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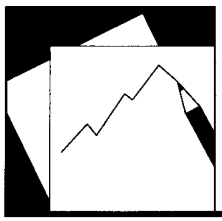

IMF Working Paper

GCC Monetary Union and the Degree of Macroeconomic Policy Coordination

Bassem Kamar and Samy Ben Naceur

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GCC Monetary Union and the Degree of Macroeconomic Policy Coordination

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Abstract

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Coordinating macroeconomic policies is a pre-requisite to a successful launch of the common currency in the GCC countries. Relying on the Behavioral Equilibrium Exchange Rate approach as a theoretical framework, we apply the Pooled Mean Group methodology to determine the similarity of the impact of a selected set of macroeconomic indicators on the real exchange rate in each country. Our empirical evidence points to a clear coordination of monetary policy, fiscal policy, government consumption, and openness across the member countries. While RER misalignments also show a substantial convergence building over time, differences in the misalignments of the two polar cases remain rather substantial, calling for further coordination and policy harmonization.

JEL Classification Numbers: C23, E58, E63, F02, F15, F31, F36, F42.

Keywords: Models with panel data, central banks and their policies, analysis of fiscal and monetary policy, economic integration, foreign exchange, policy coordination and transmission.

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I. INTRODUCTION

At the very beginning of the Bretton Woods system in 1945, twenty-two Arab countries demonstrated their readiness to cooperate in formulating exchange rate policy, through a plan to launch a united currency called the "Arab dinar." However, this plan for Arab regional integration remained unfulfilled until 1998, when the Great Arab Free Trade Area (GAFTA) was founded. Nevertheless, the GAFTA agreement represents only a shallow integration, and the low levels of Middle East and North African (MENA) countries' intra-regional trade are not expected to enhance the dynamic effects of this integration.

Within the region, the countries of the Gulf Cooperation Council (GCC) – Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirates (UAE) – represent a unique case of advanced cooperation in their commitment to deepen their economic integration, by moving from a free trade area in 1981 to a full customs union in 2005. The creation of a common currency by 2010, referred to in this paper as the Gulf Currency (GC), reflects the real engagement of these six countries to achieve economic union. This experience might inspire a larger Arab movement toward deep integration.

Policy coordination among the member countries is a prerequisite for deep regional integration and monetary union. Simply looking at the differences between the main macroeconomic indicators does not bring much insight into the sources of divergence or the adequacy of a common policy response.

In this regard, our paper presents an original approach to identifying the degree of economic policy harmonization among the GCC countries and considers areas in which further coordination is needed. Specifically, we aim at determining the impact of different macroeconomic variables on real exchange rate (RER) behavior in each country and at analyzing whether these effects are similar in magnitude and direction. We attempt to improve on previous studies by exploiting the panel dimension of the data set with the pooled mean group (PMG) estimator developed by Pesaran and others (1996, 1999).

In the case of the GCC, all member countries adopt a fixed exchange rate to the US dollar, and the calculated RERs reflect inflation differentials with respect to the US inflation. The econometric model identifies the common determinants of these inflation differentials, which could help in assessing the areas where deeper coordination is needed.

Based on the PMG estimation results, we find that money supply, budget deficit, government consumption, and degree of openness in each country had a similar impact on the RER. Furthermore, we calculated the equilibrium exchange in order to assess the degree of RER misalignment in each country (over- or under-valuation) and its evolution from 1991 to 2005. The analysis clearly emphasizes that misalignments converged over time. While these are indicators of substantial coordination of policies, the difference between the two polar misalignments is still almost 21 percentage points, requiring further coordination and policy harmonization among the member countries.

The next section highlights the various forms of monetary cooperation in different regions of the world. Section III presents the model we use to illustrate the impact of the major macroeconomic variables on the RER behavior in each country. Section IV discusses the appropriateness of the PMG estimator approach, and Section V describes the econometric methodology and presents the results. Finally, Section VI concludes and provides policy recommendations.

II. Overview of Currency Unions

Regional economic integration has been a notable trend in the global economy in recent years. Several levels of this integration are possible. In sequence from least integrated to most integrated, they are a free trade area, a customs union, a common market, an economic union, and, finally, a full political union.

Economic theories of international trade predict that unrestricted free trade will allow countries to specialize in the production of goods and services that they can generate most efficiently. Also, opening a country to free trade stimulates economic growth and creates dynamic gains from foreign direct investment (FDI) inflows through the transfer of technological, marketing, and managerial expertise to host nations. Consequently, a growing number of countries are becoming partners in regional integration blocks, such as, the EU, the NAFTA, the MERCOSUR, and the ASEAN, among others.

On the other hand, regional integration leads to increasing interdependence of the partners' economies, with a higher likelihood of crisis contagion. This was the case in the European Union in 1992, Latin America in 1994, South East Asia in 1997, and Central and Eastern Europe in 1999.

In order to avoid or at least limit the risks of an exchange rate crisis, the members of a regional partnership should work on coordinating their exchange rate and monetary policies. The most advanced form of such coordination is the creation of a single currency.

The process of creating a common currency follows different stages of monetary cooperation; starting with a “currency area”, where currencies are freely exchanged at a constant rate; and followed by a “monetary union” characterized by a single currency and exchange rate vis-à-vis the outside world, a unified monetary market, and free movement of currencies and deposits at constant rates. Monetary union involves also common monetary and banking policies, a pool of foreign exchange reserves managed by one central bank, financial market integration (liberalized capital transactions, harmonized national financial regulations, structures, and institutions), and reasonable economic convergence. Monetary union has often been synonymous with an optimum currency area (OCA).

As a quick overview of the monetary arrangements in existence, the most advanced example of a union is the Euro area. In achieving the monetary union, the EU had to establish strict rules for the countries willing to join the common currency. These rules, known as the Maastricht convergence criteria, were reinforced by the implementation of the Stability and Growth pact in 1998. Despite its success, the process to create the Euro was long (starting in 1970 with the Werner Report), and did not go without turmoil, as evidenced in the 1992 crisis. It is also recognized that when the Euro was launched in 2002, the EU had not fully met all the criteria required by OCA theory, although the launch of the Euro enhanced European integration.

In Latin America, the absence of real exchange rate cooperation or coordination within the regional framework of the MERCOSUR trading block has repeatedly led to economic turmoil in Brazil and Argentina (Eichengreen, 1998). The agreement, ratified in 1991 had the objective of creating a common currency after a period of macroeconomic policy harmonization. Nonetheless, no substantial action has been noticed towards that end. As a result, when Brazil devalued its *real* in 1999, its goods became about 50 percent cheaper than those of its main trading partner, Argentina (Husson, 2001). The fixed peso-dollar exchange rate led to a significant loss in the competitiveness of the Argentinean exports, a growing current account deficit, a crisis of confidence, and the collapse of the currency board.

Facing similar issues, ASEAN member countries have included macroeconomic policy coordination on their agenda since the crisis in 1997 and proceeded in November 1999 to establish an Economic Review and Policy Dialogue, including Japan, China and Korea. On May 6, 2000, the finance ministers of 13 countries signed a multilateral financial cooperation agreement called the Chiang Mai Initiative (CMI)[2]. The principal tools on which the agreement relies are the ASEAN swap arrangement, the bilateral swap arrangements, and the repo arrangements. The objective of this sophisticated swap network is to provide immediate liquidity support for any member country that experiences short-run balance of payment deficits, in order to prevent systemic failure and subsequent regional contagion (Park, 2002).

Finally, in the MENA region, the GCC countries represent a unique case of advanced cooperation as they achieved a full customs' union in 2005 and are now committed to launch a common currency by 2010. Despite the vital importance of the GCC currency for its members and for the region, research on the subject is relatively sparse.

[2] The actual members of the Chiang-Mai Initiative are Japan, Korea, the People's Republic of China and the ten ASEAN countries: Brunei, Cambodia, Indonesia, the Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam.

When analyzing the prospective currency, most authors adopt the OCA criteria approach[3], while others expose the potential costs and benefits of the GC[4] or discuss its appropriate exchange rate regime.[5]

Our paper presents an innovative approach to determine the degree of policy harmonization among the GCC countries. We focus on identifying the impact of different macroeconomic variables on the RER behavior in each country and on analyzing whether these effects are similar in magnitude and direction.

III. DETERMINANTS OF THE RER BEHAVIOR

Theoretically, real exchange rate (RER) behavior is subject to the influence of many variables, such as monetary policy, government expenditure, terms of trade, degree of openness, and capital flows. In fact, the exchange rate is at the heart of economic activity as it affects and is affected by all other policies, making policy coordination and harmonization essential for the success of a common currency. Monetary policy ought to be conducted similarly in all countries for its impact on the exchange rate to be the same, given that different monetary frameworks in member countries can result in disparate impacts on the RER.

Consequently, it is important to measure the effects of monetary policy, the budget deficit, trade policy, and government consumption on exchange rate behavior for each country in the group in order to determine whether these effects are similar. If this is the case, we could expect a high level of harmonization among members' policies and could be more confident in the successful launch of the new currency. If this is not the case, and we find that these policies affect exchange rate behavior differently in each country, we should suspect *prima facie* that coordination is inadequate and there is a potential danger for the new currency, a situation that requires further harmonization of macroeconomic policies.

In this paper, we use the RER as the dependent variable to capture the relation between domestic and foreign inflation in the countries, given that nominal exchange rates are pegged to the U.S. dollar,[6] and that oil as the principal export is quoted in U.S. dollars as well.

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[3] See for example, Laabas and Imam (2002); Neaime (2005); Rutledge (2006); Abu-Bader, S., and A. S. Abu-Qarn (2006).

[4] Jadresic (2002), Badr-El-Din (2004).

[5] Abed, Erbas and Guerami (2003), Aleisa and Hammoudeh (2007).

[6] During the period from 1981 to 2006, the nominal exchange rate was fixed at 0.38 for one US dollar in Bahrain and Oman, 3.64 in Qatar, 3.67 in UAE, 3.75 in Saudi Arabia and oscillated between 0.31 and 0.29 in Kuwait. On December 31, 2002, Kuwait was the last of the GCC countries to peg its currency exclusively to the U.S. dollar, rather than to the currency basket to which it was previously attached for more than 25 years. On

(continued…)

The extensive literature on the calculation of RER misalignment identifies two main approaches to estimating the RER equilibrium, referred to in the literature by their acronyms BEER and FEER. The more commonly used one is based on a single-equation, reduced-form "behavioral" equilibrium exchange rate (BEER) model developed by Clark and MacDonald (1998). The model attempts to account for current account flow variables as well as factors influencing longer-run stock equilibrium.[7] The second approach is the "fundamental" equilibrium exchange rate (FEER) defined by Williamson (1994) as "… the RER path needed to achieve simultaneous internal and external balance by some date in the medium run future and maintain balance thereafter."[8]

Our focus in this paper is to establish a behavioral link between the real exchange rates and relevant economic variables in the GCC, and to evaluate and compare the RER misalignments. In this regard, the BEER approach is more appropriate given that it is precisely used to estimate a reduced-form equation that explains the actual behavior of the exchange rate in terms of some well-thought economic determinants. The long-run relationship between the exchange rate and the explanatory variables is derived and interpreted as the equilibrium exchange rate.

The selected explanatory variables (Table 1) are subject to data availability, policies under investigation, and suitability to the GCC countries' specificity. The time series with annual frequency from 1991 to 2005 are based on the *World Economic Outlook* (WEO) in the first place, and supplemented with data from the *International Financial Statistics* (IFS) and the *World Development Indicator* (WDI) databases where needed. For the purpose of our analysis and for data harmonization, variables are presented hereafter in logarithmic form, as indicated by an "L" preceding the variable under study.

RER index

The RER index is calculated with respect to the U.S. dollar as the ratio of tradables to nontradables, according to the following formula:

$$RER = NER * US\ CPI / Domestic\ CPI$$

May 20, 2007, the Governor of the Central Bank of Kuwait announced an ending of the peg to the dollar, using instead a basket of currencies to set the price of the Kuwaiti dinar. According to the Bank however, the US dollar is likely to make up about 75% of that new currency basket.

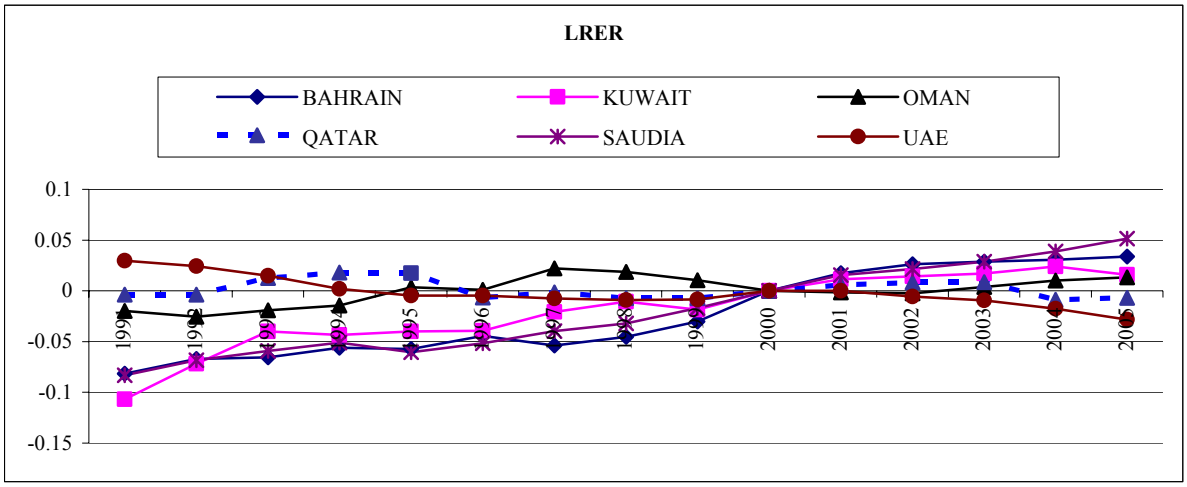
[7] See for example, Elbadawi (1994, 1997); Baffes, Elbadawi, and O'Connell (1999); Clark and MacDonald (1998); Dufrenot and Yehoue (2005); Paiva (2006); Iimi (2006); and Zalduento (2006).

[8] The FEER concept was originally proposed by Williamson (1985), and subsequently spawned a rapidly growing literature. See, for example, Williamson and Miller (1987), Isard and Faruqee (1998).

An increase (decrease) in the index means a depreciation (appreciation) of the RER. The year 2000 is the base year for both the nominal exchange rate and the consumer price index (CPI) of each country. NER = Number of local currency per one U.S. dollar (Figure 1). We do not focus on the real effective exchange rate because the GCC currencies have been, and in all likelihood will continue to be, pegged to the U.S. dollar, at least until the launch of the common currency.

Figure 1 shows that RERs in almost all GCC countries depreciated over time, which reflects a lower relative domestic inflation to the United States, while NERs were kept constant under the pegged regime. A simple correlation test shows that the RERs of Bahrain, Kuwait, and Saudi Arabia are highly correlated, while Oman's RER correlation with these three countries is lower, and that of Qatar is not correlated with any of the countries in the sample (Table 2). Moreover, the negative correlations of the United Arab Emirates (UAE) illustrate that inflation in this country was relatively higher, and therefore the behavior of their RER was in an opposite direction compared with the other countries.

Figure 1. Calculated LRER



Monetary policy

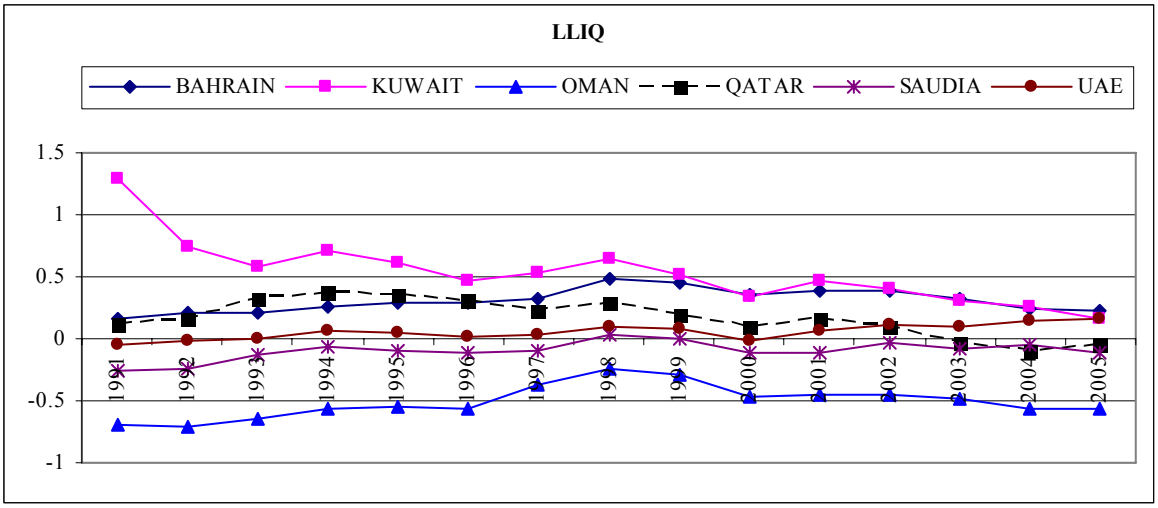
Since the RER is a relationship between national and international prices, any variation in the monetary base that induces a price level change different from the international price level change will provoke a variation in the RER. As the quantity theory of money puts it, the price level is directly related to the stock of money or monetary base (Fisher, 1911). The "economic trilemma triangle", presented by Robert Mundell (1967), also points that a fixed exchange rate is incompatible with an activist monetary policy directed toward output stabilization, in the context of free capital movements. Within the existing fixed exchange rate in the GCC countries, the monetary policy is linked to that of the US which reduces the effect of interest rates on the RER behavior.

Still, with the increase of capital flows resulting from the recent raise in oil prices, we should expect an increase in the stock of net foreign assets (NFA) and consequently, an increase in the money base (money supply), which could be higher than the increase in money demand, leading to inflationary pressures. This has been clearly the case in the recent years of high oil prices, as the money supply increased at double-digit figures in each of the GCC states (as high as 34% in Qatar and the UAE).

To capture the effect of oil price variations on inflation, we use the liquidity to gross domestic product ratio (Broad Money to GDP) as a proxy for the monetary policy. An increase in the liquidity ratio (LIQ) will lead to an increase in prices and an appreciation of RER (decrease in the value of RER).

As can be seen from Figure 2, the money supply growth in the GCC countries has been converging, though the correlation matrix in Table 3 shows that over the studied period the countries have experienced some disparities. For example, Qatar shows no correlation with any other country, and Oman is only correlated with the UAE with a negative sign. Besides with Oman, the UAE is only correlated with Saudi Arabia. Finally, Saudi Arabia, Kuwait and Bahrain are strongly positively correlated.

Figure 2. Monetary Policy Indicator - Broad Money to GDP



We also note that for almost all variables, Kuwait starts the period at a significantly higher level but converges rapidly toward the others within a year or two, a phenomenon largely attributed to the first Gulf war effect.

The budget balance

The way the budget deficit is financed is crucial in determining whether inflationary pressures are likely to arise (Rahman, Mustafa, and Bailey, 1996). Financing by internal borrowing or taxation is likely to depress private spending counteracting the rise in government spending, which makes the net effect on the general price level rather ambiguous. Alternatively, financing by external borrowing may subdue the inflationary pressure by improving the supply of goods through increased imports. In contrast, any monetization of the budget deficits will intensify the inflationary pressure.

But, in the case of the GCC countries, it is a fiscal surplus, not a fiscal deficit that could be conducive to inflation[9]. The source of the budget surplus is the oil revenue, not increased taxes or decreased government spending. Consequently, the decrease in net domestic assets is offset by an increase in net foreign assets. Since the NFA effect tends to be even more important, the monetary base can even increase, leading to inflationary pressures.

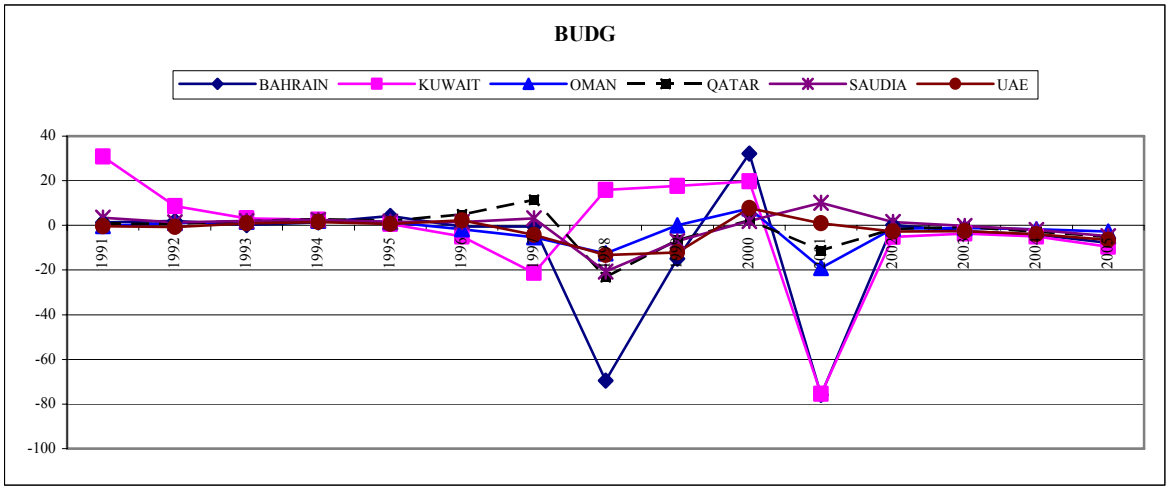
Moreover, the GCC countries rapidly transformed the accumulated fiscal surpluses into government expenditures (both current and capital), increasing aggregate demand, and therefore initiating demand-pull inflation. Finally, the fiscal surpluses also led to the increase of public sector wages (double-digit increases in recent years), and consequently to the increase of private sector wages, spurring cost-push inflation.

These combined effects explain our assumption of a negative relation between the budget balance and our calculated RER in the long run, which means that an increase in budget balance will lead to RER appreciation. The variable BUDG in our model is a proxy for the budget balance (general government balance / GDP).

The graphical analysis of the BUDG variable (Figure 3) reveals several behavioral disparities with significant outliers for most of the period under study, while a clear trend toward convergence in BUDG is only noted in more recent years. In terms of the correlation matrix, Kuwait is not correlated with Saudi Arabia, Qatar, and the UAE, so as Saudi Arabia with Bahrain and Oman, and also Oman with the UAE (Table 4).

[9] A standard theoretical argument advocates that a budget surplus would reduce the central bank's claims on the government, reduce the net domestic assets and therefore lead to a decrease in the monetary base and to deflationary pressures.

Figure 3. Budget Balance to GDP



The Balassa-Samuelson effect

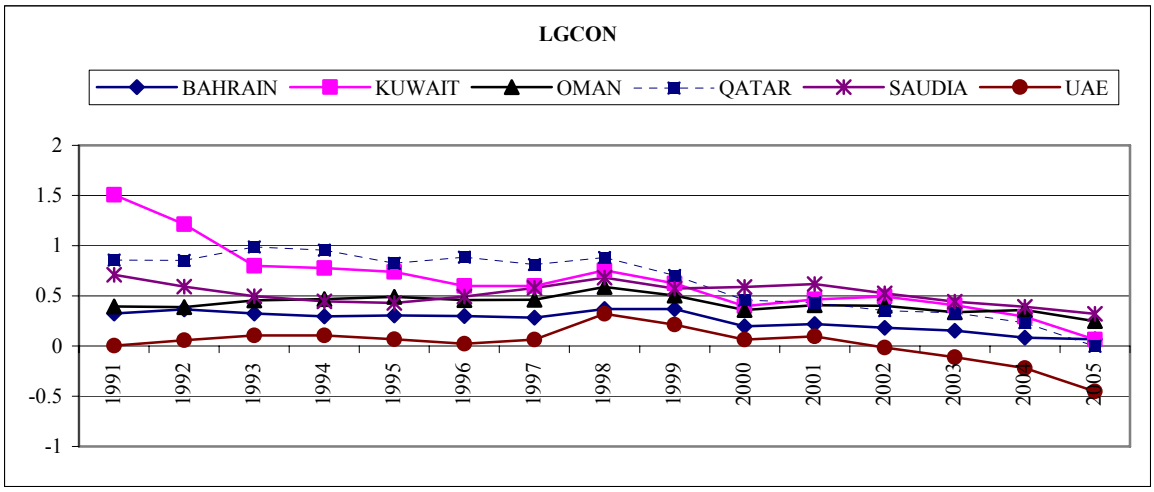
The relation between the price of tradable to nontradable goods is proxied by the government consumption variable (GCON) that represents an important part of the demand for both tradable and nontradable goods (Figure 4).[10] While we cannot determine *a priori* the expected sign of the GCON coefficient, a government consumption biased in favor of nontradables means that an increase in GCON will lead to an increase in the prices of nontradable goods and an appreciation of the RER. If government consumption is dominated by tradables, the effect of an increase in GCON on the RER is likely to be in the direction of depreciation.[11]

The behavior of this variable seems rather homogeneous (Table 5), the only exceptions being Kuwait with Oman and the UAE, while Saudi Arabia is borderline correlated with Oman and Qatar (where the coefficients of correlation are 0.48).

[10] Including government consumption as a determinant of the real exchange rate is standard in the literature. Égert, Halpern, and MacDonald (2004) list a number of papers that find a statistically significant positive effect of government consumption on the real exchange rate, in the sense that an increase in government expenditures leads to an appreciation of the RER.

[11] Oomes (2005) states that the intuition behind this result is that, to the extent that government spending is biased towards nontradables, an increase in government consumption is likely to lead to a rise in the relative price of nontradables, and therefore to real appreciation. Of course, one could argue that government spending will eventually have to be financed through higher taxes, which would offset the effect on real appreciation through a decline in disposable income and therefore to a fall in the relative price of nontradables, assuming that the demand for nontradables increases with disposable income. However, as Edwards (1989) has argued, the first effect (appreciation) is likely to dominate the second effect, as generally confirmed by empirical studies.

Figure 4. Government Consumption to GDP



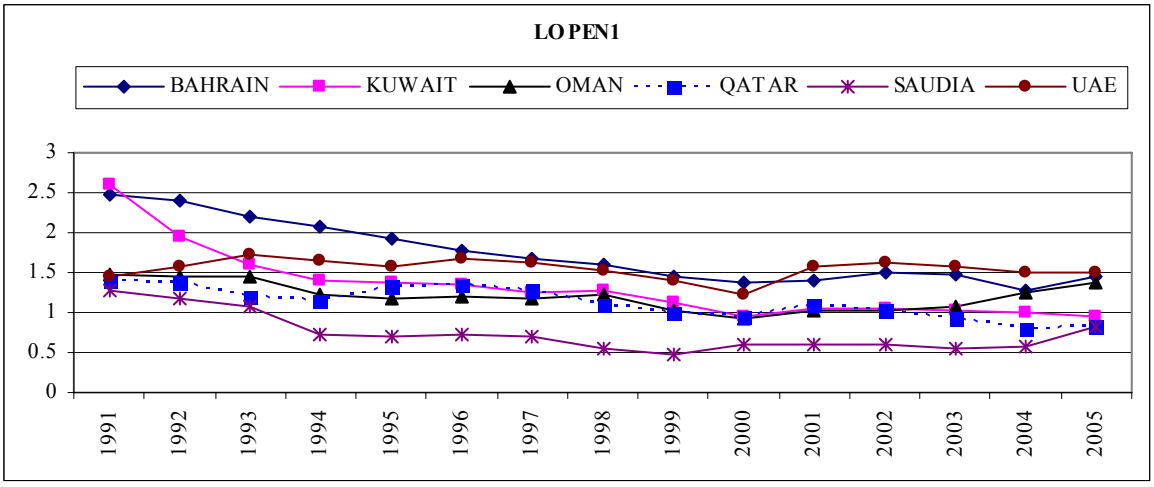
The degree of openness

The growing degree of openness is consistent with decreasing capital controls, a process which creates higher possibilities for fluctuations in capital flows. Increased openness will lead to higher capital flows for imports, exports, and investments. Yet, economic theory is ambiguous about the exact effect of a commercial liberalization and, *a priori*, there is uncertainty regarding the sign attached to that variable (Edwards, 1992).

The common proxy used in the literature to measure the country's trade openness is the variable OPEN (total trade as percentage of GDP), despite an important caveat that it can be biased in the context of oil exporting countries (Kamar, 2006). Total trade includes both imports and exports. If oil prices increase, exports will increase, and the proxy OPEN will also increase, reflecting a misleading impression of more openness, while a decrease in oil price would incorrectly indicate a decrease in openness. To avoid the impact of oil price fluctuations on GCC exports and a possible misleading impression of openness, we use another proxy, measured by imports to GDP, which we refer to as OPEN1 (Figure 5).

Regarding trade openness, the only outliers are the UAE being not correlated with any other country, and Qatar being not correlated with Oman. All other countries are strongly and significantly correlated as shown in Table 6.

Figure 5. Trade Openness



Capital flows

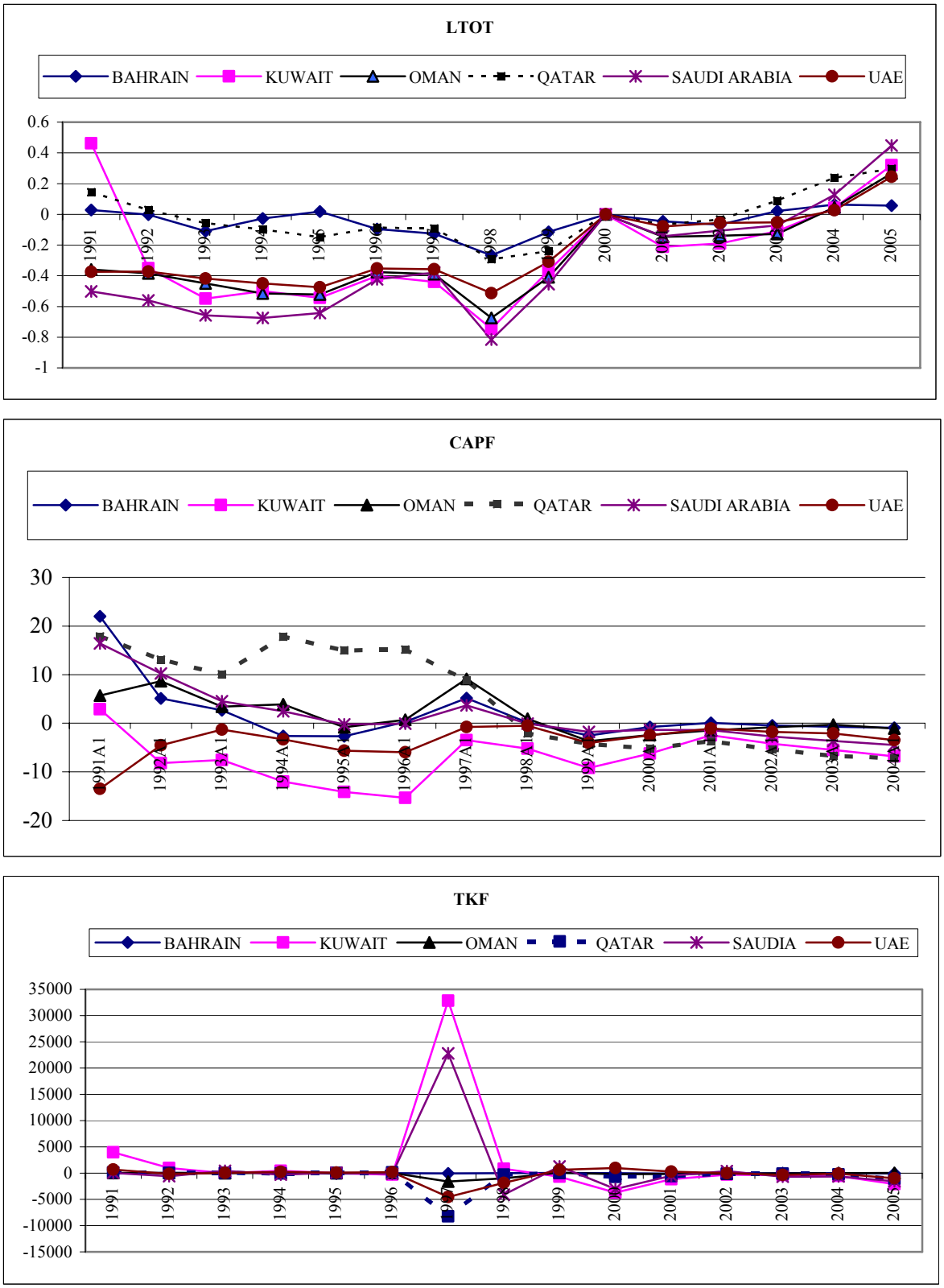
The general literature uses terms of trade (TOT), which represent the relative price of exports to the price of imports, as an indicator of capital flows. An increase in the international price of a country's exports, in this case an increase in oil prices, can lead to an increase in capital inflows. Capital mobility and capital controls are hard to measure, as pointed out by several authors (Obstfeld, Shambaugh and Taylor (2003) and Edwards (1992)).

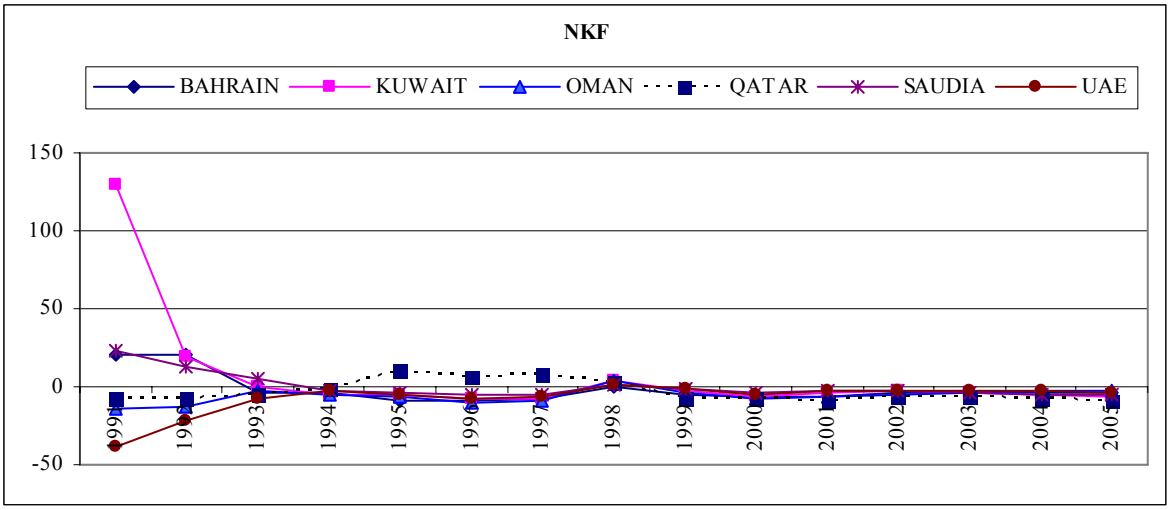
For this reason, we also examine alternative measures of capital flows. The first one is another common proxy for capital flows (CAPF), measured by the inverse sign of the current account balance. The second one is proxied by the IMF WEO measure of total capital flows (TKF). The third proxy is net capital flows (NKF), measured by the inverse sign of the resource balance. It aims to account for transfers, particularly workers' remittances (Kamar, 2006), as this type of transfer reflects a significant part of capital outflows in the GCC countries. In addition, we tested another measure of capital flows captured by the net foreign assets (NFA), as proposed by Clark and MacDonald (1998).

Moreover, in light of the important role played by the GCC central banks interventions through change in international reserves to neutralize the impact of net capital flow fluctuations on exchange rate behavior, we use total reserves to GDP ratio (RESY) to capture the impact of the reserves on RER behavior (Figure 6). An insignificant effect of the capital flows proxies may be the result of central bank interventions.

Overall, the different capital flows proxies reveal certain disparities. The TOT variable represents the most harmonized development, with all variables being positively correlated. For the TKF proxy, Bahrain has no correlation with any other country, and some countries exhibit negative correlations.

Figure 6. Measures of Capital Flows

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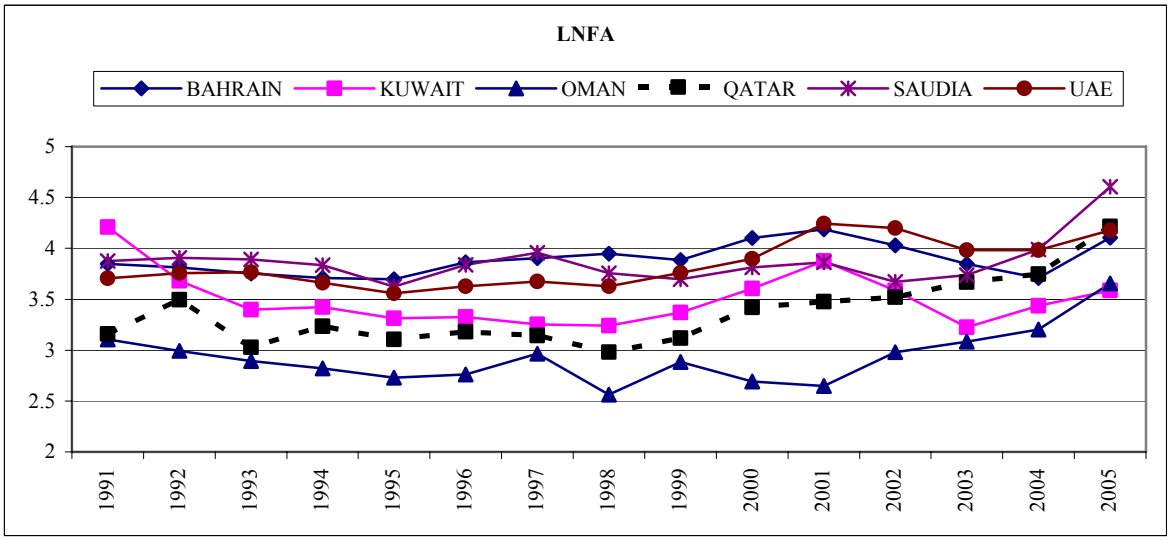
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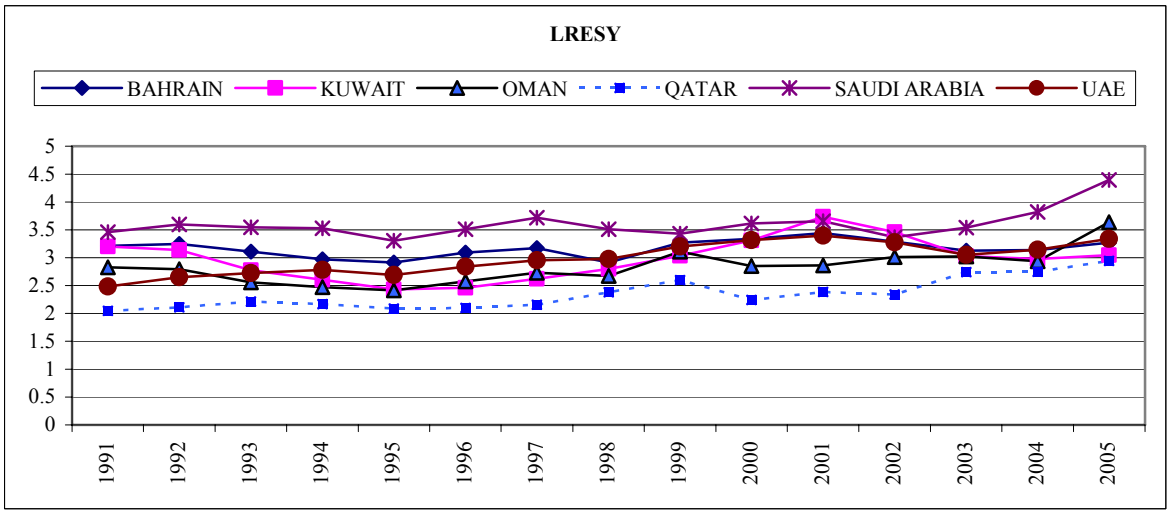
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Regarding the CAPF variable, Kuwait is only correlated with Bahrain, while Bahrain is not correlated with Qatar, and the UAE is not correlated with Oman. It is also worth noting that the UAE, when correlated, exhibits negative signs. The only outlier for the NKF variable is Qatar, while Oman and the UAE exhibit negative correlations with all other countries. The NFA variable presents the most divergent results. The only countries that are correlated are Qatar, Saudi Arabia and Oman, and individually UAE with Bahrain and with Qatar. Finally, for the reserves proxy, Saudi Arabia is not correlated with Bahrain, Kuwait and the UAE, while Qatar diverges from Bahrain and Kuwait (Table 7).

IV. THE ECONOMETRIC METHODOLOGY

As already noted, variables are presented in their logarithmic forms unless specified otherwise—as for example where they display negative values. The explanatory variables are taken to be relative to the United States values. We specify the estimated equation as follows:

$$
\begin{aligned}
&Log\ (\text{Real Exchange Rate}) \\
&= \alpha_{0,i} + \alpha_1 * Log(\text{broad money divided by GDP relative to the same variable for the USA}) \\
&\quad + \alpha_2 * Log(\text{openess of the economy relative to the openess of USA economy}) \\
&\quad + \alpha_3 * Log(\text{government consumption divided by GDP relative to same variable for the USA}) \\
&\quad + \alpha_4 * Log(\text{state budget divided by GDP relative to same variable for USA}) \\
&\quad + \alpha_5 * Log(\text{capital flows divided by GDP relative to same variable for USA})
\end{aligned}
\qquad (1)
$$

where the constant term $\alpha_{0,i}$ is allowed to differ between the countries in the sample, denoted by i.

Different estimation methods are available to estimate Equation (1) using panel data. One approach is to estimate a simple static fixed effects model, in which the slope coefficients are assumed to be similar and a different constant-fixed effect is included for each country. If the variables are nonstationary, however, other estimators may be more efficient. Furthermore, in the presence of dynamic effects and slope heterogeneity, the use of standard panel data tools, such as the fixed effect estimator, may lead to inconsistent estimates and potentially misleading inferences (Pesaran and Smith, 1995).

Over the last decade or so, a booming cointegration literature has focused on the estimation of long-run relationship among I(1) variables, but this literature involves two misconceptions (Loaysa and Ranciere, 2005). The first is that a long-run relationship exists only in the context of cointegration of integrated variables. The second is that standard methods of estimation and inference are incorrect. Pesaran and Smith (1995) and Pesaran and Shin (1999) have argued against both misconceptions and have proposed methods that are valid whether or not the variables of interest are I(0) or I(1). Under these conditions, other methods that can estimate the long-run relationship include the mean group (MG) estimator

(Pesaran and others, 1996), the pooled mean group (PMG) estimator (Pesaran and others, 1999) and the fully modified OLS (FMOLS) estimator (Pedroni, 1995, 1999).

In this paper, we compute the PMG estimator because it has been developed in particular for a panel comprising a comparatively small number of groups and not too small a number of periods. Pesaran and others (1999) apply the PMG estimation method for two periods. For the smaller of these periods, the number of countries (N) =10 and the number of years (T) =17. The panel of countries used here has a dimension of N=6 and T=14.

In the context of testing the convergence of GCC countries toward a common currency, the PMG methodology is useful to assess whether monetary, fiscal, trade, and financial policies of GCC countries have identical effects on the RER in the long run. The main benefit of the PMG procedure for our case is that it constrains only the long- run coefficients to be identical across groups. Pesaran and others (1999) have proved that this weak homogeneity assumption is better than the strong assumption required by fixed effects, Instrumental Variable or Generalized Method of Moment. For instance, a significant coefficient for monetary policy in the long run indicates that this specific policy affects in similar ways the real exchange rate in the region. Conversely, a non-significant coefficient for a policy variable is clear indication that cooperation should be strengthened in order to ease the convergence to a currency union.

To describe the PMG estimator, let us assume an autoregressive distributive lag (ARDL) (p, q,…q) dynamic panel specification of the form:

$$Y_{it} = \sum_{j=1}^{P} \lambda_{ij} Y_{i,t-j} + \sum_{j=0}^{q} \delta'_{ij} X_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (2)$$

where the number of groups, i=1,2,…, N, the number of time periods, t=1,2,…, T, x_{it} is a (kx1) vector of explanatory variables, δ_{it} the (kx1) coefficients vectors, λ_{ij} scalars, and μ_i is the group specific effect. Time trends and other fixed regressors may be included.

If the variables in Equation (1) are, for example, I(1) and cointegrated, then the error term is an I(0) process for all i. The model can be rewritten in the following error correction model (ECM) form by stacking the time-series observations:

$$\Delta Y_{it} = \phi_i \left(Y_{i,t-1} - \theta_i^{'} X_{it} \right) + \sum_{j=1}^{P-1} \lambda^{*}_{ij} \Delta Y_{i,t-1} + \sum_{j=0}^{q-1} \delta'^{*}_{ij} \Delta X_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (3)$$

where $\phi i = -\left(1 - \sum_{\mathrm{j}=1}^{\mathrm{p}} \lambda_{\mathrm{ij}}\right)$, $\theta_i = \sum_{j=0}^{q} \frac{\delta_{ij}}{1 - \sum_k \lambda_{ik}}$, $\lambda^{*}_{\mathrm{ij}} = -\sum_{m=j+1}^{p} \lambda_{im}$ $\quad \mathrm{j} = 1,2,...,\mathrm{p}\text{-}1$

and $\delta^{*}_{\mathrm{ij}} = -\sum_{m=j+1}^{q} \delta_{im}$ $\quad \mathrm{j} = 1,2,...,\mathrm{q}\text{-}1.$

The parameter ϕ_i is the error-correcting speed of adjustment term. If ϕ_i=0, then no long-run relationship is expected to take place. This parameter is expected to be significantly negative under the hypothesis that the variables show a return to long-term equilibrium. Of particular importance is the vector $\theta_i^{'}$, which contains the long-run relationship between variables.

To derive the parameters in Equation 3, we use a maximum likelihood approach to maximize the log-likelihood function by means of the Newton-Raphson algorithm (further details can be found in Pesaran and others, 1999).
Alternatively, we can perform the estimation of the long-run parameters by the Mean Group Estimator (MG), which is an unweighted average of country specific long-run coefficients. Although this estimator yields consistent estimates, it is very sensitive to outliers.
For example, the MG estimator of the error correction coefficient ϕ is:

$$\hat{\phi} = N^{-1} \sum_{i=1}^{N} \phi_i \text{ with the variance } \hat{\Delta}\hat{\phi} = \frac{1}{N\left(N-1\right)} \sum_{i=1}^{N} \left(\hat{\phi}_i - \hat{\phi} \right)^2 \qquad (4)$$

We use a Hausman type test applied to the difference between the MG and the PMG estimates to test the poolability restriction of the long-run parameters. Pesaran and others (1999) argue that pooled mean group estimates are consistent and efficient only if homogeneity holds. Conversely, if the hypothesis of homogeneity is rejected, the PMG estimates are not efficient. In that case, the MG estimators would normally be preferred. Thus, we can form the test statistic:

$$H = \hat{q}' \left[\mathrm{var}\left(\hat{q}\right) \right]^{-1} \hat{q} \sim \chi_k^2, \qquad (5)$$

where $\hat{q}$ is a (kx1) vector of the difference between the MG and PMG estimates, and var($\hat{q}$) is the corresponding covariance matrix. Under the null hypothesis that the two estimators are consistent, but one is efficient (PMG estimator), var($\hat{q}$) is easily calculated as the differences between the covariance matrices for the two underlying parameter vectors. If the poolability assumption is not valid, the PMG estimates are no longer valid and we fail the test.

V. Estimation and Interpretation of the Results

We first test whether the variables used in our estimations are non-stationary and the estimated equations are actually cointegrated. To perform this, we use a panel unit root test developed by Hadri (2000), which is an extension of the Kwiatkowski and others (1992) test to a panel with individual and time effects and deterministic trends (PKPSS test). The test has as its null the stationarity of the series. In general, our estimates of the panel unit root tests confirm that the variables contain a unit root (Table 8).[12]

After we identify the order of integration, we estimate equation (1) using the pooled mean group estimator. For comparison, we display the results of the mean group estimator. A joint Hausman test is used to determine whether common long-run coefficients are applicable to the whole sample. Rejection of the null hypothesis suggests that the sample is too heterogeneous to be pooled. In these estimations, we use the RER of the domestic currency relative to the U.S. dollar as the dependant variable.

A. Estimation of the Long-Run Determinants of the RER Behavior in the GCC

Table 9 shows estimation results for the two estimators. With regards to long-run coefficients, we can see that all parameters estimated using the PMG estimator are highly significant (over 99 percent confidence). When comparing these results with the alternative estimators, we confirm that the PMG estimator provides a better match for the data and our theoretical model. We can also see that, as expected after Hausman's tests, the very restrictive mean-group estimator is not consistent with the data: the estimated parameters are not significant at the 90 percent confidence level.

When we performed our tests, we started by testing the relation between the monetary variable and the RER, where we found a significant relation. We then started adding the other variables one at a time and kept the variables that appeared significant. Adding new variables has not affected the coefficients of the existing ones in the model, nor their significance, reflecting a high degree of robustness. We tried different combinations by adding the variables that were previously insignificant to check if they become significant when included in a different set. The results always showed the non-significance of these variables. That is why we kept them out of the final model presented in Table 9.

[12] A similar result applies to the IPS test (Im and others 2003), although there is some evidence with this test that the variable BUDG is stationary when time dummies are not included. However, their inclusion would seem to be important for our sample, given the importance of turmoil in the region.

B. Interpretation of the Results

The estimated cointegration represents the relation between the real exchange rates and their common determinants. As we can see from the results in Table 9, government consumption, the degree of openness, the budget balance and the liquidity in the estimated cointegration relation have a significant and negative impact on RER indices in the long run. This goes to show that the GCC member countries have succeeded in harmonizing these indicators, and in establishing some important prerequisites for a successful monetary union. A negative sign means that an increase in a given variable leads to a decrease in the index (an appreciation of the RER).

The government consumption (GCON) has the highest negative impact on RER, where a 1 percent increase in GCON in the GCC compared with the U.S. will lead to an appreciation of the RER by 0.22 percent. This suggests that government consumption could be used as an efficient tool to manage inflation. Moreover, the GCC governments should pay particular attention to coordinating their spending policies so as to avoid asymmetric impacts on inflation differentials.
The degree of openness (OPEN1= imports to GDP) has a similar impact on the RER, in terms of both sign and magnitude. The GCC countries have adopted common trade policies in 1981 and have since achieved a high degree of trade liberalization. Furthermore, the ongoing free trade negotiations between the GCC members and third parties should be ratified by all members in order to maintain a similar impact on inflation differentials.

Liquidity has a negative impact as well, where a 1 percent increase in LIQ in the GCC compared with the U.S. will lead to an appreciation of the RER by 0.15 percent. The control of money supply growth is a challenge for the GCC countries within the actual context of high oil prices, leading to a continuous sharp increase in net foreign assets that could be costly to sterilize. Nevertheless, the GCC countries need to implement coordinated measures to control the growth of the monetary base in order to contain inflation.

The budget balance has also a negative but small impact, whereby a 1 percent increase in BUDG in the GCC compared with the U.S. results in merely 0.03 percent appreciation of the RER. While this impact is too small, it is constantly significant at the 1% level in all alternative model specifications. Its negative sign corroborates our assumption that part of the GCC inflation was driven by their fiscal surplus.

The error correction term has the negative sign that signals the conversion toward equilibrium, and the speed of adjustment seems low as the coefficient is only -0.35. This value is consistent with the results obtained in most of the research applied using the same methodology on different groups of countries.

In the short run, only OPEN1 is significant with a positive sign and a very small coefficient. Since we concentrate on the long-run relation, we do not wish to focus our attention on the short-run variables because the methodology does not allow for changing the variables of our models to identify which variables affected RER behavior in the short run.

We can see from our test that variables reflecting capital flows have no impact on RER behavior in the long run. This confirms our intuition that GCC central banks have been using their reserves to reduce the potential impact of capital flow fluctuations on the RER. The fact that the reserves have no impact as well confirms this hypothesis.

Still, as the methodology we used has its limits, we cannot determine whether some variables are non-significant because the impact of these variables on the RER differs in each country or because they have effectively no impact at all on RER behavior. For example, if capital flows have a significant impact on RER in three of the six GCC countries, the methodology will reject the variable and deem it non-significant in the long run, without determining if it had any impact in any country.

We would have also performed time-series tests for each country individually and compared the coefficients to better emphasize the specificity of each country[13]. Nevertheless, the lack of sufficiently long time series for all the needed variables for the six countries prevented us from applying, for example, the VAR Cointegration.

C. RER Equilibrium and Misalignment

In our paper, we use the previous cointegration results to calculate the RER equilibrium and misalignment for the GCC countries in order to check whether the difference between the misalignments has been decreasing over time[14]. If the RER is overvalued by 30 percent in one country and undervalued by 30 percent in another, this may indicate problems of exchange rate management and of ineffective policy coordination that need correction. If the RER overvaluation in the first country decreases to 10 percent over time and the undervaluation of the other country decreases to 10 percent as well, for example, these changes would signal a convergence toward common levels of misalignment, which in turn would indicate clear movement toward deeper coordination and harmonization of policies.

[13] See Kamar and Bakardzhieva, 2006, for a time-series cointegration analysis applied to only four of the GCC countries.

[14] In the real exchange rate behavior literature, one common approach to calculate the RER equilibrium and misalignment is based on the permanent components of its underlying long run determinants.

Using our model, we proceed to construct indexes of equilibrium real exchange rates (ERER) and real exchange rate misalignments (RERMIS), which is now common practice in the literature.[15]

- Assume that the real exchange rate at any time t is given by $\log e_t = \hat{\alpha} + \hat{\beta}' F_t$, where F stands for the long-run fundamentals and the corresponding parameters are the estimated regression coefficients;
- Using time series decomposition (e.g. Hodrick-Prescott procedure) decompose the fundamentals into permanent ($\widetilde{F}$) and transitory ($F - \widetilde{F}$) components;
- Construct the equilibrium RER: $\log \widetilde{e}_t = \overline{\alpha} + \hat{\beta}' \widetilde{F}_t$, where $\hat{\beta}'$ are the coefficients estimated in the long-run regression and $\overline{\alpha}$ is the intercept that reflects the specificity of each country, only when significant;
- Finally, the RER misalignment is given by $rermis(t) = (\log e_t - \log \widetilde{e}_t).100\%$, where positive values indicate RER undervaluation and negative ones RER overvaluation.

The calculation of the RER misalignment could be subject to many critics, as different methodologies could result in disparate misalignment magnitudes. Also, changing the base year for calculating the equilibrium leads to different interpretations of the misalignment[16].

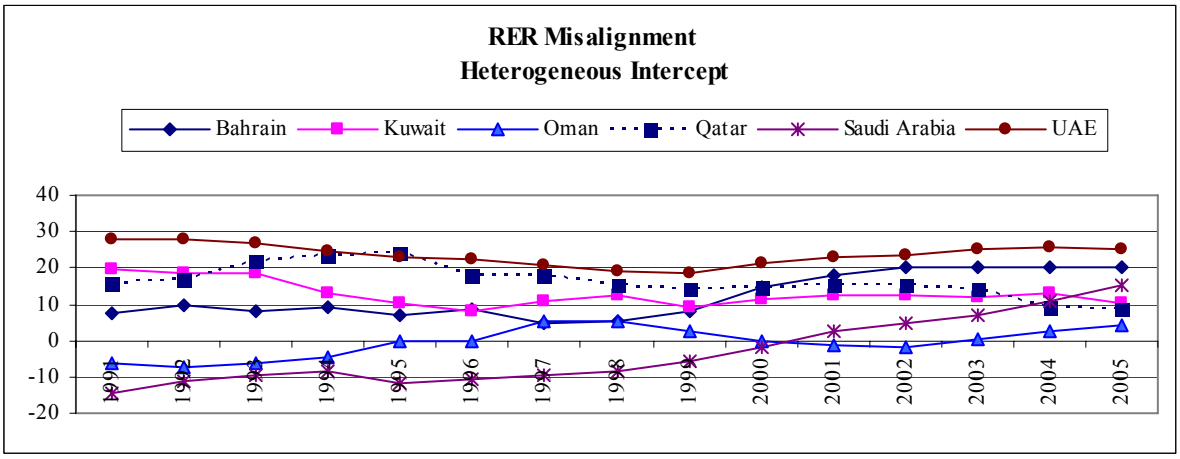
In our research, we do not face these problems, as we are indifferent to the degree of misalignment and the level of under /overvaluation itself. We rather focus our interest on the behavior of the misalignments among the countries and whether or not they are converging over time. We do not make any use of the RER equilibrium, except as a common benchmark for calculating the misalignment. Moreover, using a similar model, methodology and variables in identifying the long run relations allow us to deduce reliable measures of misalignments without getting into the controversial aspects of the equilibrium measures.

As we can see from Figure 7, overall misalignments converged over the period, and the misalignment differences between the two polar countries declined by 50%. This could be considered an additional clear sign of successful macroeconomic policy coordination.

[15] See, for example, Elbadawi (1994); Elbadawi and Soto (1997, 2005).

[16] Not everyone agrees with the equilibrium exchange rate view. Deviations of RER from what the fundamentals can explain might represent our ignorance, especially if these deviations are sizable and persistent over time.

Figure 7. RER Misalignment



While the largest difference, between Saudi Arabia and UAE, was more than 42 percentage points in 1992, it declined to only 21 percentage points between UAE and Oman in 2005. This decline of the misalignment reflects clearly the effective steps taken toward harmonizing macroeconomic policies, in a way that reduced the overall misalignment and reduced as well the difference of misalignments between the different countries. Still, more efforts are needed to minimize the misalignments and bring the RER in all countries closer to equilibrium.

VI. Conclusions and Policy Recommendations

The results of the long-run estimation of the RER equilibrium show that the main variables which affected RER behavior in a similar way during 1991─ 2005 in the GCC countries were liquidity to GDP, budget deficit, government consumption, and degree of openness. The increase of any of these variables led to a RER appreciation. Furthermore, the absence of any significant effect of the proxies for capital flows in our model could be due to the absence of a common impact over the six GCC countries or to the systematic use of central banks' reserves as a way to neutralize the impact of capital flow fluctuations, especially since all countries had fixed exchange rates. The similarity of the impact of each indicator on each country's RER behavior clearly reflects a high level of policy coordination and harmonization within the group.

We also computed the RER equilibrium and calculated its misalignments for the six countries and the results clearly indicate a convergence of misalignments over time, as the largest difference in misalignment between any two countries decreased by half. While these factors indicate deeper coordination of policies in a way that reduced the misalignment and led to its convergence among the countries, the difference between the two extremes is still almost 21 percentage points based on our calculations, and this would seem to require further coordination and policy harmonization.

If the GCC are to meet the deadline of 2010 to launch the GC, it is indispensable to increase the level of macroeconomic policy harmonization. In that sense, we might recommend that the GCC countries start working on the creation of an independent “Gulf Central Bank” that would be responsible for conducting monetary policy, with control over liquidity in all countries until the GC is launched. It is also highly advisable that the GCC start publishing regularly their main macroeconomic statistics in order to allow analysts to conduct the required research in tracking the progress of policy coordination. Doing so would let analysts provide policy makers in the GCC with timely assessments of the feasibility of the GC and so guarantee its eventual success.

Table 1. Variables Definition

Variable	Definition	Source
RER	Real Exchange Rate Index = The ratio of the foreign (US) wholesale price index, multiplied by the nominal exchange rate (NER), to the domestic consumer price index 2000 = 1 for the index.	Authors' Calculation based on WEO data
GCON	Government Consumption = Public Consumption Expenditure / GDP (current, local currency)	Authors' Calculation based on WEO data
BUDG	Budget Balance = General government balance / GDP (current, local currency)	Authors' Calculation based on WEO data
LIQ	Liquidity = Broad Money / GDP (current, local currency)	Authors' Calculation based on WEO data
OPEN	Degree of Openness = (Imports + Exports) / GDP (Constant, Local Currency)	Authors' Calculation based on WEO data
OPEN1	Degree of Openness = Imports / GDP (Constant, Local Currency)	Authors' Calculation based on WEO data
TOT	Terms of Trade (Price of Exports to the Price of Imports), Index 2000=1	WEO
CAPF	-(Current Account Balance / GDP) (Current, USD)	Authors' Calculation based on WEO data
TKF	Total Capital Flows (Net) (Current, USD)	WEO
NKF	Net Capital Flows = Balance on goods and services (resource balance) / GDP (Current, USD)	Authors' Calculation based on WEO data
NFA	Net Foreign Assets (current, local currency)	IFS – 2006
RESY	Stock of reserves at year-end / GDP (Current, USD)	Authors' Calculation based on WEO data

Source: World Economic Outlook (April 2006) and International Financial Statistics (June 2006)

Table 2. Real Exchange Rate Correlation

LRER	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDIA	UAE
BAHRAIN	1	0.8997	0.42172	-0.1249	0.98358	-0.6905
KUWAIT		1	0.6417	-0.0584	0.92129	-0.8271
OMAN			1	-0.3757	0.51019	-0.844
QATAR				1	-0.1877	0.19181
SAUDIA					1	-0.7561
UAE						1

Table 3. Liquidity Correlation

LLIQ	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDIA	UAE
BAHRAIN	1	0.93561	-0.3146	0.1357	0.77202	0.3408
KUWAIT		1	-0.3085	0.08713	0.80847	0.42788
OMAN			1	0.4433	-0.498	-0.6637
QATAR				1	0.07065	-0.4157
SAUDIA					1	0.69903
UAE						1

Table 4. Budget Balance Correlation

BUDG	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDIA	UAE
BAHRAIN	1	0.524948	0.940737	0.802481	0.320338	0.508784
KUWAIT		1	0.703146	0.07614	-0.46686	-0.12047
OMAN			1	0.614238	0.12201	0.399196
QATAR				1	0.656032	0.60254
SAUDIA					1	0.778416
UAE						1

Table 5. Government Consumption Correlation

LGCON	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDIA	UAE
BAHRAIN	1	0.7564	0.7966	0.9191	0.6338	0.844
KUWAIT		1	0.3785	0.7453	0.6325	0.4848
OMAN			1	0.7686	0.4734	0.8872
QATAR				1	0.4797	0.7602
SAUDIA					1	0.7066
UAE						1

Table 6. Openness Correlation

LOPEN1	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDIA	UAE
BAHRAIN	1	0.91617	0.74217	0.81089	0.87307	0.35483
KUWAIT		1	0.71116	0.75478	0.86294	0.13668
OMAN			1	0.41554	0.8415	0.37909
QATAR				1	0.60382	0.37979
SAUDIA					1	0.2213
UAE						1

Table 7. Capital Flows Correlation

LTOT	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDIA	UAE
BAHRAIN	1	0.71301	0.64748	0.80593	0.58273	0.55163
KUWAIT		1	0.75166	0.84234	0.7079	0.68428
OMAN			1	0.80028	0.98681	0.98314
QATAR				1	0.74636	0.71064
SAUDIA					1	0.98578
UAE						1
CAPF	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDIA	UAE
BAHRAIN	1.0000	0.6599	0.5800	0.4366	0.8749	-0.7204
KUWAIT		1.0000	0.2169	-0.2856	0.3733	-0.1376
OMAN			1.0000	0.6497	0.7583	-0.1895
QATAR				1.0000	0.7068	-0.5492
SAUDIA					1.0000	-0.6603
UAE						1.0000
TKF	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDIA	UAE
BAHRAIN	1	-0.1100	0.20179	0.21006	-0.1391	0.20078
KUWAIT		1	-0.8227	-0.9455	0.9703	-0.855
OMAN			1	0.84514	-0.7236	0.89725
QATAR				1	-0.9404	0.87253
SAUDIA					1	-0.7835
UAE						1
LRESY	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDIA	UAE
BAHRAIN	1	0.83741	0.58596	0.22753	0.30164	0.57012
KUWAIT		1	0.51226	0.26735	0.12287	0.54989
OMAN			1	0.80432	0.6936	0.63278
QATAR				1	0.62575	0.66893
SAUDIA					1	0.42173
UAE						1
NKF	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDIA	UAE
BAHRAIN	1	0.789874	-0.53403	-0.35084	0.923669	-0.86623
KUWAIT		1	-0.53822	-0.20426	0.894768	-0.90524
OMAN			1	-0.00891	-0.52616	0.788139
QATAR				1	-0.2394	0.164486
SAUDIA					1	-0.90745
UAE						1
LNFA	BAHRAIN	KUWAIT	OMAN	QATAR	SAUDIA	UAE
BAHRAIN	1	0.33408	0.01392	0.37091	0.29036	0.66322
KUWAIT		1	0.18149	0.1739	0.18496	0.32514
OMAN			1	0.76245	0.77278	0.41767
QATAR				1	0.68953	0.76249
SAUDIA					1	0.37237
UAE						1

Table 8. Panel Unit Root Tests

Hadri's heterogeneous panel unit root tests		
Variables	Test statistic	(p-value)
lrer	3.704	(0.000)
lliqus	3.119	(0.000)
lopen1us	3.377	(0.000)
lgconus	3.595	(0.000)
budgus	1.857	(0.000)

Notes: These tests use a Lagrange Multiplier test for stationarity in heterogeneous panel data as suggested by Hadri (2000). The null hypothesis is stationarity. We take possible serial dependence in the disturbances into account.

Table 9. The Long-and-Short-Run Determinants of the Real Exchange Rate Estimator: PMG and MG with an ARDL(1,1,1,1,1)
(Sample: annual data 1992–2005)

	Pooled Mean Group		**Mean Group**	
Variables	Coef.	St. Er.	Coef.	St. Er.
Long-Run Coefficients				
lliqus	-0.153***	0.047	-0.011	0.168
lopen1us	-0.221***	0.021	-0.363*	0.202
lgconus	-0.224***	0.038	-0.358	0.231
budgus	-0.038***	0.011	0.531	0.422
Joint Hausman Test: 2.1 (0.714)				
Error Correction Coefficients				
Phi	-0.353*	0.195	-0.661**	0.279
Short-Run Coefficients				
lliqus	0.032	0.067	-0.121	0.155
lopen1us	0.083**	0.033	0.054	0.038
lgconcus	-0.081	0.057	0.076	0.092
budgus	0.033	0.026	0.039	0.044

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