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## Abstract

Using a structural cointegrated VAR, this study examines the impacts of external shocks originating from the dollar, euro and yen zones as well as the regional shocks on the oil-rich countries of the Gulf Cooperation Council (GCC), viewed as a prospective monetary union. It focuses on the implications of shock impacts for selecting an apposite common exchange rate regime. The SVECM variance decomposition and impulse response analyses strongly underscore the relative impacts of the two external shocks over the regional ones. The findings imply that the world's three major currencies should figure highly in the GCC's common basket of currencies. Accordingly, a transitional movement to a more flexible exchange rate may be desirable for these trade-dependent economies in the long run, as argued in the optimal currency literature for developing countries.



## ملخص

باستخدام طريقة إعادة بيع القيمة المضافة المتكاملة الهيكلية، تبحث هذه الدراسة تأثيرات الصدمات الخارجية النابعة من مناطق الدولار واليورو والين وكذا الصدمات الإقليمية على الدول الغنية بالنفط في مجلس التعاون الخليجي، والتي تعتبر اتحادا نقديا مستقبليا. وتركز هذه الدراسة على دلالات تأثيرات الصدمة بالنسبة لاختيار نظام سعر صرف شائع وملائم. ويؤكد تحليل التفاوت في نموذج تصحيح الأخطاء الهيكلية والتوجيهية وتحليلات استجابة الدافع التأثيرات النسبية لصدمتين خارجيتين على الصدمات الإقليمية. كما تلمح النتائج أن العملات الثلاث الرئيسية في العالم لا بد أن تبرز بشكل كبير في سلة العملات المشتركة في دول مجلس التعاون الخليجي. وعلى ذلك، فإن التحرك الانتقالي نحو سعر صرف اكثر مرونة ربما يكون أمرا مرغوبا على المدى البعيد بالنسبة لهذه الدول التي يعتمد اقتصادها على التجارة، كما ورد فيما كتب عن العملة الأفضل بالنسبة للدول النامية.

## 1.Introduction

In 1975, the Kuwaiti government commissioned Professor Robert Mundell to study the feasibility of establishing a common currency for some of the Arab countries in the oil–rich Gulf region. Professor Mundell made a positive recommendation and suggested that the prospective common currency, whether in terms of its name or components, be based on the region's history and culture[1]. In 1981, the six Gulf countries-Bahrain Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates-took one more step closer to achieving this goal by creating the Gulf Cooperation Council (GCC) to serve as a unifying framework for more monetary and economic integration.

Recently, the GCC countries have made plans to introduce a single currency in 2010. In fact, these plans which call for having monetary integration among these six countries date back to the endorsement of the first unified economic agreement. The process toward economic integration had however gone slowly, but in 2001 it gained momentum and culminated in the ratification of a new economic agreement that sets a specified timetable to achieving the requirements of the monetary union. The requirements include the harmonization of all economic policies, particularly monetary policies, the standardization of banking regulations and the meeting of the convergence criteria. In January 2003, the GCC countries formed a customs union and applied a common external tariff. On the same date, these countries formally pegged their currencies to the U.S. dollar.

The introduction of the GCC single currency in 2010 (or few years later) will necessitate the creation of a single GCC central bank, a single GCC monetary policy and the choice of a common GCC exchange rate regime. The choice of the type of the common exchange rate regime prior to the due date is one of the key economic policies pending for the GCC countries. Should these countries allow the new currency to be fixed to the U.S. dollar, the euro, or a basket of the world's major currencies where the dollar, the euro and/or the yen have the largest proportions? Or should they let the currency float subject to possible exchange market interventions from time to time? Each choice has its own merits and drawbacks. In this paper, we examine the impacts of terms of trade and major currency zones' output shocks relative to the impacts of the regional shocks on the GCC's GDP viewed as a single bloc. The findings should help us make recommendations on the best arrangement for having a common exchange rate regime in the GCC region in light of those external and domestic shocks.

As a forward-looking study, this paper in the absence of common data considers the GCC countries as a prospective single monetary union, and thus constructs weighted averages of the historical real GDPs across the GCC members[2]. The objective is to assess the impacts of external shocks: terms-of-trade, zones' output in the dollar, euro and yen zones, and the regional output on the GCC GDP, in order to derive conclusions on the type of exchange rate regime that would be suitable for this union.

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[1] Professor Mundell expressed these views in a private interview a long time after his study, which is unavailable, was completed.

[2] The weighted average of the GCC countries' GDPs is constructed based on the 2000 GDPs and PPP exchange rates.

We should note that although there will be some bias from constructing the union-wide series, it would be small due to the similarities among the countries in terms of production base, harmonization of economic policies, and coordination of laws and regulations. Moreover, one has to weigh the advantages of having a pre-emptive assessment of the impacts of macroeconomic shocks on this prospective union-wide economic system against waiting for a long time for the pan-GCC data to be available to do the analysis.[3] By doing this study, we prefer to put the horse before the cart.

A growing consensus among economists is that emerging economies should move toward a corner solution; that is, they should consider either a fully floating or a rigidly fixed exchange rate regime. Frankel (2000) argues that intermediate exchange rate regimes are vanishing (or should be). Yet the question of what type of regime is appropriate for emerging economies still remains a highly debated issue. As most of the emerging economies lack a well-developed financial market and liquid financial instruments, the role of monetary policy under a flexible regime may be limited. Even if a country satisfies the determinants for a flexible regime, many still argue that the gains from the credibility of tying the local currency to an international anchor can be greater than the benefits of adopting a floating exchange regime. Others, however, endorse a basket peg as a superior alternative to a bilateral, rigidly fixed exchange rate regime. Since basket pegs tend to be more flexible than bilateral pegs, Gudmundsson **(**2005**)** argues that the move from a bilateral peg to a basket peg can be an important step on the way to a flexible exchange rate regime.

In an empirical study of the alternative exchange rate arrangements and financial integration for GCC countries, Abed et al. (2003) compare the dollar peg to a dollar-euro basket peg as alternative exchange rate regimes for improving the external stability of the GCC countries. They suggest that the basket peg dominate the dollar peg in improving stability. They also suggest that as GCC exports become more diversified, a more flexible exchange rate policy such as pegging the prospective common currency to a dollar/euro basket may become necessary for both competitiveness and stability purposes. In addition to the competitiveness and external stability reasons, Jadresic (2002) focuses on other policy considerations in choosing a currency peg for the GCC. Those considerations include the credibility of the exchange and monetary policy stance, the effects of exchange rate volatility on financial markets, and transaction costs arising from exchange rate volatility. Jadresic finds that these considerations dominate competitiveness and external stability. Fasano and Schaechter (2003) compare the conditions for creating a successful GCC monetary union to other monetary unions already in existence (for example, the euro zone, CFA franc zone … etc). These authors emphasize the need for the GCC members to develop an institutional union framework (such as a centralized central bank, common monetary instruments, financial crises system…etc) and to set some basic quantitative benchmarks such as the European Union' Maastricht Agreements. Hammoudeh and Aleisa (2004) examine financial integration in the GCC stock markets. They find that these markets are cointegrated in the sense that

[3] Pesaran et al (1982) formally show that the estimation of aggregate equations (area-wide equations in our case) is not an inferior choice from an econometric view point. This is because the bias associated with those equations may be small and more compensated for by effective remedy given to the specification bias that impacts national equations as a result of omission of relevant within-the-area foreign variables.

they have multiple long-run relationships. However, in terms of short-term dynamics, the authors find limited causal relationships among the GCC stock markets.

The primary objective of this paper is to investigate by implications the suitability of tying the proposed common GCC currency to the U.S. dollar or to a basket of currencies, and/or having a more flexible exchange rate regime. Having in mind the literature on Optimum Currency Area (OCA) and applying a structural cointegrated VAR model, we investigate the roles played by terms of trade shocks, global shocks and regional shocks in affecting the GDP of the GCC countries as a bloc, by focusing on implications for the appropriate choice of an exchange rate arrangement. Since the U.S., the European Union and Japan are the three most important trading partners to the GCC region and their currencies are international reserve currencies, we assess the relative impact from each of these areas independently and treat the impact as the area or the zone's global output shock on the GCC's GDP. Primarily, we investigate to what extent the constructed aggregated GDP in the GCC–wide area is influenced by the terms of trade shocks in the form of the real oil price, the U.S., European and Japanese zone-specific shocks, and the GCC domestic shocks[4]. Specifically, we attempt to answer the following two questions: (1) to what extent do the GCC economies influence and to what extent are influenced by the terms of trade proxy (real oil prices/zone's CPI)?; and (2) is the business cycle of the GCC area as a bloc related to its major trading partners' (particularly the United States, the European Union and Japan's) economic activity in such a way that a monetary policy's move by these partners at a particular time would be the right policy for the GCC area too?

The balance of the paper is organized as follows: Section 2 provides an overview of the relevant literature on optimum currency area. Section 3 presents an overview of the GCC economy. Section 4 describes the empirical model and methodology for the GCC as a prospective single bloc and identifies the relative impacts of the domestic and external shocks. Section 5 examines the estimation results of the model. Section 6 provides the main implications and conclusions.

## 2. Relevance of an Optimum Currency Area to the GCC

The literature on the theory of OCA pioneered by Mundell (1961) and subsequently by McKinnon (1963) and Kenen (1969) suggests several criteria that can be used in examining the suitability of a common monetary arrangement. The criteria include symmetry of the underlying macroeconomic shocks, factor mobility, openness, fiscal redistribution schemes and real wage flexibility, among others. More recently, some authors emphasized the need for a supra -national government body to conduct interregional transfers (De Grauwe, 1997). Frankel and Rose (1997, and 1998), Corsetti and Pesenti (2002), and De Grauwe and Mongelli (2005), examine the endogeneity of the optimum currency area. The findings of these authors confirm that monetary unions are conducive to significant increases in trade integration. For example, Frankel and Rose (1997 and 1998) argue that even if a country does not meet the criteria of the OCA ex ante, the increase in trade within the monetary union resulting from the introduction of the common currency may qualify this country to satisfy the OCA criteria ex post.

[4] We consider regional shocks to be the same as domestic shocks, since regional GDP is the weighted average of the GCC countries' GDPs

The GCC economies seem to be fairly integrated in terms of economic structures and trade. They have a remarkable degree of monetary and fiscal convergence, long run low inflation in all member states and narrow short-term interest rate movements. These members have highly open economies and a high degree of labor and capital mobility within the GCC region. Furthermore, the GCC countries have over time established a broad range of institutions to support the economic integration process. The aforementioned factors support the view that the GCC is more likely to experience symmetric shocks, thus reducing the likeliness of asymmetric shocks and the need to resort to nominal exchange rate adjustments.

Forming a monetary union among the GCC countries would entail some costs, but membership in a currency union may provide greater potential benefits to these states. There are key benefits that can be achieved from such an arrangement. First, a single currency would eliminate the transaction costs associated with using different currencies among the GCC countries, and this cost elimination would minimize the magnitude of price discrimination between their markets. Second, one can expect some efficiency gains associated with enhanced trade and increased capital flows as a result of abandoning a multiplicity of currencies. Even though each GCC country follows a fixed exchange rate system, a common GCC currency is more credible than just having a bilateral fixed rate system for the individual country. Third, a common GCC currency would induce national price convergence and would imply a common real exchange rate for all members. There may be welfare gains from less uncertainty about future real exchange rates. Fourth, a single currency would promote better policy formulation and coordination of national economic policies. A decentralized strategy for economic policies among the six markets will create healthy competition that should promote the best policies. Equally important, the integration of the GCC capital market will deepen the width and breadth of the financial market, enabling domestic investors to diversify their investments and giving firms efficient access to raise capital. However, membership in a common currency union will reduce policy independence, that is, membership in a monetary union prevents member states from implementing country-specific monetary and fiscal policies in response to country-specific disturbances**.**

## 3. An Overview of the GCC Economies

Although some of the GCC countries have to some extent been successful in diversifying their production base, oil still continues to be the key component of their output as displayed in **Table 1**. The oil sector accounts for over 30 percent of the individual GCC country real GDP, with the exception of Bahrain which has a smaller proportion over the period 2000-05. It should be noted that much as diversification away from oil is considered to be an important element for the GCC area's economies, diversification of government revenues is also as important. As is always the case, falling oil prices exert pressure on the local currencies, making the proposed new currency vulnerable to the developments in the world oil market. Thus, policies to diversify governments' revenues are as crucial as the diversification of the GCC economies. This table also shows that on average the GCC member countries had a remarkable growth rate over the period 2000-05. Although inflation began to rise in the GCC area in 2004-05, particularly in Qatar and UAE, other members' inflation rates are stable over this period. Moreover, GCC countries not only have stable and low inflation over the long-run, but also the inter-GCC

country inflation rates have high correlations averaging around 50% as shown in **Table 2**. However, the individual country output growth rates have modest correlations except for Oman. The overall inter-trade between the GCC countries is fairly limited. The individual members' exports trade patterns within the GCC region and with other countries and regions are provided in **Table 3.** Excepting Saudi Arabia, GCC exports to the rest of the world are concentrated in Asia. In contrast, GCC imports seem to be concentrated in the European Union, followed by Asia. In terms of openness, the GCC countries have highly open economies as evidenced by the high ratios of imports and exports to GDP

## 4. The Model and Methodology

We use quarterly data for the period 1980:01 to 2003:04 for the U.S., the European Union, Japan and GCC countries. The data are accessed from the IMF's *International Financial Statistics* CD-Rom database and *World Economic Outlook* (WEO), and European Central Bank (ECB)'s database. Due to the lack of quarterly data on the GCC GDPs, we use the popular Ginsburgh (1973) method to extract quarterly GDP from the available annual data[5]. The data includes: real GDP and the price level for the US; real GDP[6] and price level for the European Union, real GDP and the price level for Japan; and real oil price and the weighted average of the individual real GDPs for the GCC countries. Therefore, we proxy terms of trade by real oil price[7] (which is defined as crude oil price deflated by the US CPI for the Dollar Zone, by the German CPI for the Euro Zone, and by the Japanese CPI for the Yen Zone) because crude oil and its related products represent the bulk of GCC countries' exports. Furthermore The GCC real output is represented by the weighted GCC real GDP for the GCC region. The zone's respective global output for each area is proxied by the U.S. real GDP for the Dollar Zone, the European Union real GDP for the Euro Zone and Japan's real GDP for the Yen Zone.

### *4.1. Integration*

The integration of each variable in each zone is tested by means of two unit root tests, the augmented Dickey-Fuller (ADF) test and the Phillips-Perron (PP) test. Both of these tests examine the presence of a stochastic trend in the individual series. If any individual series has a stochastic trend, it implies that the variable of this series does not revert to an average or a long value after a shock strikes. The distribution for this series does not have a constant mean and variance. The results of both tests for the three zones confirm that all

[5] Oil production index was used as a reference to extract the quarterly GDP. Moreover, the GINSBURGH function constructs high frequency from low frequency time series using information from high frequency series such that consistency with the low frequency data is ensured. The variations of the derived high frequency data reflect closely those of the related series, ensuring a smooth adaptation between successive periods, while at the same time the original low frequency figures are obtained when compressing the high frequency series.

[6] ECB, *Monthly Bulletin*, prior to 1991 calculated using OECD methodology. Furthermore, we proxy the European Union price level by the available Germany's CPI.

[7] We treat terms of trade shock as the first because of the importance of oil in the GCC economies and the direct impacts from the development in the oil market on their economies.

the variables are I(1) as shown in **Table 4**. Testing for integration is an important step for carrying out the cointegration analysis

### *4.2. Cointegration*

A system of two or more time series, which are individually non-stationary in levels and have individual stochastic trend(s), can share a common stochastic trend(s). In this case, those two series are cointegrated. Thus, two or more non-stationary time series are co-integrated if a linear combination of these individual variables is stationary, that is, converges to equilibrium over time. The stationary linear combination is called the cointegrating equation and is considered as a co-integrating vector, and may be interpreted as a long- run equilibrium relationship between or among the variables. The idea behind cointegration is that there are common forces that co-move the variables over time. Therefore, a common stochastic trend in a system of variables can be interpreted to mean that the stochastic trend in one variable (such as, GDP in a given zone) is related to the stochastic trend in some other variables (like for example, terms of trade and another GDP in the same zone).

There are many possible tests for detecting cointegration; the most general is the multivariate test which is based on the autoregressive representation discussed in Johansen (1988) and Juselius (1990). The Johansen maximum-likelihood method provides two different likelihood ratio test, the trace test and the maximum Eigenvalue test, in order to determine the number of cointegrating vectors. The finding of the presence of cointegration paves the way for using the VEC model (VECM).

The results of the cointegration tests applied to the three zones suggest that there is cointegration in each zone (see **Table 5**). This implies that for each zone there are long-run relations among the GCC's GDP (*GCCGDP*) and the zone's global GDP (*USAGDP*) and terms of trade (*USAH*), all defined in logarithmic form. In the Dollar Zone there are two cointegrating vectors, implying that there is one common stochastic trend that co-moves the three variables in this zone. In contrast, the Euro Zone's VAR (*GCCGDP*, *EURGDP* and *EURH*) and the Yen Zone's VAR (*GCCGDP*, JPGDP and JPH) each has one cointegrating vector or two common stochastic trends. These results imply that the long-run relationship in the Dollar Zone is more stable than in the other two zones (Crowder and Wohar, 1998, p. 195). This is not surprising given the fact that oil is priced in the US dollars and the GCC countries effectively peg their currencies to the dollar, which is not the case in the other two zones.

### *4.4. Empirical Model*

Consider an open-economy model structured as a three-variable cointegrated VAR with ***r*** cointegrating vectors to examine the suitable choice of an exchange rate regime for the GCC countries viewed as a prospective monetary union. These countries trade primarily with major global zones. The three variables in a VAR include an output for each global zone (a real GDP of the US, the European Union or Japan), the terms of trade and the regional output (as the geometrically weighted average of the GCC real GDPs). Since the VARs are cointegrated, the VAR for each zone can be written as a VECM:

$$\Delta X_t = \alpha\beta' X_{t-1} + \Gamma_1 \Delta X_{t-1} + \cdots + \Gamma_{p-1} \Delta X_{t-p+1} + u_t \qquad (2)$$

where the vector $X_t = [h_t, y_t^g, y_t^r]'$ representing the terms of trade (real oil price) $h_t$, the zone's global output $y_t^g$, and the regional output $y_t^r$. The matrices $\alpha$ and $\beta$ have the dimension *3* x *r*, where *r* is number of cointegrating vectors, and encompass the loading coefficients and the cointegrating vectors, respectively. The $\Gamma_i$, *i*= 1, 2... *p*-1 are 3 x 3 matrices of the short-run coefficients, and the VECM residuals $u_t$ are white noise error vector, that is, $u_t \sim N(0, \Sigma_u)$. Since the $u_t$ are combinations of structural shocks, we cannot directly use them to examine the impacts of structural innovations on the system. To identify the structural innovations, we consider the following structural representation:

$$A\Delta X_t = \Pi^* X_{t-1} + \Gamma_1^* \Delta X_{t-1} + \cdots + \Gamma_{p-1}^* \Delta X_{t-p+1} + \varepsilon_t \quad (3)$$

where **A** is a 3×3 matrix, $\alpha\beta' = A^{-1}\Pi^*$, $\Gamma_1 = A^{-1}\Gamma^*_1, \ldots, \Gamma_{p-1} = A^{-1}\Gamma^*_{p-1}$ and the residual $\varepsilon_t \sim N(0, \Sigma_\varepsilon)$ denotes a vector of structural shocks at time *t*. Hence, the VECM residual are expressed as linear combinations of the structural innovations $\varepsilon_t$

$$u_t = A^{-1}\varepsilon_t = B\varepsilon_t \quad (4)$$

This is the so-called *B*-type model of structural VARs. Following the standard assumption that $\varepsilon_t$ is orthogonal and has an identity covariance matrix as $\Sigma_\varepsilon = I_3$, Equation (4) implies $\sum_u = BB'$.

Furthermore, based on Granger's representation theorem, the VECM above has the MA representation:

$$X_t = \Xi \sum_{i=1}^{t} u_i + \sum_{j=0}^{\infty} \Xi_j^* u_{t-j} + X_0 \quad (5)$$

where $X_0$ contains initial values and $\lim_{j\to\infty} \Xi_j^* = 0$. Therefore $\Xi$ and $\Xi^*$ represent long run and short run effects of forecast error impulse responses of the reduced-form VECM. Substituting equation (4) into (5), the long run and short run effects of structural innovation impulse responses are given by $\Xi B$ and $\Xi^* B$ respectively. The long run effect matrix $\Xi B$ has rank 3-***r*** because *B* is nonsingular and ***r*** cointegrating vectors exist. Since $\Xi^*$ has been restricted by the condition $\lim_{j\to\infty} \Xi_j^* = 0$, we only need to place restrictions on $\Xi B$ and *B*, which are the long run and contemporaneous (short run) effect matrices, respectively.

*Identification*

Analogous to a structural stationary VAR, in this *B*-type model, matrix *B* needs 3×3=9 (*K* x *K*) independent restrictions to be uniquely just-identified. But $\sum_u = BB'$ only provides 3×(3+1)/2 = 6 (or *K* x *(K+1)/2*) restrictions due to the symmetry of covariance matrix. Therefore, 3 (or *K* x *(K-1)/2*) more independent restrictions need to be assumed to just-identify the system. Moreover, as argued by Lutkepohl (2005), if there are ***r*** cointegrating vectors, at most ***r*** transitory shocks and at least 3-***r*** (or K-***r***) long run shocks can exist. If ***r*** transitory shocks are assumed, then ***r*** columns in the long-run effect matrix $\Xi B$ can be

restricted to be zeros. Furthermore, these ***r*** zero columns in $\Xi B$ represent ***r*** ×(3-***r***) (or ***r*** x (K-***r***)) independent restrictions because $\Xi B$ has the reduced rank 3-***r***. Additionally, r×(***r***-1)/2 further restrictions have to be placed to identify those ***r*** transitory shocks, and (3-***r***)×(3-***r***-1)/2 (or (K-***r***)((K-***r***)-1)/2) further restrictions are needed to identify the 3-***r*** (or (K-***r***)) long -run shocks.

In our context, all three zones are diagnosed with one cointegrating vector resulting in at most one transitory structural innovation to the whole system. To just-identify the system, we assume: (1) Regional shocks are transitory with no long run effects; and (2) shocks to global zonal GDP do not have contemporaneous impacts but have long-run on the regional GCC GDP. Most of the regional GCC shocks are related to geopolitical events and volatility in the oil price. However, most of the impacts in the long run come from shocks in the global zones and the terms of trade.

Hence, the long-run effect and short-run effect matrices are, respectively, restricted as:

$$\Xi B = \begin{bmatrix} * & * & 0 \\ * & * & 0 \\ * & * & 0 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} * & * & * \\ * & * & * \\ * & 0 & * \end{bmatrix}$$

where the stars denote the elements that are unrestricted, while the zeros denote the elements that are restricted to be zeros. Since in the long-run matrix two structural innovations (shocks to the terms of trade and to the global zonal GDP) cannot be identified within $\Xi B$, we place an additional restriction on the short-run matrix *B*. Hence, the two innovations are identified by $B_{32}$=0, which attests that shocks to global zonal GDP do not have a contemporaneous (short-term) impact on the regional GCC GDP.

## 5. Empirical Results

The dynamic effects of the innovations on the GCC GDP for each of the three zones can best be understood by carrying out the impulse response function analysis and the variance decompositions (VDC) typical for the SVEC models.

### *5.1. Impulse Response function Analysis*

**Figure 1** plots the impulse responses to thirty nine horizon periods after the shock (h =40 in quarterly increments). The significance of this response is demonstrated by the use of confidence intervals representing 90% percentile bands based on 2000 draws. At points where IRF confidence bands do *not* straddle the zero line of the horizontal axis, the impulse response is considered statistically different from zero between the upper 5% and lower 5% limits of the band. The figure provides the results of the impulse response function analysis for the GCC output's dynamic responses as a bloc to unit shocks originating in the three zones. We are not interested in the responses of terms of trade and the global zones' output to shocks.

In the Dollar Zone, the response of the GCC output to terms of trade is strong, positive and significant, basically all the way. It dips slightly within two periods after the shock, but then rises to reach the steady state equilibrium at h =14. Therefore, the GCC response to terms of trade, which reflects the weight of the oil exports, is strong, positive and persistent, underscoring the importance of real oil price on the GCC output in this

Dollar Zone. Oil is also priced in dollars and GCC currencies are pegged to the dollar, thus a strong dollar bodes well for the GCC economy. The United States also consumes 25 percent of world oil supply, and thus affects the oil price. The response to the US output, as a global zone shock, is also significant, positive and persistent after two periods but still of much lower caliber than the terms of trade. The immediate impact is insignificant because we restrict $B_{32}=0$ stipulating that global shocks do not have instantaneous effect on GCC output, but then the GCC response to this US output shock oscillates some time before it reaches the steady state when h =24 quarters. Finally, the short-run response to the regional or domestic shock is irregular and dies out within eight quarters because it is restricted to be transitory. This response irregularity reflects perhaps the high volatility of the oil revenues and frequent occurrence of geopolitical events (for example, the 1991 Gulf war, the 2001 New York attack, the 2003 Iraq war … etc) in this region. All in all in this dollar zone, the terms of trade shock has the strongest positive impact followed by the US GDP shock, pointing out that the business cycles in the United States, oil price and dollar movements have different weighing on the economy and economic policies, whether monetary policy or exchange rate policy, of the GCC.

In the Euro Zone, the short–run responses of the GCC output to the terms of trade are significant and positive as in the Dollar Zone. The initial response is positive and significant but unsteady and then becomes negative and insignificant after h = 5. This implies that the euro does not have material impact on the oil-based GCC countries over the long run, and thus has much less influence on the GCC economy and economic policies relative to the dollar. However, the EU GDP as a global output shock, after the initial shock, is significant, positive and reaches the steady state at h = 20 quarters. Although the impact pattern is similar to that in the US zone, the magnitude is much stronger in the EU zone. This is not surprising because the GCC countries have stronger trade, particularly imports, ties with the EU bloc than with the United States. This is partly influenced by geographic proximity between the GCC region and Europe. The response to the regional shock in this zone is similar to that in the dollar zone. In sum, comparing the responses of the GCC to two global shocks in the two western zones, it is evident that the EU bloc wins on the basis of the response to the zone global output, while the United States wins over the response to terms of trade. In this case, both zones have important impacts on the GCC economic policies including the exchange rate.

In the Japan Zone, the response to the terms of trade is very similar to the response in the EU zone. However, the response to Japan's global zone output comes in between the responses of the Euro Zone and The US Zone. The GCC also has important trade ties with Japan and the latter invests in the GCC oil-based projects. Thus, the Yen Zone has influence on the GCC business cycles and economic policies. The response to the regional shock in this zone is somewhat more positive and significant than in the two western zones.

### *5.2. Variance Decomposition Analysis*

Another way of characterizing the dynamic behavior of the zones is through variance decomposition. This breaks down the variance of the forecast error for each variable in a particular zone into components that can be attributed to each of the endogenous variables in that zone. **Figure 2** displays VDC analysis of the relative impacts of the three shocks: the regional GCC GDP, the terms-of-trade and each zone's (the US, European

Union and Japan) global output on the regional output *GCC GDP* as a bloc variable. We do not discuss the VDC results of the impacts of shocks on the global output and the terms of trade as these results are not part of the objectives of this study.

The VDC results for the Dollar Zone demonstrate that the highest percentage of the GCC GDP forecast variance is attributed by far to the terms of trade in this zone. The impact of this shock rises over the short-run and then reaches the steady state in the long-run. This is consistent with the results provided by the IRF analysis above, and has the same explanations. Even though the GCC countries have a growing non-oil sector, the results demonstrate that their GDPs as a block can still be vulnerable to the real oil price and dollar developments, particularly at the end of the horizon after a shock strikes the terms of trade.

The US global output shocks for this Dollar Zone has a small but steady impact on the GCC regional output movements throughout the forecasting horizon. An interesting aspect of this result is that the impacts of the US global output shocks are rather modest despite the dominant role played by the US dollar on the economies of the GCC countries (particularly that the bulk of the GCC oil exports is denominated in dollar terms). This implies that the business cycles of the GCC countries as a bloc do not appear to be driven significantly by the output movements in the U.S, whether in the short- or long-run. The regional shock consistently gives way to the first two shocks over time, underscoring the impacts of external shocks over the regional ones on the GCC economy as a bloc.

The VDC results for the Euro and Yen zones are similar to each other but are strikingly different from those for the Dollar Zone, reflecting the importance of the growing trade, particularly imports, of the European Union and Japan, with the GCC countries. The impacts of the EU and Japan's global output shocks on the GCC's output in these two zones overtake the impact of the transitory regional shocks in about two years (8 quarters). Global shocks have unrestricted long-run effects but with no contemporaneous effects, while the regional shocks have unrestricted short run effects, but restricted long-run effects. This result highlights the importance of the output movements in the European Union and Japan to the business cycles and economic policies of the GCC countries as a block over the long-run, complementing the similar result reached in the IRF analysis.

## 6. Conclusions

The GCC countries are taking very important steps towards forming a monetary union and introducing a single currency in 2010 or a few years after. This paper examines the relative impacts of domestic and external shocks on the region's economies hypothesized as a prospective single bloc, with the objective of making a recommendation on selecting a suitable common currency regime. In the absence of actual data for an actual bloc, we analyze the aggregated historical data to make a forward-looking judgment on the appropriateness of a common currency regime for the prospective monetary union. We construct weighted averages of the GDPs across the GCC members to shed some light on the structural properties of the GCC area as a single economic system. This study applies structural cointegrated VARs primarily to investigate the roles of the terms of trade shocks, the Dollar and Euro zones' output shocks, and the regional (domestic) output

shocks on the pan GCC output as a prospective single economy, focusing on the choice of an apposite exchange rate regime.

The variance decomposition and impulse response analyses strongly suggest that the global output has much stronger impacts on or responses from the GCC output in both the Euro Zone and the Yen Zone than in the Dollar Zone over the short- and long- runs. This result is attributed to the stronger GCC imports originating from the two non-dollar zones. It implies that the GCC output movements are strongly related to the business cycles in those two global zones. Consequently, the GCC policy makers should tune their monetary policies to those of the two zones, and this in turn has ramifications for their choice of an apposite common currency regime. Therefore, if the GCC's policy makers decide on making their exchange rate moderately more flexible by transitioning from a rigid dollar peg to a peg to a currency basket, euro and yen should have important weights in this common basket, but with euro having the higher share because it leads to higher responses. Such connection should help the GCC countries in addressing the imported inflation problem associated with a depreciating dollar as is happening now.

In terms of impulse response function analysis, the response to the terms of trade impulses is stronger in the US zone than in the EU and Japan zones. The GCC economies are relatively more influenced by the terms of trade in this zone because of the dollar denomination of the oil price, the dollar dominance in their foreign reserves and the bilateral pegging of their exchange rates. On the other, no oil product is priced in euro or yen, and the share of these two currencies in the GCC foreign reserves is much less than the dollar.

The response to the global zone output is the highest in the EU zone, followed by Japan and the US in this order. Based on this response, the GCC countries should also cater to the business cycles and economic policies in the euro and yen zones. Thus, movements in euro and yen should have impacts on the GCC economies and currencies. Consequently, the GCC exchange rate policies should cater for the shocks and business cycles in all three global economies and not just in the US zone. Therefore, in the transition period, the GCC should prefer a currency basket-based exchange rate arrangement that includes the dollar, yen and euro over a bilateral peg scheme. It is not within the findings of this paper to recommend a relative distribution of the three currencies in the basket. It is possible that other regions such as Southeast Asia may have shocks that pertinently affect the GCC GDP and economic policies. Therefore, a gradual transitional movement to a more flexible exchange rate is desirable for these trade-dependent economies.

In the process of forming a common currency, we agree with Professor Mundell's suggestions mentioned in the introduction that:

- The name and hierarchy of the currency should be based on the region's history and culture. The gold and silver dinars in proportion 1 to 10 prevailed during the Islamic era can be a reference to revisit this issue.
- The national currencies should initially be present for a limited period of time as a medium of exchange within the GCC countries along with the adopted common currency which could be the GCC dinar. During this period the national currencies and the common currency should be two sides of the same currency. But after this limited period of time expires the national currencies should cease to exist and the

GCC dinar and its components should be the only medium of exchange and store of value. The voting on fiscal and monetary targets should be distributed according to the country's economy size; and

- The pegging of the common GCC currency should initially be to an anchor to maintain stability.

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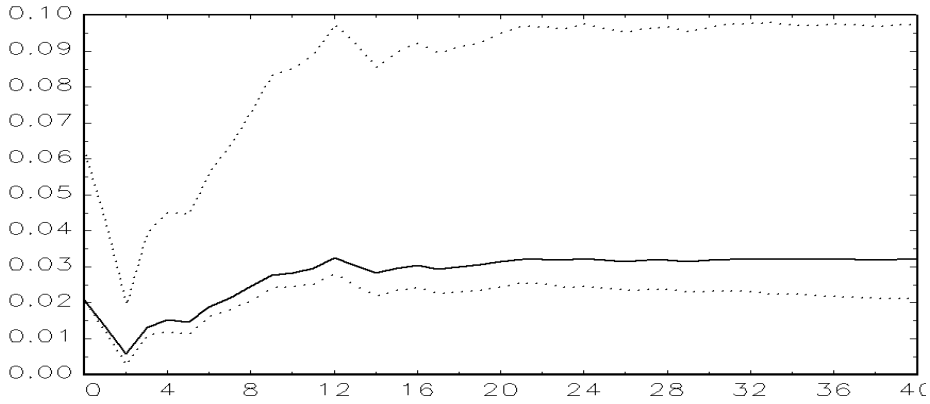
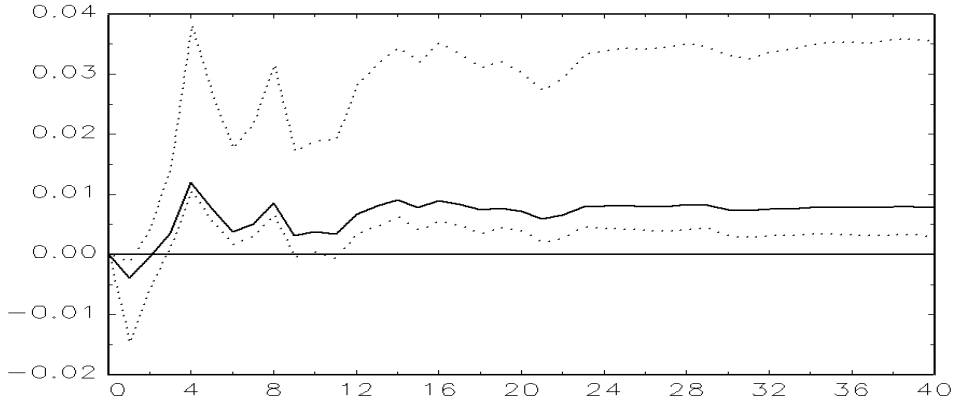
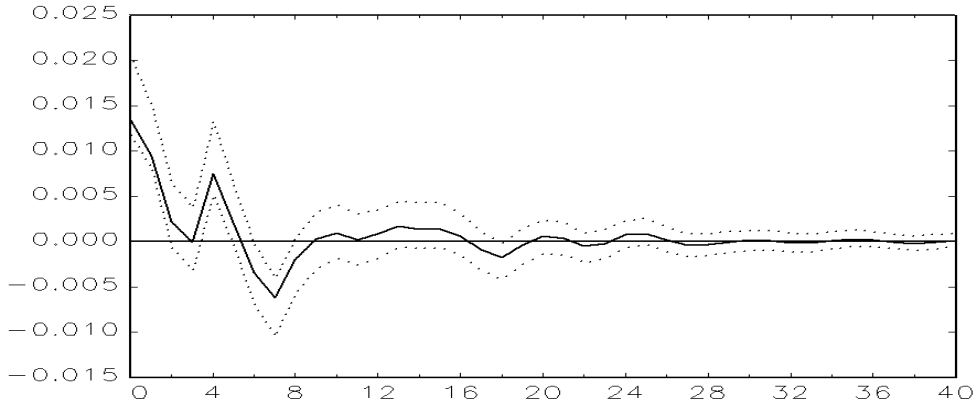
**Figure 1: Impulse Response Analysis: Dollar Zone**




Term of trade → Regional




Global → Regional

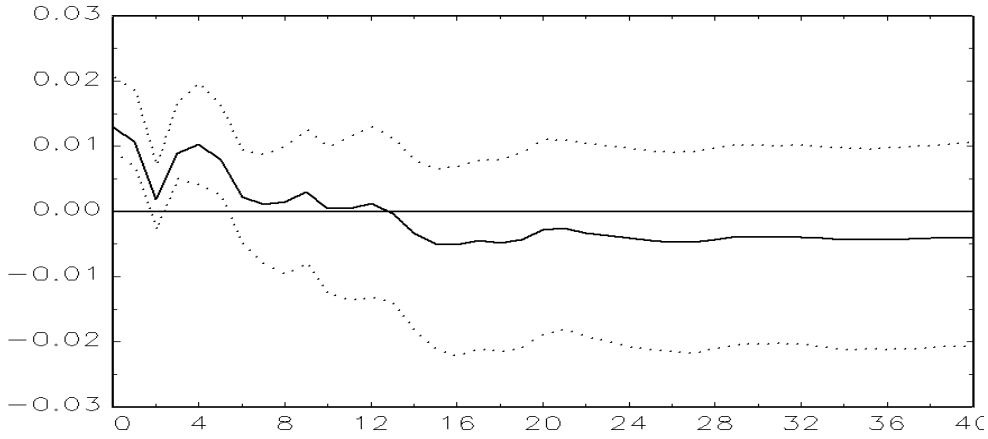



Regional → Regional

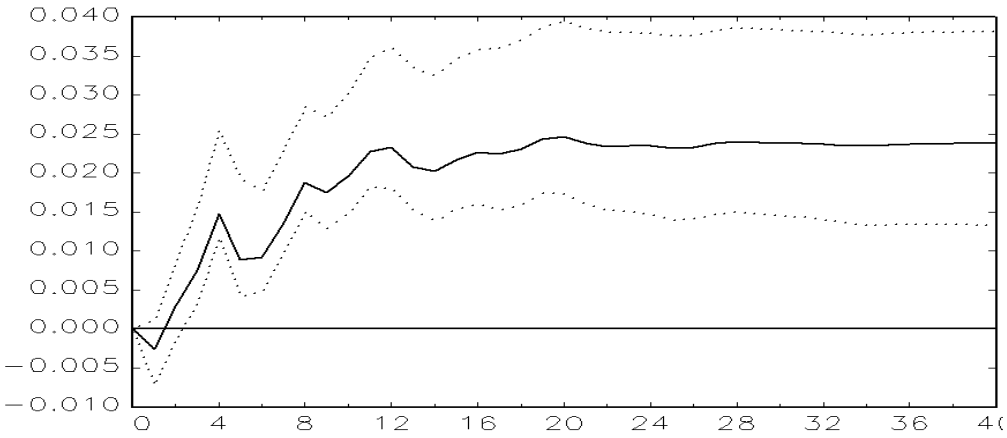
SVEC Impulse Responses

90% Hall Percentile CI (Number of Bootstrapping =2000)

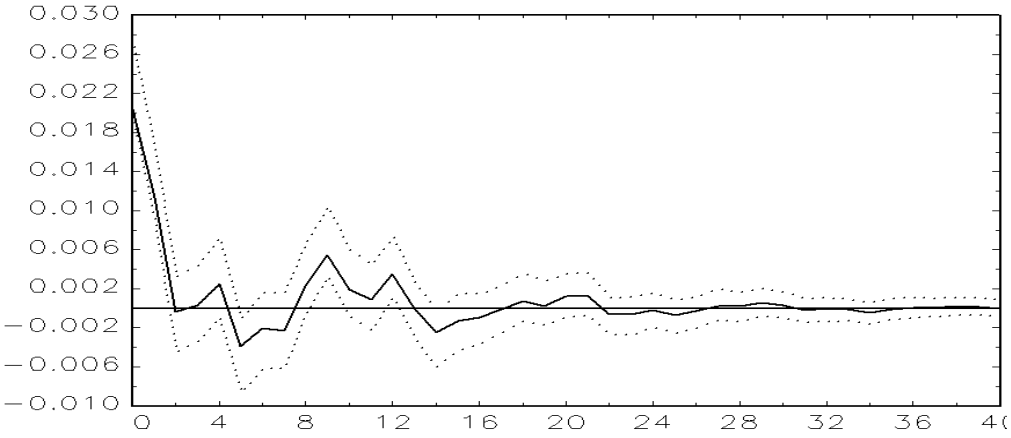
Euro Zone




Term of trade → Regional




Global → Regional

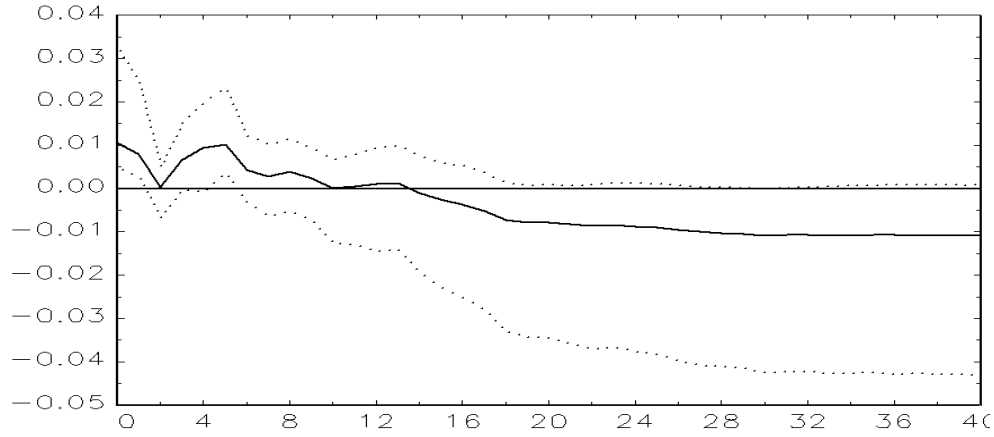



Regional → Regional

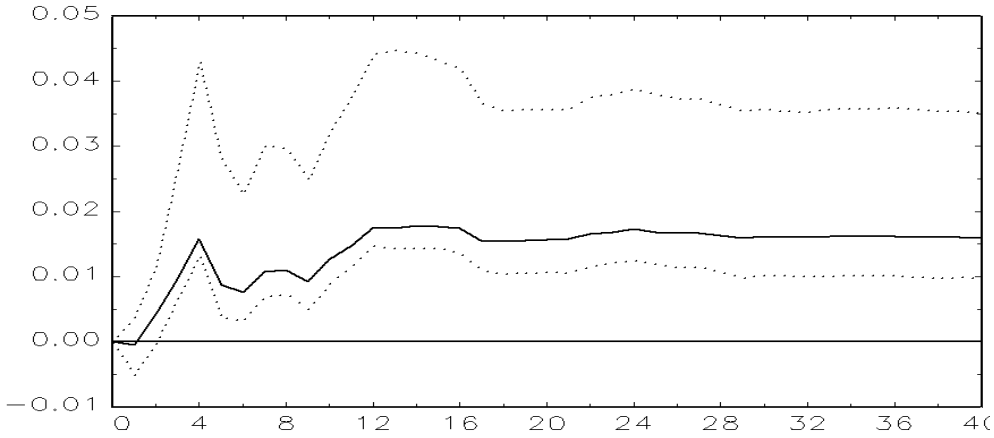
SVEC Impulse Responses

90% Hall Percentile CI (Number of Bootstrapping =2000)

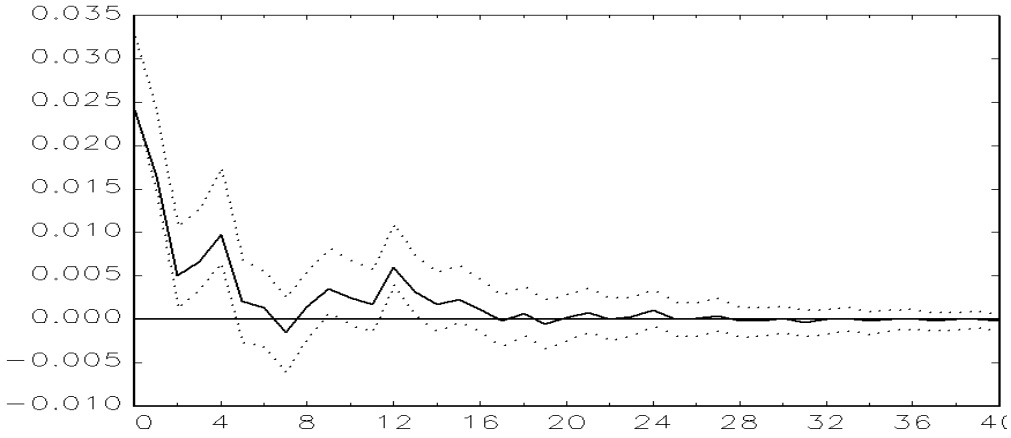
Yen Zone




Term of trade → Regional




Global → Regional

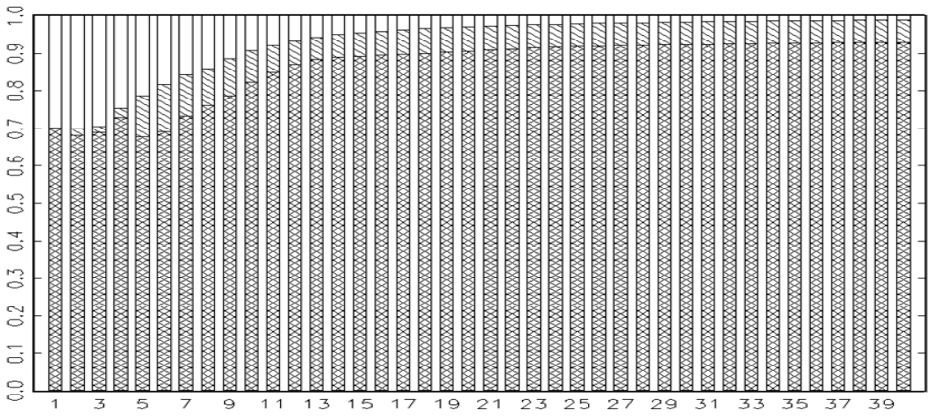



Regional → Regional

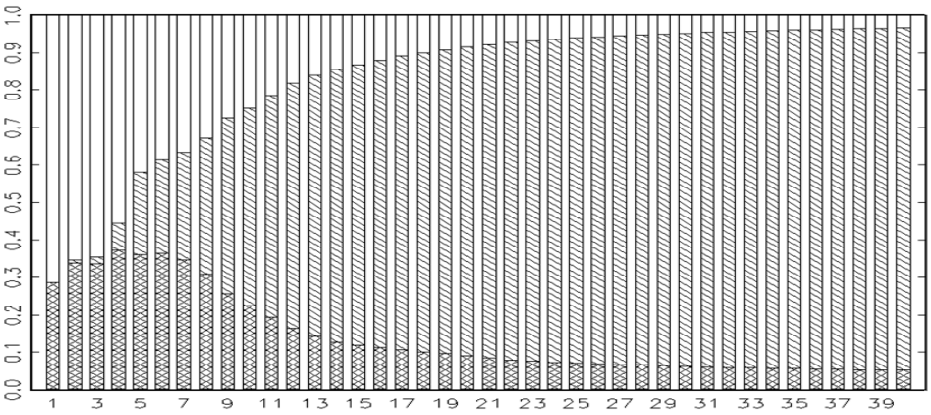
SVEC Impulse Responses

90% Hall Percentile CI (Number of Bootstrapping =2000)

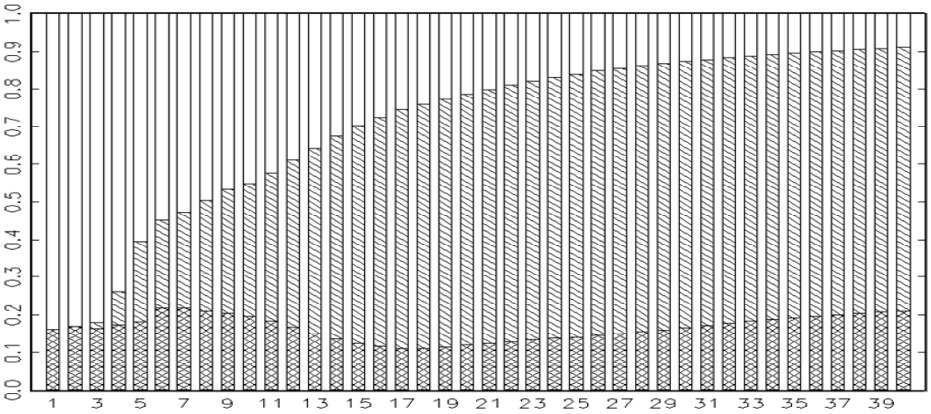
**Figure 2 Variance Decomposition of Impacts of Shocks on GCC's GDP**




**Dollar Zone**




**EURO Zone**




**Yen Zone**

Percent of Forecast Error Variance Attributed To Regional Shock
Percent of Forecast Error Variance Attributed To Global Shock
Percent of Forecast Error Variance Attributed To Term of Trade Shock

## Table 1: Selected Macroeconomic Indicators for the GCC Countries

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|---|
| **Bahrain** | | | | | | |
| GDP Growth Rate (%/year) | 5.2 | 4.6 | 5.2 | 7.2 | 5.4 | 6.9 |
| CPI Inflation Rate (%/year) | -0.7 | -1.2 | -0.5 | 1.7 | 2.3 | 2.6 |
| Current Account Balance ($billion) | 0.8 | 0.2 | 0.0 | 0.2 | 0.4 | 1.6 |
| % of Oil in Total Real GDP | 17.8 | 17.2 | 16.5 | 15.6 | 13.1 | 11.3 |
| % of Oil in Total Government Revenue | 73.0 | 68.6 | 67.3 | 73.0 | 72.6 | 74.3 |
| Share in World Oil Production (%) | n. s. | n. s. | n. s. | n. s. | n. s. | n. s. |
| **Kuwait** | | | | | | |
| GDP Growth Rate (%/year) | 4.7 | 0.7 | 5.1 | 13.4 | 6.2 | 8.5 |
| CPI Inflation Rate (%/year) | 1.6 | 1.4 | 0.8 | 1.0 | 1.3 | 3.9 |
| Current Account Balance ($billion) | 14.7 | 8.3 | 4.3 | 9.4 | 17.3 | 32.3 |
| % of Oil in Total Real GDP | 40.1 | 38.5 | 33.7 | 35.6 | 36.0 | 37.0 |
| % of Oil in Total Government Revenue | 68.7 | 68.8 | 74.0 | 76.8 | 77.2 | 79.2 |
| Share in World Oil Production (%) | 2.8 | 2.8 | 2.7 | 3.0 | 3.1 | 3.3 |
| **Oman** | | | | | | |
| GDP Growth Rate (%/year) | 5.5 | 7.5 | 2.6 | 2.0 | 5.6 | 6.7 |
| CPI Inflation Rate (%/year) | -1.2 | -0.8 | -0.2 | 0.2 | 0.8 | 3.2 |
| Current Account Balance ($billion) | 3.1 | 1.9 | 1.3 | 0.9 | 0.4 | 4.4 |
| % of Oil in Total Real GDP | 36.8 | 35.4 | 33.8 | 30.9 | 28.8 | 28.0 |
| % of Oil in Total Government Revenue | 85.4 | 83.1 | 81.9 | 79.8 | 83.7 | 86.4 |
| Share in World Oil Production (%) | 1.3 | 1.3 | 1.2 | 1.1 | 1.0 | 1.0 |
| **Qatar** | | | | | | |
| GDP Growth Rate (%/year) | 9.1 | 4.5 | 7.3 | 5.9 | 11.2 | 6.5 |
| CPI Inflation Rate (%/year) | 1.7 | 1.4 | 0.2 | 2.3 | 6.8 | 8.8 |
| Current Account Balance ($billion) | 3.2 | 4.2 | 3.8 | 5.8 | 7.6 | 7.1 |
| % of Oil in Total Real GDP | 59.1 | 57.0 | 56.9 | 57.1 | 58.9 | 57.3 |
| % of Oil in Total Government Revenue | 79.1 | 71.6 | 65.5 | 64.4 | 65.5 | 66.5 |
| Share in World Oil Production (%) | 1.1 | 1.1 | 1.1 | 1.2 | 1.2 | 1.4 |
| **Saudi Arabia** | | | | | | |
| GDP Growth Rate (%/year) | 4.9 | 0.5 | 0.1 | 7.7 | 5.3 | 6.6 |
| CPI Inflation Rate (%/year) | -1.1 | -1.1 | 0.2 | 0.6 | 0.4 | 0.7 |
| Current Account Balance ($billion) | 14.3 | 9.4 | 11.9 | 28.1 | 52.0 | 90.8 |
| % of Oil in Total Real GDP | 34.1 | 32.5 | 30.0 | 32.7 | 33.1 | 32.9 |
| % of Oil in Total Government Revenue | 83.1 | 80.6 | 78.0 | 83.2 | 84.1 | 89.4 |
| Share in World Oil Production (%) | 12.7 | 12.4 | 12.1 | 13.3 | 13.2 | 13.6 |
| **United Arab Emirates** | | | | | | |
| GDP Growth Rate (%/year) | 12.4 | 1.7 | 2.6 | 11.9 | 9.7 | 8.5 |
| CPI Inflation Rate (%/year) | 1.4 | 2.8 | 2.9 | 3.1 | 5.0 | 8.0 |
| Current Account Balance ($billion) | 12.2 | 6.6 | 3.0 | 7.1 | 10.6 | 19.1 |
| % of Oil in Total Real GDP | 33.6 | 33.0 | 29.8 | 30.2 | 28.3 | 26.7 |
| % of Oil in Total Government Revenue | 74.1 | 71.6 | 78.1 | 79.7 | 77.2 | 77.6 |
| Share in World Oil Production (%) | 3.5 | 3.4 | 3.1 | 3.4 | 3.3 | 3.4 |

Sources: International Financial Statistics (IFS), World Economic Outlook (WEO), Oil production figures, British Petroleum (www.bp.com). Note: "n.s." means not significant.

**Table 2: Correlations of the GCC Output Growth and Inflation (2000-05)**

| | Bahrain | Kuwait | Oman | Qatar | S. Arabia | UAE | GCC |
|---|---|---|---|---|---|---|---|
| Bahrain | ---- | 0.26 | 0.13 | 0.00 | 0.14 | 0.14 | 0.29 |
| Kuwait | 0.33 | ---- | -0.20 | 0.37 | -0.18 | 0.09 | 0.33 |
| Oman | 0.22 | 0.63 | ---- | -0.28 | -0.27 | -0.13 | -0.28 |
| Qatar | 0.45 | 0.41 | 0.45 | ---- | 0.20 | 0.20 | 0.47 |
| Saudi Arabia | 0.52 | 0.54 | 0.43 | 0.39 | ---- | 0.30 | 0.81 |
| United Arab Emirates | 0.51 | 0.12 | 0.46 | 0.51 | 0.39 | ---- | 0.60 |
| GCC | 0.61 | 0.67 | 0.66 | 0.58 | 0.93 | 0.60 | ---- |

Note: correlations of output growth are above the diagonal, while correlations of the inflation are below the diagonal.

**Table 3: Direction of the GCC Countries' Trade (2000-05)**

| Country/Region | Bahrain | Kuwait | Oman | Qatar | Saudi Arabia | United Arab Emirates | The GCC |
|---|---|---|---|---|---|---|---|
| | | | Exports[a] | | | | |
| Within the GCC | 6.7 | 1.6 | 10.0 | 5.1 | 4.8 | 5.5 | 4.9 |
| Middle East | 8.3 | 3.3 | 16 | 5.9 | 8.1 | 11.3 | 8.6 |
| United States | 3.5 | 12.5 | 3 | 2.1 | 18.3 | 2.0 | 12.0 |
| European Union | 3.9 | 11.0 | 3 | 3.0 | 16.2 | 8.1 | 12.1 |
| Japan | 1.9 | 22.1 | 16 | 43.1 | 16.0 | 26.8 | 20.2 |
| Asia (Ex. Japan) | 9.3 | 49.0 | 60 | 36.8 | 33.1 | 31.4 | 35.7 |
| Total Exports ($Billion) | 10.7 | 21.7 | 12.2 | 15.3 | 94.3 | 54.9 | 209.1 |
| Exports/GDP | 79.2 | 29.0 | 39.6 | 44.4 | 30.4 | 42.3 | 35.2 |
| | | | Imports[b] | | | | |
| Within the GCC | 37.2 | 11.3 | 30.3 | 14.9 | 7.5 | 4.2 | 9.6 |
| Middle East | 38.4 | 16.2 | 32.0 | 16.9 | 6.8 | 6.9 | 10.6 |
| United States | 9.2 | 13.4 | 6.1 | 11.2 | 13.7 | 7.7 | 11.7 |
| European Union | 25.0 | 35.0 | 23.6 | 39.2 | 31.2 | 33.7 | 32.0 |
| Japan | 6.5 | 9.1 | 16.4 | 9.4 | 9.0 | 7.1 | 9.0 |
| Asia (Ex. Japan) | 12.3 | 16.5 | 14.2 | 15.6 | 22.0 | 33.8 | 22.9 |
| Total Imports ($Billion) | 4.8 | 10.6 | 6.8 | 5.4 | 46.7 | 49.7 | 124.0 |
| Imports/GDP | 36 | 14 | 22 | 16 | 15 | 38 | 20.7 |

Sources: Direction of trade, International Monetary Fund.

Notes : [a] in (%) of total exports.

[b] in (%) of total imports.

**Table 4: Unit Root Tests**

| | ADF Test | | | | PP Test | | | |
|---|---|---|---|---|---|---|---|---|
| | Const. Only | | Const. & Trend | | Const. Only | | Const. & Trend | |
| | ADF stat. | Lags | ADF stat. | Lags | PP stat. | Bandwidth | PP stat. | Bandwidth |
| LGCCGDP | 0.225 | 2 | -2.542 | 2 | -0.180 | 6 | -2.435 | 7 |
| LUSAGDP | -0.217 | 3 | -2.632 | 2 | 0.074 | 4 | -2.705 | 5 |
| LEURGDP | -0.933 | 1 | -2.340 | 1 | -1.037 | 5 | -2.378 | 5 |
| LJPGDP | -1.138 | 3 | -1.637 | 3 | -1.537 | 4 | -1.354 | 4 |
| LUSAH | -2.554 | 0 | -2.152 | 0 | -2.576 | 2 | -2.215 | 2 |
| LEURH | -2.393 | 0 | -2.332 | 0 | -2.445 | 2 | -2.526 | 3 |
| LJPH | -2.437 | 0 | -1.993 | 0 | -2.488 | 2 | -2.080 | 2 |

Notes: all the variables are in logarithmic form. The GDP for the three areas: USA, EURO and GCC are in real terms. LUSAH is the Dollar's terms of trade represented as (log of ) oil price, WTI divided by the USACPI, LEURH is the Euro Zone's terms of trade defined as the (log of) oil price divided by the Germany CPI, and LJPH is the Yen Zone's terms of trade given as the (log of ) oil price divided by the Japan CPI. Lags of ADF test are based on SIC criterion. PP test is based on Newey-West using Bartlett kernel. The 5% critical value for PP and ADF with constant is -2.89, and with constant and trend is -3.46. Results suggest all variables are I(1) based on the 5% level.

**Table 5: The Johansen Co-integration Tests for the Three Zones' Term of Trade, Global GDP and Regional GDP**

| Hypothesized no. of CE(s) | Eigenvalue | Trace statistic | 5% Critical value | Max-Eigen. Stat. | 5% Critical value |
|---|---|---|---|---|---|
| *Dollar Zone* | | | | | |
| None * | 0.364 | 69.910 | 42.915 | 40.256 | 25.823 |
| At most 1 * | 0.224 | 29.654 | 25.872 | 22.619 | 19.387 |
| At most 2 | 0.076 | 7.035 | 12.518 | 7.035 | 12.518 |
| *EURO Zone* | | | | | |
| None * | 0.434 | 68.565 | 42.915 | 50.023 | 25.823 |
| At most 1 | 0.117 | 18.541 | 25.872 | 10.904 | 19.387 |
| At most 2 | 0.083 | 7.637 | 12.518 | 7.637 | 12.518 |
| *Yen Zone* | | | | | |
| None * | 0.303 | 49.509 | 42.915 | 31.725 | 25.823 |
| At most 1 | 0.142 | 17.784 | 25.872 | 13.499 | 19.387 |
| At most 2 | 0.048 | 4.285 | 12.518 | 4.285 | 12.518 |

Notes: There is one cointegrating vector for each of the dollar, euro and yen zones. Based on AIC, the lag length for the Dollar Zone is eight, while for the Euro Zone and the Yen Zone is seven each. All three zones have intercept in the VAR and linear trend in cointegration. The cointegration specification order is intercept in the VAR and linear trend in the cointegration (specification d).