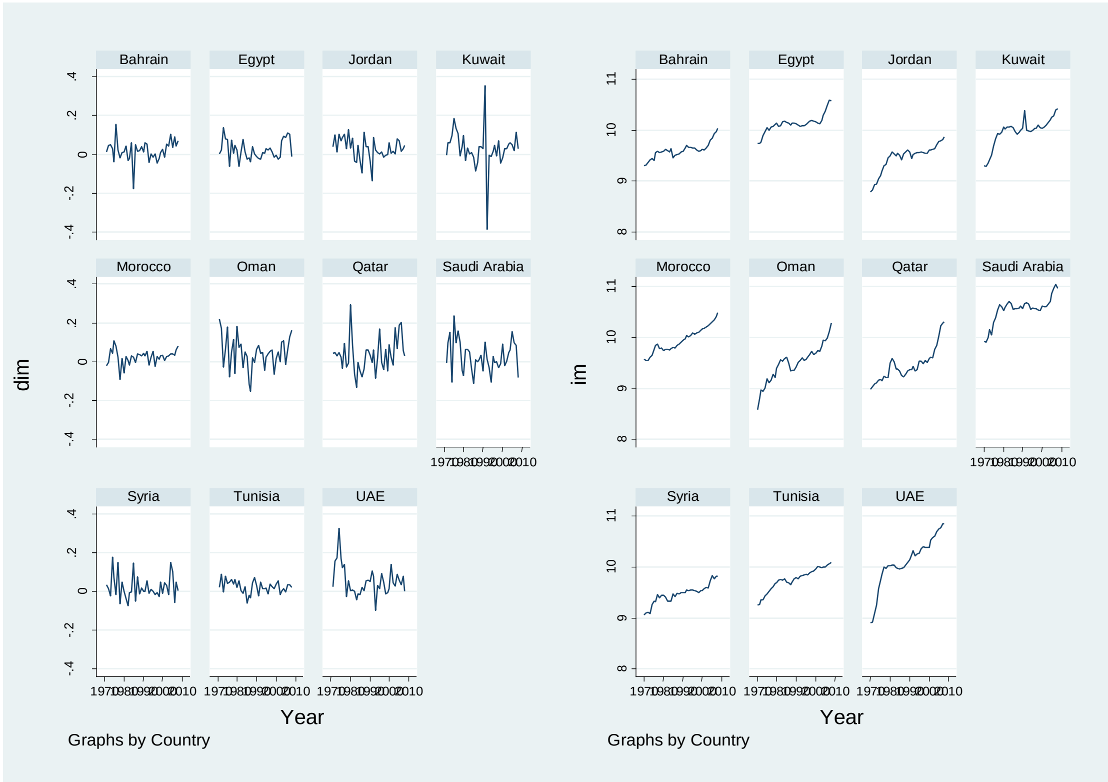


Figure 4-2 Consumption in Levels and First Differences

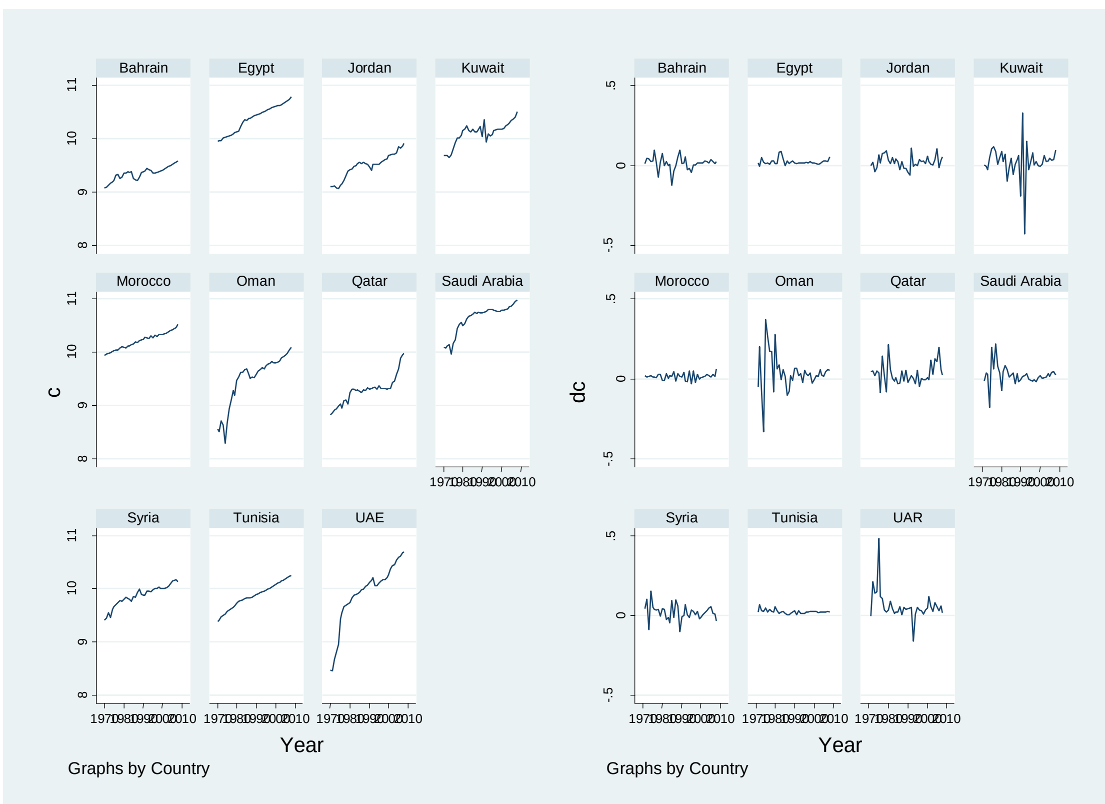


Figure 4-3 Government Spending in Levels and First Differences

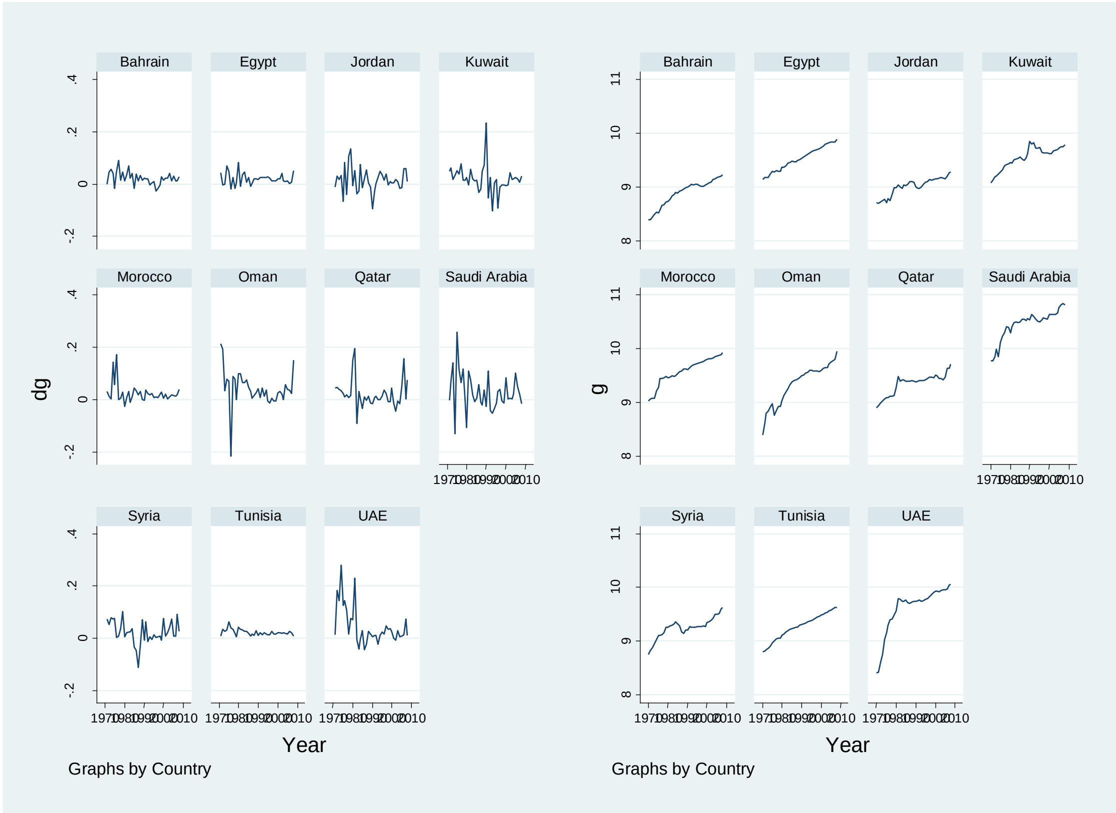


Figure 4-4 Investment in Levels and First Differences

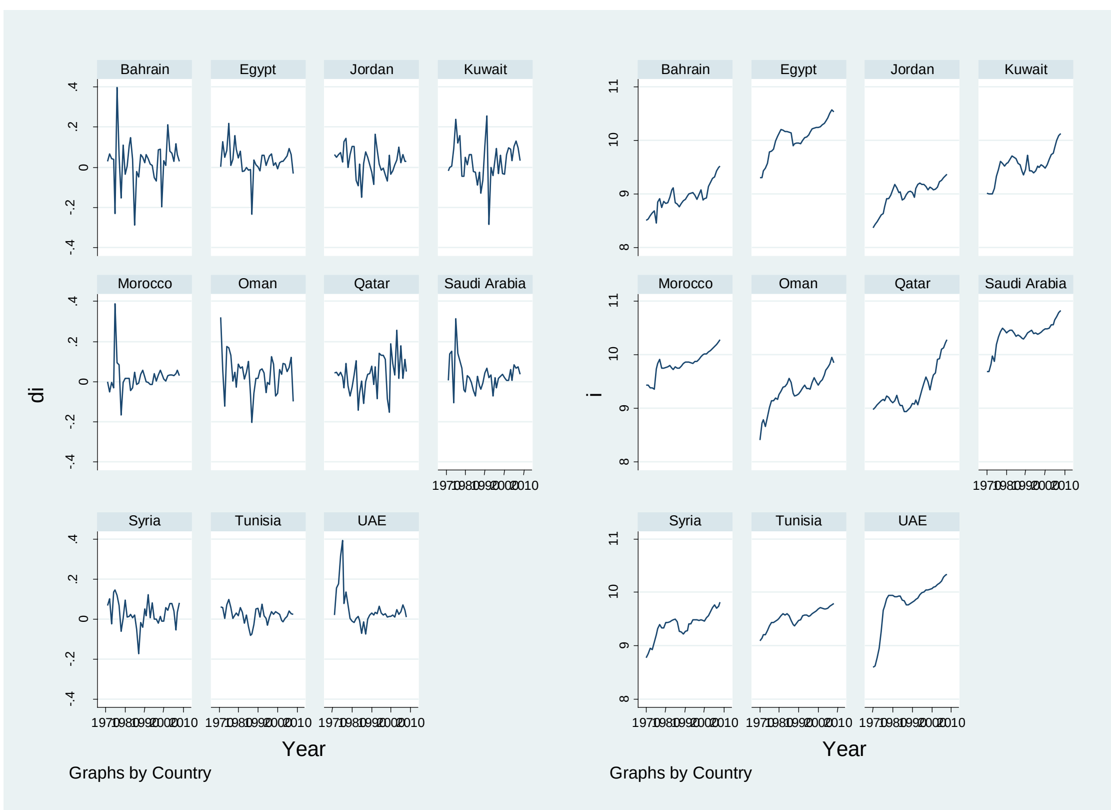


Figure 4-5 GDP in Levels and First Differences

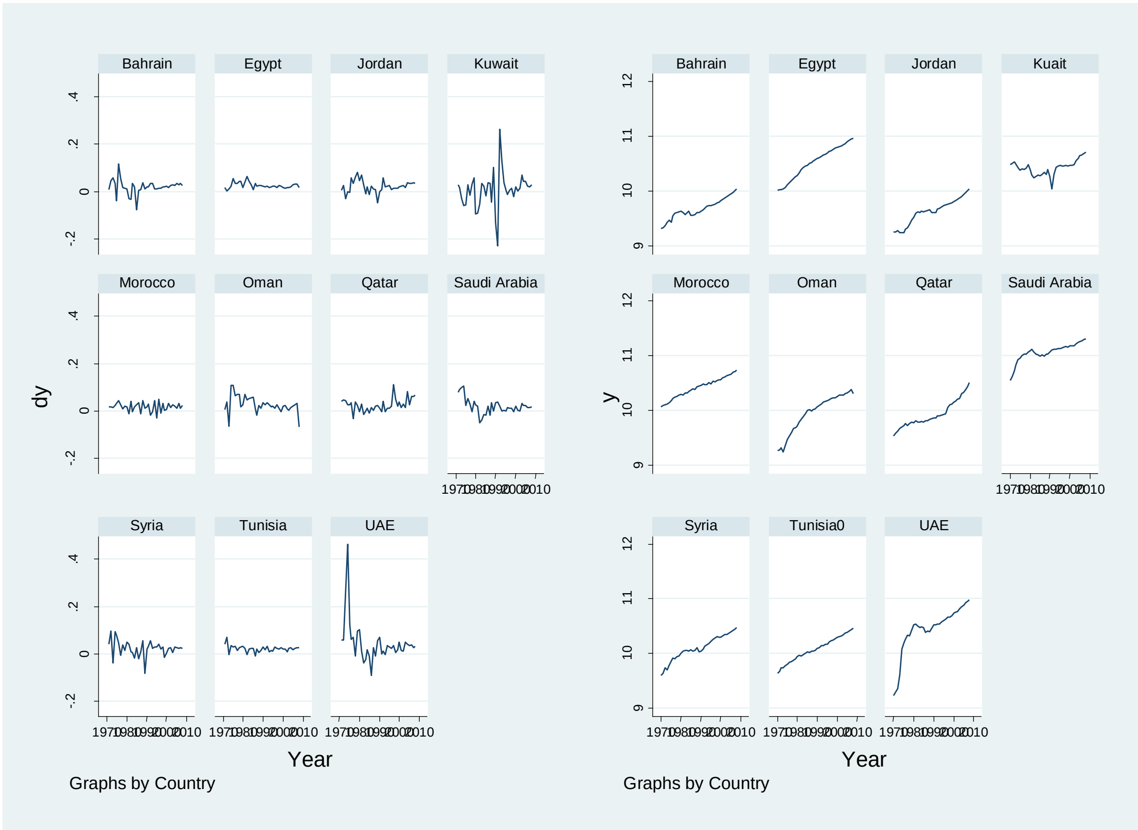


Figure 4-6 Relative Prices in Levels and First Differences

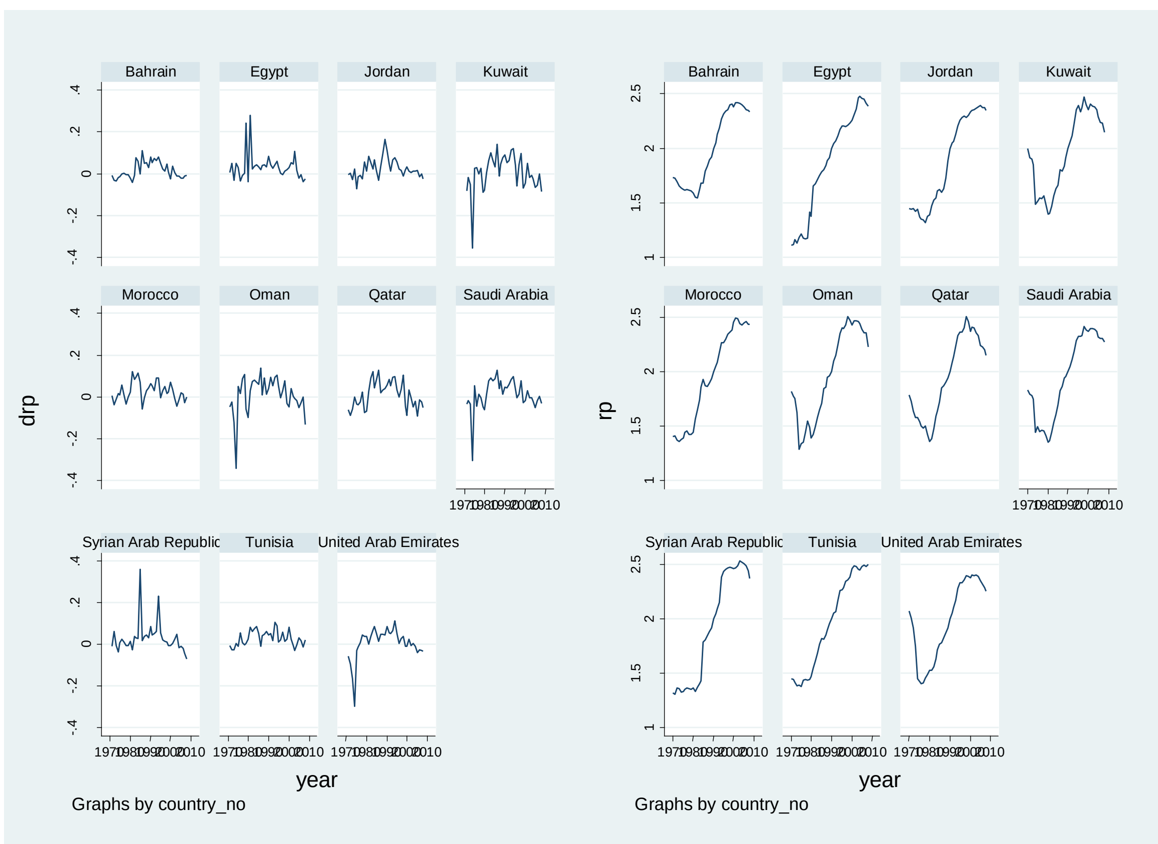


Figure 4-7 Histogram of Import in Levels and Logs

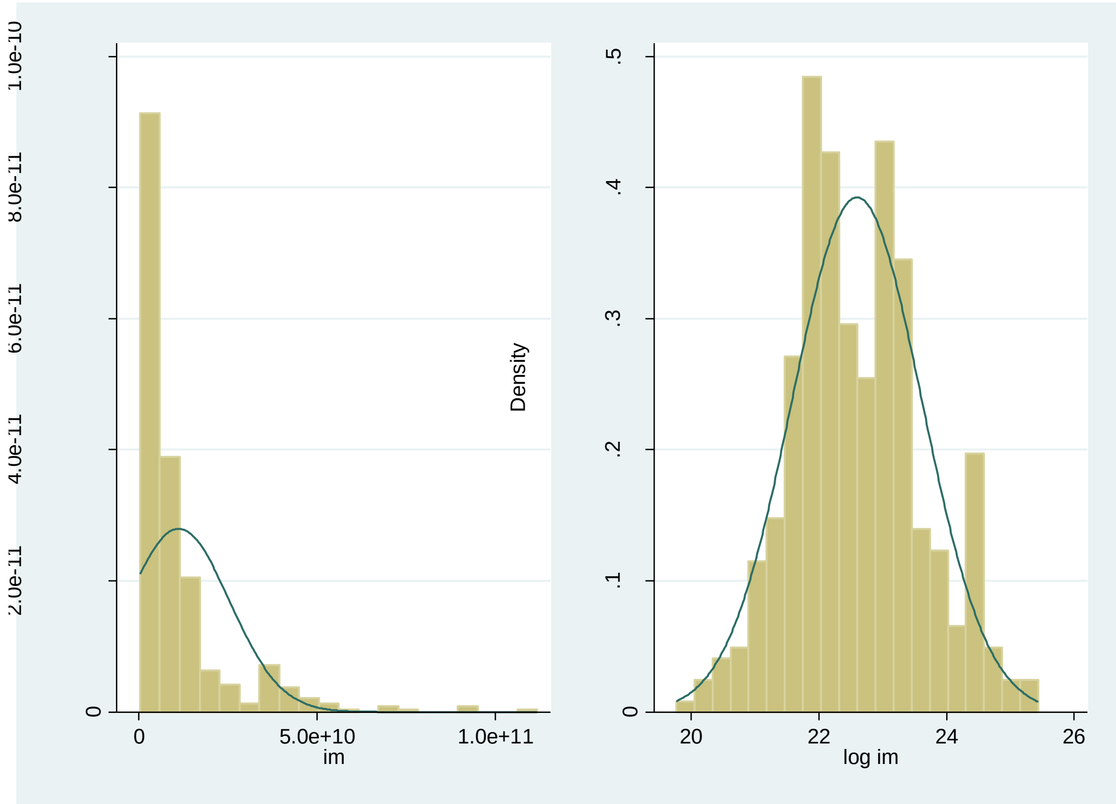


Figure 4-8 Histogram of Consumption in Levels and Logs

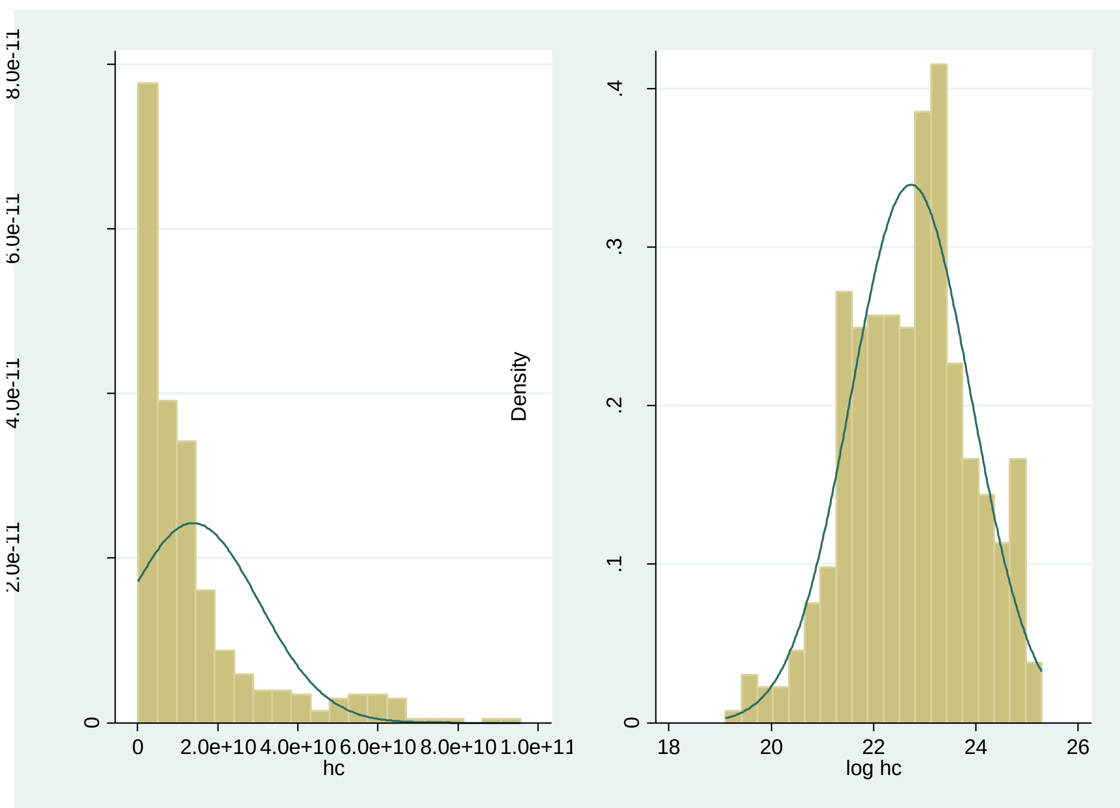


Figure 4-9 Histogram of Government Spending in Levels and Logs

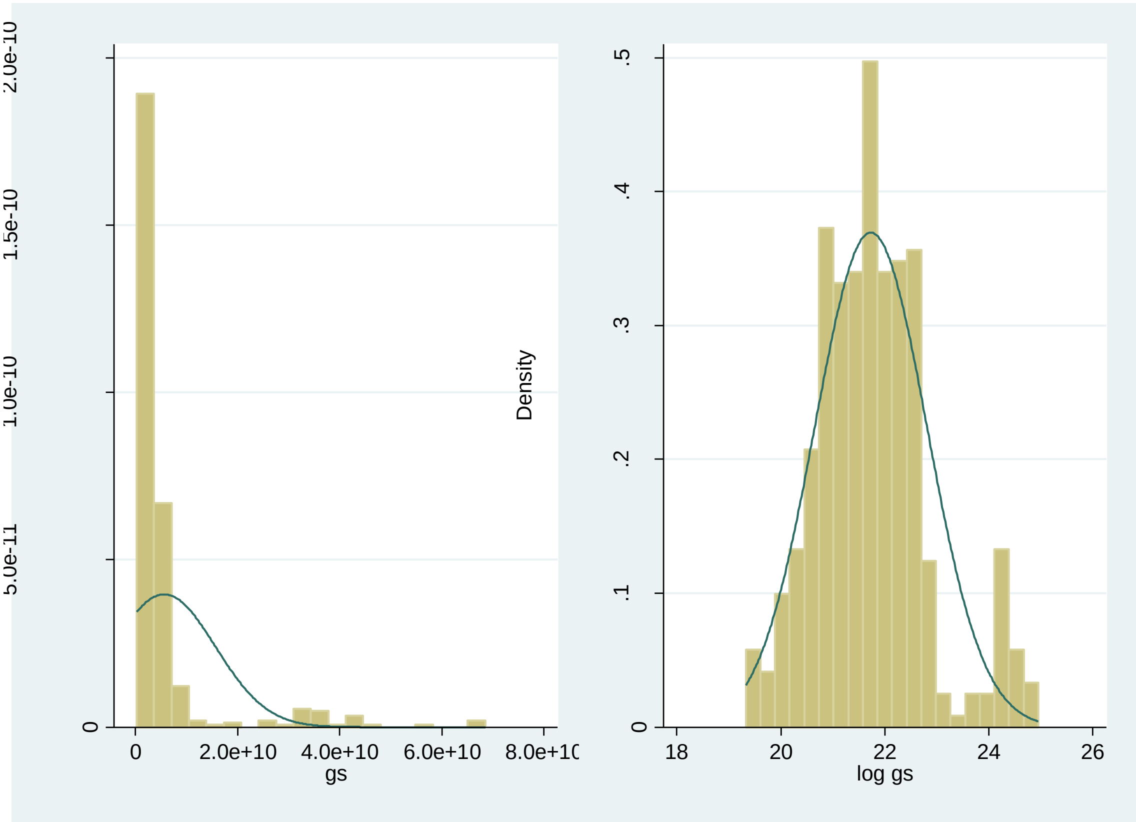


Figure 4-10 Histogram of Investment in Levels and Logs

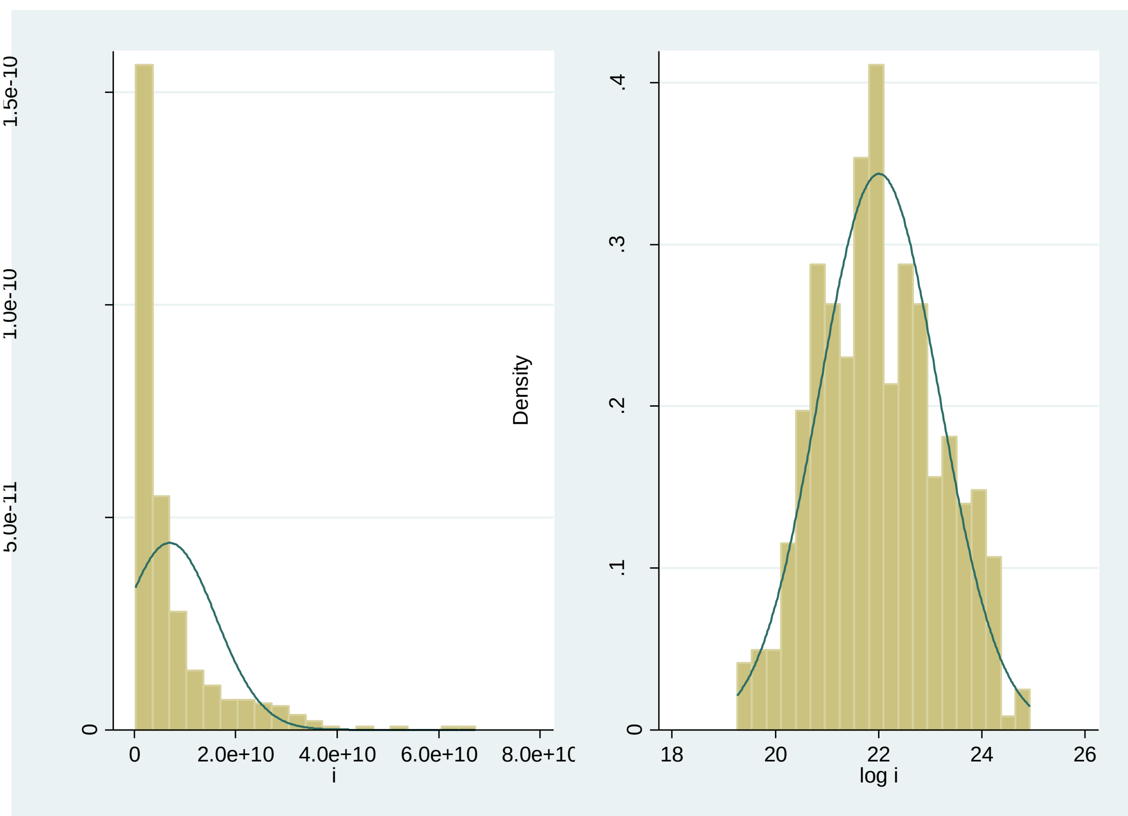


Figure 4-11 Histogram of Export in Levels and Logs

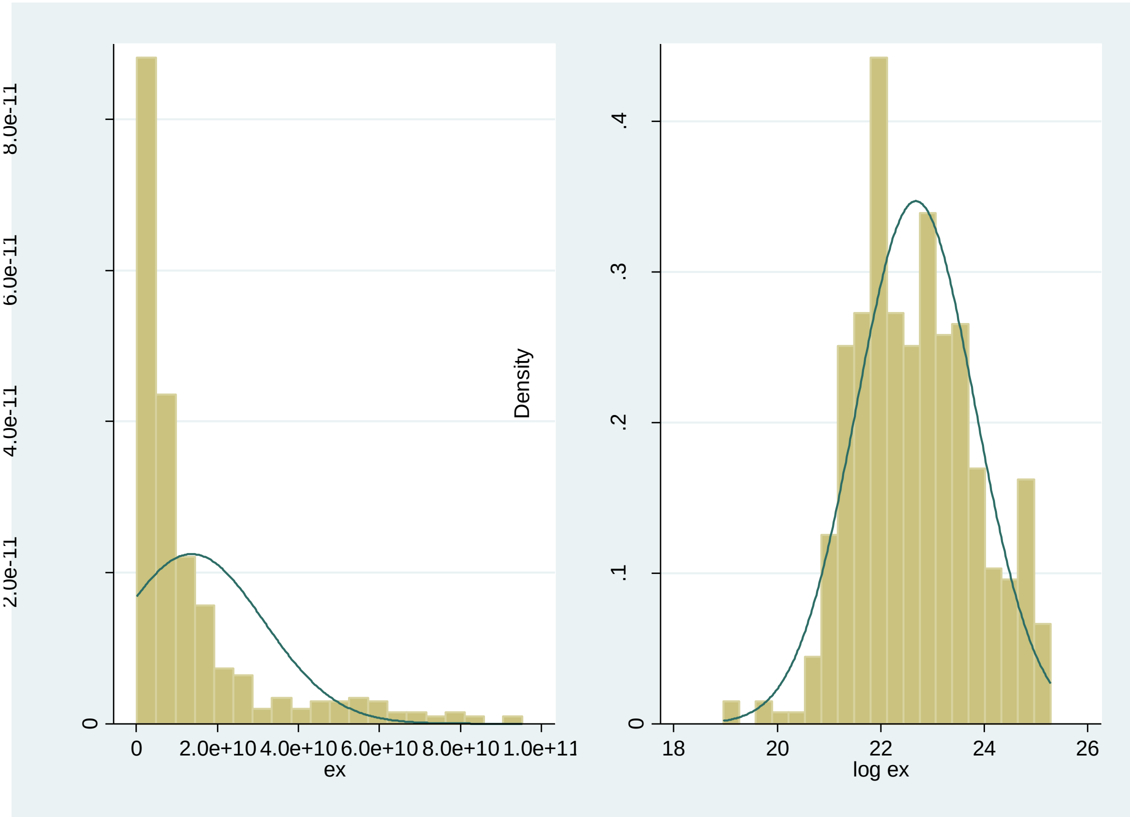


Figure 4-12 Histogram of GDP in Levels and Logs

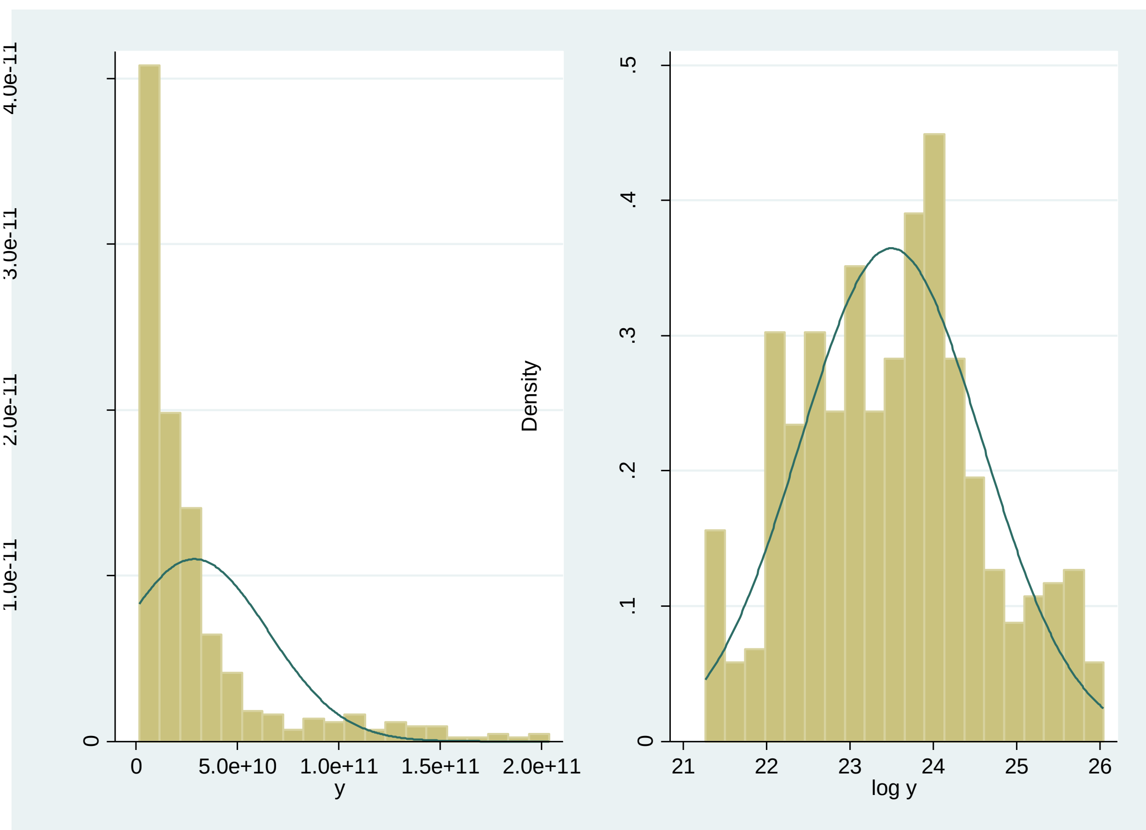


Figure 4-13 Histogram of Relative Prices in Levels and Logs

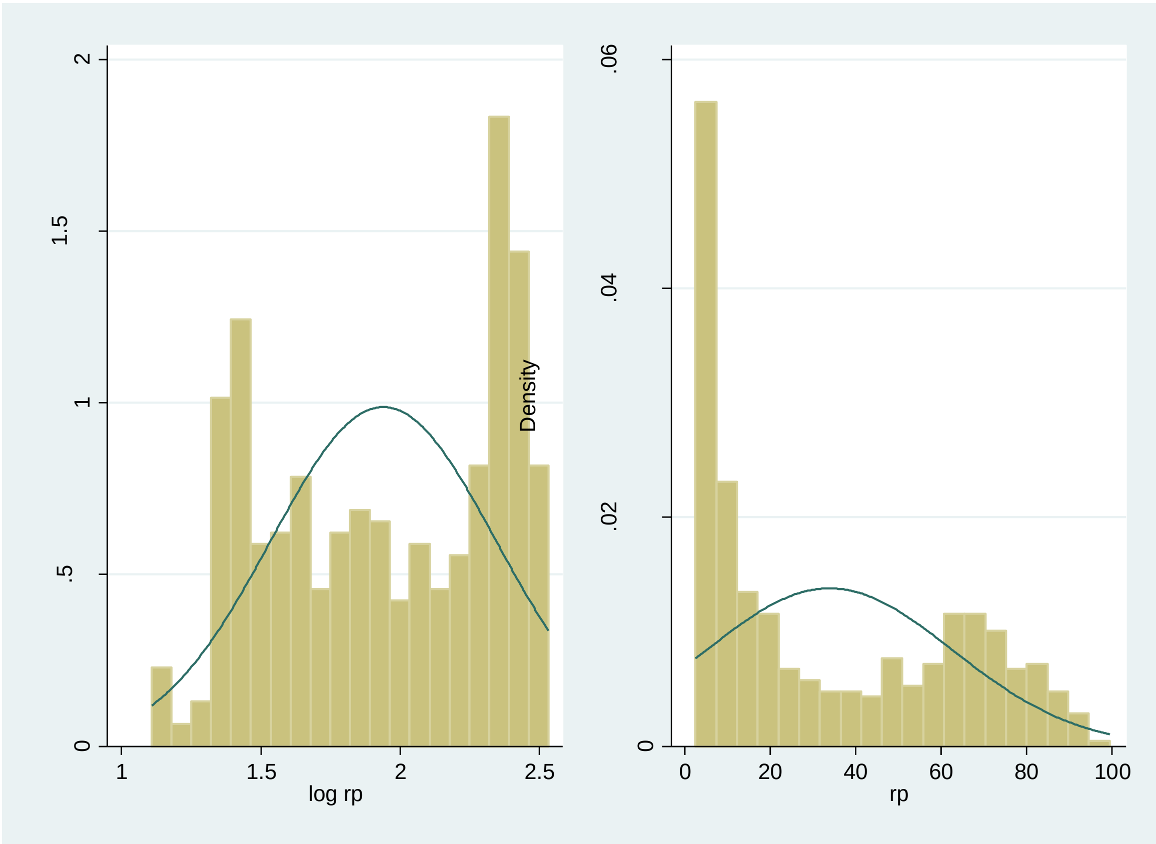


Figure 4-14 Probability Distribution of Imports

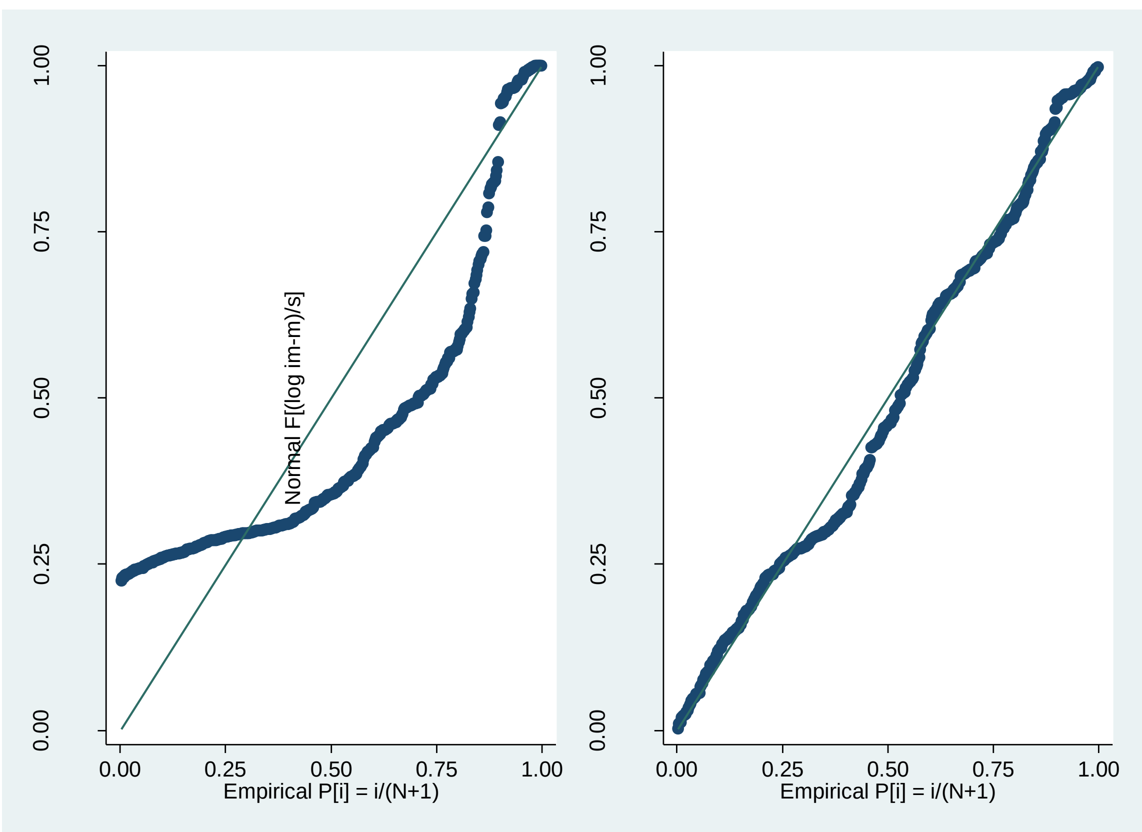


Figure 4-15 Household Consumption Probability Distribution

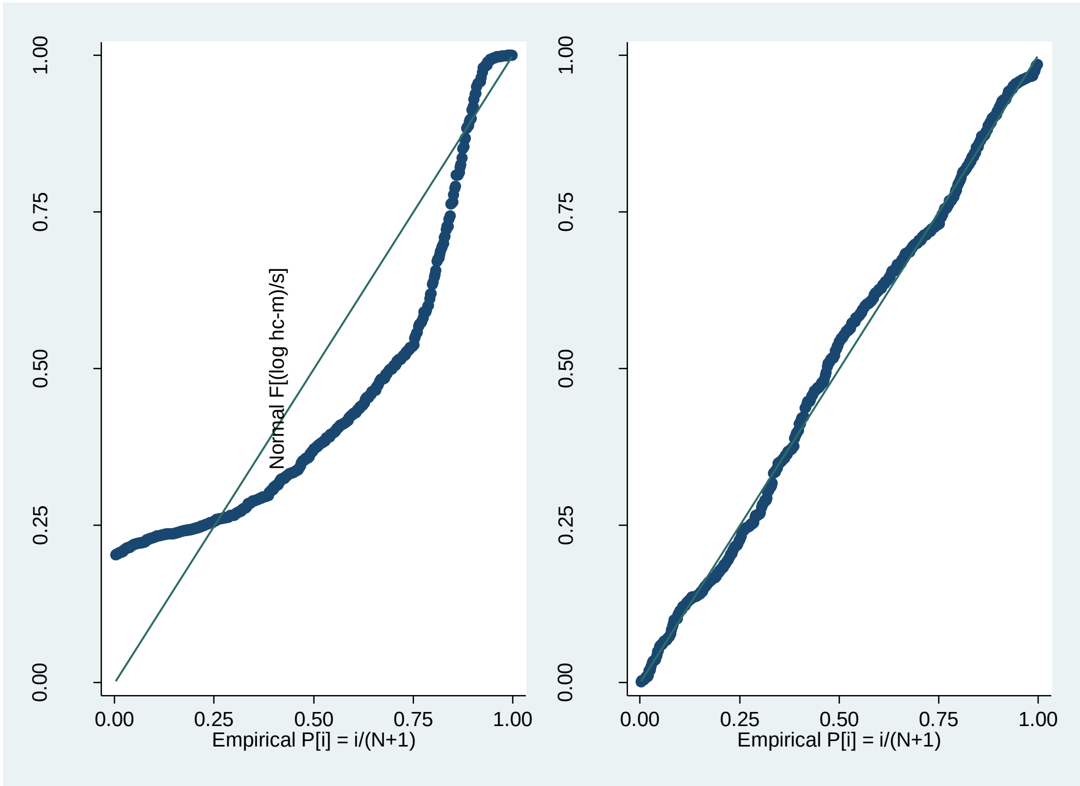


Figure 4-16 Government Spending Probability Distribution

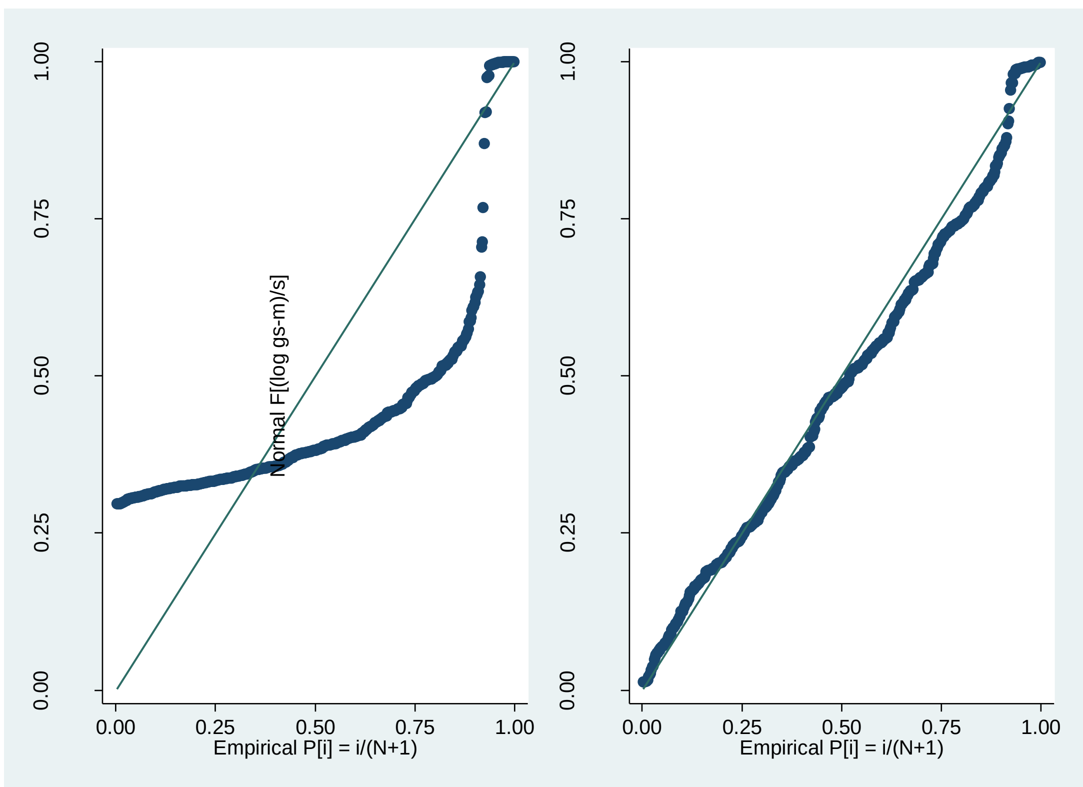


Figure 4-17 Investment Probability Distribution

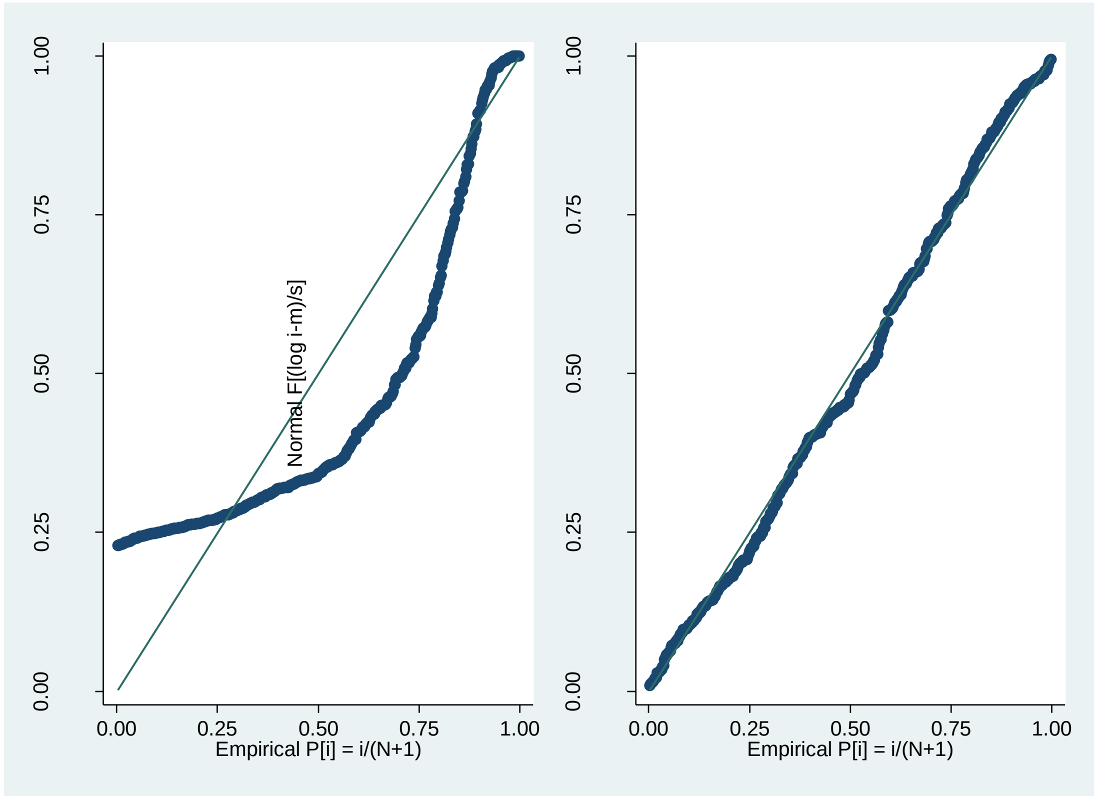


Figure 4-18 Exports Probability Distribution

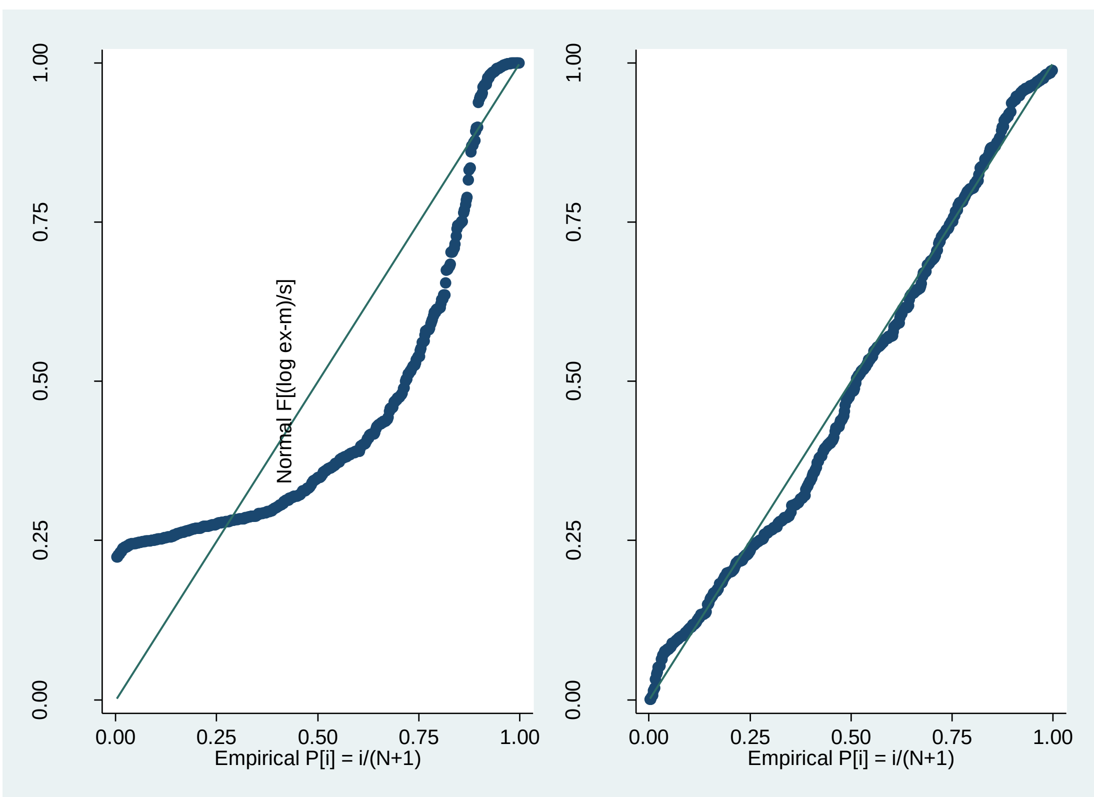
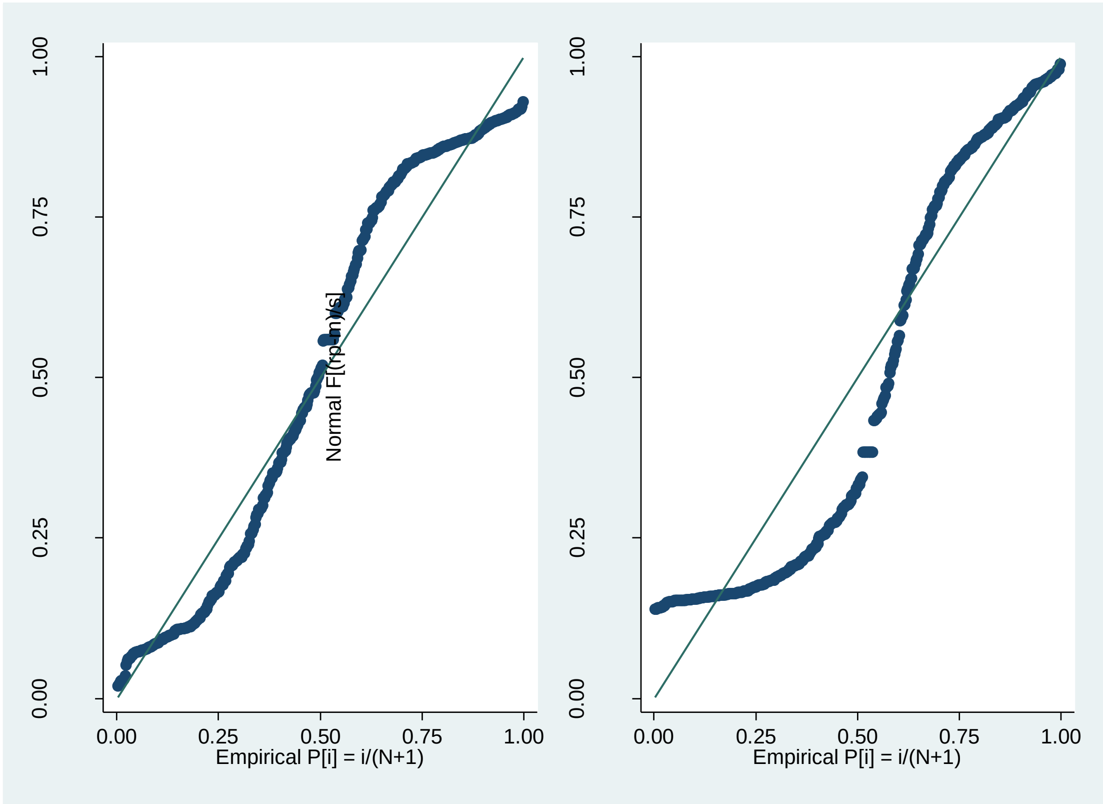


Figure 4-19 Relative Prices Probability Distribution



CHAPTER 5

CONCLUSIONS, POLICY IMPLICATIONS, AND FUTURE RESEARCH

CHAPTER 5: CONCLUSIONS, POLICY IMPLICATIONS, AND FUTURE RESEARCH

5.1 INTRODUCTION AND PURPOSE

This chapter briefly summarizes the research thus far accomplished. The following section is a recapitulation of the impact of fiscal policy on the current account in the investigated developing countries adopting fixed exchange rate regime and some of them are oil exporters. Section 5.3 addresses the policy implications arising from the findings and discussion of previous chapters. The last section (i.e. section 5.4) explores possible extensions of the research.

5.2 THE IMPACT OF FISCAL POLICY ON THE CURRENT ACCOUNT

In this study we have investigated the association between the current account and fiscal policy, along with some other control variables, for eleven developing countries (from the Arab economies) by testing the validity of (TDH) in which a fall in public saving has an adverse effect on the current account balance, against the (REH) in which lower public savings are met by equal increase in private saving and thus the current account does not respond to the changes in fiscal policy. The study contributes to the existing literature in many ways; firstly in terms of the studied sample (i.e. countries depending on fixed exchange rate regime, and oil versus non-oil countries), secondly, using multiple and advanced econometric methodologies, finally, the variables considered for investigation.

Our first important finding is that, the panel data estimates statistically support the conventional theory of positive relationship between fiscal and external balances (TDH) for oil producing countries, whereas supporting the Ricardian view in non oil countries. A one percent increase in the government fiscal balance (surplus/deficit) to GDP ratio tends to (improve/deteriorate) the current account balance to GDP ratio by 0.28 to 0.39 percent in oil countries in contrast to the non oil countries as such relationship does not exist. More deeply, one percent increase in government expenditure deteriorates current account by 0.26–0.85 percent in both oil and non oil countries, at the same time, as one percent increase (decrease) in taxes to GDP ratio, increases current account surplus (deficit) to GDP by 0.23–0.35 percent only in the oil countries. Moreover, the wider the gap between saving and investment the greater is the deterioration in the current account balance. An increase in the growth rate of money supply by one point improves the current account balance to GDP ratio by 0.04 percent only in oil countries.

Next, the results the cointegration analyses, based on Johansen's vector error correction model (VECM) proposed by Johansen (1988) and developed by Johansen and Juselius (1990) and Johansen (1991), has been exploited in CHAPTER 3: to examine the long and short run relationships between fiscal policy and the current account in the investigated countries. In conformity with theoretical considerations of (TDH), the analysis reveals that there is a positive short-run relationship between the current account balance and taxes with causality running directly from the later to the former only in Jordan and UAE. On the other hand, and in contrary to (TDH), the causality is running in the opposit direction with negative effect in the long run in Bahrain, Morocco, Qatar, and UAE, while it is positive in Tunisia short run positive in Syria and Kuwait. Moreover, the bidirectional long-run causality between taxes and the current account balance receives strong empirical support in Bahrain, Egypt, Kuwait and Saudi Arabia. On contrary no long run causality was found in Jordan and Syria, while no short run causality found in Morocco, Qatar and Tunisia which supports the (REH).

Regarding the causality relationship between the current account balance and government expenditure, the analysis finds negative causality running directly from the later to the former in the long run in Saudi Arabia which support both (TDH) and (REH). In contrary, we found positive long run causality running from the current account balance to government spending in Egypt, Qatar and Tunisia. Furthermore, there is long run bidirectional causality between the current account balance and government spending in Kuwait, Syria and UAE while the short run bidirectional causality found in Kuwait, Morocco and UAE. In addition, we found no causality in any direction either directly or indirectly in Jordan in short and long run while in Qatar, Saudi Arabia, Syuria and Tunisia in short run only. However, in the short run, we found weak evidence that these relationships are closely linked and that the taxes and government expenditures cause the current account balance and vice versa.

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Moreover, we investigated the effects of fiscal policy on the current account by measuring the import elasticity to the government expenditure. Applying Pedroni (1999), Kao (1999) Westerlund (2007) panel cointegration tests, dynamic fixed-effects DFE, mean-group MG, pooled mean-group PMG, common correlated effects mean group CCEMG and augmented mean group AMG estimation techniques, we found that an increase in government expenditures has a significant positive impact on goods and services imports. A one percent increase in government spending increases goods and services imports of about 0.21—0.61 percent. Accordingly, an increase in government expenditure would also bring about a deterioration of the current account position. However, the ceteris paribus assumption in our perspective might lead to improper policy conclusions if an increase (decrease) in government expenditure crowds out (crowds in) the private demand components. If this crowding-out/in effect is strong enough, an increase in government expenditure could cause the opposite result (Nickel and Funke 2006). Moreover, as government expenditure found to affect the current account balance positively in Bahrain, Morocco and UAE in the long run and in Kuwait in the short run, one has to be cautious when interpret the positive import elasticicty of the government spending. That is, the content of the government import is very important because some of these countries' import may be directed to their infant export industries, re-exportation and import substitution industries etc which may improve the current account.

5.3 POLICY IMPLICAITIONS

The first, and most obvious, result is that the negative relationship between the current account and government expenditure (in some countries) as well as the high elasticity of import to the later. Therefore, the most important implication is adopting a policy of rationalization of government spending. But, because the reduced size of the government spending is a major problem for the developing countries as it causes negative effects on the performance of economic activity and social justice considerations, especially in the oil dependant countries in which the government spending generates the most of its revenues. However, in rationalizing government spending, we must take into account activation of the quality of government spending through the following; firstly, determine the maximum size of the government spending for the year to cut the continuous increase in the government spending a year by a set of financial controls and oversights by which to avoid wasting public money. Secondly, rationalize the government subsidies and social benefits. Thirdly, supervise the budgets of the institutions and government departments for effective and productive financial control by the various country' agencies and the councils.

Secondly, we tested the two hypotheses (TDH) and (REH) through the relationship between the current account balance and taxes and we found that these hypotheses are not valid in most of these economies, but (TDH) is valid in short run for Jordan and UAE while (REH) is valid in the long run for Jordan and Syria and in the short run for Morocco, Qatar and Tunisia. Accordingly, it is not necessary for the oil dependent countries to be Keynesians and for non oil countries to be Ricardians. However, to reduce the current account balance, Jordan and UAE has to reduce taxes along with its government spending while other countries like Kuwait, Saudi Arabia have to do the opposite. In contrary, policy makers in Egypt and Tunisia (in the long run), Egypt, Kuwait, Saudi Arabia and Syria (in short run) should be mainly attentive to negative development in the current account since such developments could hinder fiscal consolidation efforts.

Moreover, as the oil export revenue is the essential source of income in oil exporting countries, this revenue affects the government revenues and the exports of goods and services. Considering the important role of oil revenue of the components of the current accounts and the government budget, we expected these countries to be Keynesian (i.e. taxes cause the current account balance), but the direction of the causality is reversed, current account balance affects, negatively or positively, taxes. So, if the government would like to reduce its current account and fiscal deficits, the government must commence by reducing the current account deficit. Since the current account balance depends on oil prices, the country has to diversify the resources of the national income. When the oil revenues become less important in domestic income, the structural economic transformation may reverse the causality direction between the taxes and the current account balances, and the (TDH) will be more valid.

As the large portion of the exports in the investigated countries is the row materials and agricultural products which depends on the climate, international prices, exchange rates in other countries … etc. To improve the current account position, attention should be paid to export promotion measures, especially to structural reforms that increase the competitiveness in merchandise trade of these economies. Also, as the elasticities of private consumption, government spending and investment to import are relatively high, the improvement of the current account position requires much attention to the import substitution industrialization policy (ISI) as well as rationalizing government foreign purchases to reduce the imports. Another important policy implication is to attain financial reform by improving the efficiency of the stock markets, insurance industry and bond markets.

However, care should be taken with sustainability issues, to avoid debt accumulation. The high internal debt ratio in some countries like Egypt, Jordan, Tunisia and Morocco points to the need to adopt debt reduction policies, such as further cutting the budget deficit and intensifying and qualifying privatisation programmes. Also, as the increase in the growth rate of money supply improves the current account balance to GDP ratio in some countries. That is, in these same small open economies; current account surplus with fixed nominal exchange rate regime (as our sample) increases the acquisition of hard currencies causing the nominal exchange rate to appreciate forcing the central banks to intervene to hold the exchange rate constant. It buys the foreign currencies, in exchange for domestic currency. This intervention causes the home country currency stock to increase and interest rate starts to decline. Because these economies are small and open, when the interest rate tries to fall below world interest rate as a result of increasing money supply, savers will invest abroad. We propose that it is important to maintain some flexibility in the exchange rate system. This would make the economy less vulnerable to any speculative capital flows, and avoid the costs of sterilization.

5.4 FUTURE RESEARCH

We believe that the real and effective key to the problem of fiscal and current account imbalances consists of a coherent package containing both fiscal and monetary policies. Policy measures adopt productivity improvement, exchange rate and monetary stance complementary to the fiscal policy. It must be iterated again that the problem of twin deficits is truly an empirical one, and the number of countries selected in this study definitely cannot lead one to a generalization of results. However, the results obtained in this study do satisfy the priori assumption that it is more likely for the developing countries to show high correspondence between fiscal policy and the current account. One major limitation of this study is the non availability of more frequent data. This research may be replicated later if such data is available. This will help to improve the power of our tests.

Possible expansion to this study could consider using a wider range of developing countries along with applying other econometric methodologies on a model that includes other variables such as exchange rate, interest rate, oil wealth and the degree of maturity in oil production to depict the relationship between the current account and fiscal policy. Given sufficient data availability, one may stop using a proxy for a certain variable. Although, we have used a relatively little and less frequent data to analyze this relationship—compared with other researchers–the outcomes of this study are consistent with earlier research. Moreover, it has provided evidence from a sample of developing countries—never studied as a groups of oil and non oil dependent economies–on the twin deficits relationship as well as the direction of causality and aggregate import elasticities. These are interesting features of this study.

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