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Abstract

This paper tests the desirability and feasibility of establishing a monetary union in GCC countries using a multivariate structural Vector Autoregression Model (VAR) for the period 1980-2006. The paper builds on the earlier work, capitalizing on a methodology that captures supply and demand disturbances impinging on individual economies. Co-movement of shocks across countries is considered a crucial condition towards integration in a common currency area. Shocks are based on the estimation of a structural VAR model that comprises world real output, domestic output, real exchange rates and the price level. Based on correlations using demand and monetary shocks, the paper establishes the following results: (i) countries of the region are still far from the necessary conditions to ensure the success of joining a currency union. Nevertheless, for a subset of countries (Saudi Arabia, the United Arab Emirates and Qatar), conditions suggest higher potential to take the lead in endorsing and fostering a common currency zone, (ii) a higher degree of labor mobility, openness, and intra-regional mobility are still desired to accelerate regional integration and ensure a steady path towards the establishment of a currency union.

ملخص

يقوم هذا البحث بفحص مدي الرغبة في والجدوى من تأسيس اتحاد مالي في دول مجلس التعاون الخليجي وذلك بإستخدام منحدر فكتور الذاتي متعدد المتغيرات الهيكيلية في خلال الفترة من عام 1980 الي عام 2006. ويبني هذا البحث علي العمل السابق مستفيداً من منهجية تقوم علي رصد اضطرابات العرض والطلب التي تؤثر علي اقتصاديات الأفراد. وتعتبر الحركات المصاحبة للتغيرات المفاجئة في البلاد شرطاً حاسماً نحو التكامل من اجل تحقيق عملة مشتركة لدول المنطقة. وتعتمد التغيرات المفاجئة علي تقييم منحدر فكتور الذاتي الهيكلي الذي يضم الإنتاجية العالمية الحقيقية والإنتاجية المحلية واسعار الصرف الحقيقة وايضاً مستوي السعر. وقد أثبت البحث بعض النتائج وذلك بالإعتماد علي الإرتباطات من خلال استخدام التغيرات النقدية المفاجئة والطلب. وتتضمن هذه النتائج ما يلي: ان دول المنطقة لاتزال بعيدة عن الشروط الضرورية التي تضمن تحقيق نجاح في الانضمام لإتحاد نقدي. ولكن علي الرغم من ذلك فإن هذه الشروط- بالنسبة لجزء من دول المنطقة وهي السعودية، والإمارات العربية المتحدة، وقطر- تتضمن امكانية أعلي من أجل اخذ زمام المبادرة لدعم وتعزيز وجود منطقة لها عملة مشتركة. لاتزال هناك رغبة شديدة بشأن وجود مرونة اليد العاملة، والإنفتاح، والمرونة بين الأقاليم وذلك من أجل الإسراع في تحقيق تكامل اقليمي وضمان طريق ثابت وموطد نحو تأسيس اتحاد نقدي.

1. Introduction

The Gulf Cooperation Council (GCC) was established in 1981, comprising six countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the U.A.E with the objective of strengthening economic relations and coordinating monetary and financial policies towards achieving a monetary union between the members in the long-run. Despite considerable delay in achieving this regional integration, following a meeting in Bahrain in 2000, a renewed momentum emerged as members agreed to establish a customs union in 2003 and peg their national currencies to the US dollar. The ultimate goal to form a monetary union and a single currency in 2010 is supported by many factors, primarily similarities between the economic structures of GCC members, which remain highly dominated by oil and hydrocarbon sectors.

The aim of the paper is to assess the desirability and feasibility of establishing a currency union in GCC member states based on the optimum currency area theory (henceforth OCA). Indeed, since the seminal contributions on the topic by Mundell (1961), McKinnon (1963) and Kenen (1974), subsequent papers have focused on the features of economic relationships between members that are likely to crystallize the benefits of adopting a common space for a unique currency, namely (i) labor mobility, (ii) extent of trade between countries, (iii) the symmetry of shocks across members, and (iv) the risk-sharing system. It is also commonly agreed that the correlation of shocks remains a crucial condition in determining a country's decision to integrate in a monetary union. If the shocks are positively correlated, it is possible to use common union-wide policies for the different member states of the union (Mundell (1961)).

After a lag of two decades, the interest has been renewed during the nineties with a growing body of literature on OCAs, especially after the successful monetary unification in Europe. According to the literature, the evaluation of OCAs depends on the degree of asymmetry between shocks and across countries. In other words, if the shocks are not positively correlated and highly idiosyncratic, it is not possible to use common union-wide policies to adjust eventual imbalances. The results imply that the desirability of a monetary union hinges on the fact that aggregate demand (AD) and aggregate supply (AS) are correlated across member countries.

Bayoumi and Eichengreen (1994) were among the first to identify, in a seminal contribution, the underlying structural shocks using the VAR technique developed by Blanchard and Quah (1989). Specifically, they have used a two variable structural VAR model to measure the degree of symmetry across the European Community members, while comparing them with those prevailing in the USA. The response of an economy to these structural supply and demand disturbances stemming from preferences and technology is of crucial importance, since the symmetry of shocks is likely to ensure the success of common currency adoption.

The application of the approach in Bayoumi and Eichengreen (1994) included samples of East Asian countries, where the authors estimated the correlations of the underlying disturbances and tested symmetry across Japan, South Korea, Hong Kong, Malaysia Indonesia and Singapore. The results support a common currency arrangement between these countries.

The literature on the monetary union in GCC countries is not abundant and few contributions have focused on the suitability of the monetary union from the standpoint of benefits and costs for each country (e.g. Jadresic (2002), Laabas and Limam (2002), Oman Economic Review (2002), Fasano and Igbal (2003), Ibrahim (2004), Sturm and Siegfried (2005) and Pattanaik, (2007)). The bulk of these studies have established an agreement on the possibility of a monetary union, emphasizing that Gulf economies have similar structures and are dominated by oil and gas —even if regional trade is not robust among partners. In addition,

there is no evidence of business-cycle synchronization and economic convergence across GCC countries.

However, previous contributions did not study the effects of similar macroeconomic shocks on GCC economies. The only two papers that have used the methodology of Bayoumi and Eichengreen (1994) for the GCC countries are those of Abu-Bader and Abu-Qarn (2006) and Rosmy, Bali and Osman (2008). The first paper used a bivariate structural VAR (SVAR) to analyze the effects of macroeconomic shocks on GCC countries. Specifically, the SVAR comprised total output and prices, employing long-run restrictions in order to extract AS and AD shocks. Moreover, the authors tested for common trends and business cycles among GCC countries using cointegration and correlation analysis, employing common-cycle tests. They found that transitory demand shocks were typically symmetric while permanent supply shocks were asymmetric.

A subsequent paper (Rosmy, Bali and Osman (2008)) tested the suitability of monetary union in GCC countries using the symmetry of shocks based on a bivariate SVAR that comprised non-oil output and prices. The SVAR was identified using long-run restrictions of the various shocks. The authors found that the monetary union is feasible, although the evidence was not overwhelming in favor, since non-oil AS shocks were weakly symmetrical while AD shocks were totally symmetrical across GCC members. Moreover, the US dollar, rather than the Euro, was found to be more appropriate as an anchor for the new currency since AD shocks were symmetrical with the US while there was no symmetry with major countries of the EURO area (France, Germany and Italy).

The goal of this paper is to contribute to the empirical literature on the feasibility of a currency union in GCC, employing the methodology by Bayoumi and Eichengreen (1994) to estimate a multivariate SVAR with four variables including: the world GDP, domestic real GDP, real effective exchange rate and the local price level. The world GDP captures exogenous global conditions while domestic shocks comprise supply, demand and monetary shocks. The estimation follows identifying the SVAR using long-run restrictions in order to extract structural economic shocks across GCC members. This approach expands on the list of variables in previous studies, which were limited to real GDP, consumer price index (CPI) and interest rates (e.g. Goto and Hamada (1994) and Kwan (1998)).

Moreover, the choice of a multivariate SVAR, instead of a straightforward approach with bivariate structure, makes it possible to expand the structure beyond classical supply and demand shocks (Ling (2001)). The shocks include an external global shock, since the main source of income for GCC is based mainly on hydrocarbon production for which the price fluctuates in response to global demand conditions. In addition, the model captures a monetary shock to test the feasibility of a monetary union and the prospects of coordinating monetary policies.

The main results of the paper are: (i) The analysis of structural disturbances suggests that GCC countries are still far from forming an OCA. Nevertheless, for a subset of countries (Saudi Arabia, United Arab Emirates and Qatar), it may be beneficial to take the lead in endorsing and fostering a common currency zone since these economies show significant and positive correlations of underlying disturbances. (ii) The multivariate approach shows that Oman does not satisfy the shocking criteria. (iii) a higher degree of labor mobility, openness and intra-regional mobility are still desired despite significant progress and strong drive among policymakers and business leaders to accelerate regional integration and ensure a successful path going forward.

The remainder of the paper is organized as follows. Section 2 presents descriptive statistics. Section 3 provides the methodology based on multivariate SVAR. The data and variables are

described in Section 4. Section 5 presents the empirical investigation. Finally, Section 6 concludes the paper.

2. Descriptive Analytics

The results in Table (1) reveal that real GDP growth has varied across GCC countries yet remains largely underpinned by a significant share of oil production. The largest average growth of GDP in Qatar (10.3%) reflects the largest share of oil production (54.7%). Kuwait has the second largest share of oil production to GDP, (46%) and the second highest average growth across GCC (7.2%). Both Qatar and Kuwait register the highest averages of non-oil real GDP growth (12.8% and 9.9% respectively), reflecting a large spill over positive effect of oil growth on the non-oil sector of the economy. In Saudi Arabia, where average real growth is the lowest across GCC countries (3.6%), the share of oil production is high (32% of GDP). However, non-oil real GDP is the lowest across the group (4.3%). Similarly, in Oman the average growth rate is the second lowest in the region (4.3%) despite a large share of oil production (30.7%), reflecting a relatively smaller growth of non-oil GDP (7.8%).

Overall, the high share of oil production has had a positive effect on non-oil real GDP growth and has contributed to a relatively robust high average of real growth across GCC countries. However, the oil boom and accompanying wealth, coupled with a fixed exchange rate policy, increased domestic demand and the price of imports, resulting in high inflation that ranged between 6% in Bahrain and 10.5% in Qatar.

High inflation resulted in persistent appreciation of the real effective exchange rate (REER), ranging from 1.7% in Bahrain to 7% in Qatar, on average, relative to major trading partners. Movements in the interest rate reflected the monetary policy stance, in line with the US interest rate policy to support the currency peg, although varying inflationary experiences have affected the real interest rate differently since the difference between the money market rate and the inflation rate was negative in Kuwait and Qatar.

The oil boom accelerated monetary growth and private credit growth across GCC countries. Moreover, oil revenues contributed to a surge in government spending, as evident by the high share relative to GDP. Similarly, the surge in revenues, relative to expenditures, sustained an overall surplus of the government balance in major countries. Moreover, oil exports maintained a high surplus in the current account, ranging from 7.6% of GDP in Bahrain to 26% in Qatar. The surplus in the current account contributed to significant growth in international reserves ranging from 5.5% in Bahrain to 28.3% in UAE, on average, over time.

3. Methodology

According to the OCA literature, the observable macroeconomic variables (GDP growth rates, inflation rates, real exchange rates, etc…) may be correlated across a group of countries or provinces. Bayoumi and Eichengreen (1994) identified the structural shocks, based on Blanchard and Quah's (1989) VAR structure. In this paper, we use a four-variable structural VAR model[1] to examine the shocks according to the OCA predictions. These variables are log differences of world real GDP (y_t^*), domestic output (y_t), real exchange rate (e_t) and the price level (p_t).

If we consider the vectors $\Delta x_t = X_t = (\Delta y_t^*, \Delta y_t, \Delta e_t, \Delta p_t)'$ and $\varepsilon_t = (\varepsilon_{st}^*, \varepsilon_{st}, \varepsilon_{dt}, \varepsilon_{mt})'$ where Δ is the first-difference operator and ε_{st}^*, ε_{st}, ε_{dt}, ε_{mt} are external supply, domestic supply, domestic demand and monetary shocks, respectively. The structural model can be written as follows:

[1] See Amisano and Giannini (1970) and Hamilton (1994) for more details.

$$\Delta x_t = X_t = A_0\varepsilon_t + A_1\varepsilon_{t-1} + A_2\varepsilon_{t-2} + \ldots = A(L)\varepsilon_t \quad (1)$$

Where $A(L) = \begin{pmatrix} A_{11}(L) & A_{12}(L) & A_{13}(L) & A_{14}(L) \\ A_{21}(L) & A_{22}(L) & A_{23}(L) & A_{24}(L) \\ A_{31}(L) & A_{32}(L) & A_{33}(L) & A_{34}(L) \\ A_{41}(L) & A_{42}(L) & A_{43}(L) & A_{44}(L) \end{pmatrix}$

The matrix A is then a 4×4 matrix that provides the impulse responses of endogenous variables to structural shocks. The vector $\varepsilon_t = (\varepsilon^*_{st}, \varepsilon_{st}, \varepsilon_{dt}, \varepsilon_{mt})'$ represents the four structural shocks that are likely to affect the macroeconomic variables in the economy. These shocks are supposed to be serially uncorrelated with a normalized (identity) covariance matrix.

The world real output is posited to evolve exogenously so that domestic supply, domestic demand and monetary shocks do not affect world real GDP in the long run. This means that disturbances in GCC countries are not strong enough to affect real world output. Nevertheless, domestic variables are posited to be affected by external as well as domestic shocks. This would imply that $A_{11}(L) \neq 0$ and $A_{12}(L) = A_{13}(L) = A_{14}(L) = 0$.

However, for the identification of these structural shocks, we impose the following long-run restrictions. (*i*) The long-run real GDP is affected only by supply shocks. This means that $A_{22}(L) \neq 0$. (*ii*) Supply and demand shocks are supposed to affect real exchange rates in the long run which is equivalent to having $A_{32}(L) = A_{33}(L) \neq 0$. (*iii*) Monetary shocks do not have effects on either real GDP output or real exchange rates in the long run. This restriction leads to $A_{24}(L) = A_{34}(L) = 0$.

More specifically, to have identified series of the vector $\varepsilon_t = (\varepsilon^*_{st}, \varepsilon_{st}, \varepsilon_{dt}, \varepsilon_{mt})'$ and the A_i matrices, the long-run restrictions are equivalent to $A_{23}(L) = A_{24}(1) = A_{34}(1) = 0$, which is considered as sufficient to identify the A_i matrices and the structural shocks series.

As a consequence, the system can be rewritten as follows:

$$\begin{pmatrix} \Delta y^*_t \\ \Delta y_t \\ \Delta e_t \\ \Delta p_t \end{pmatrix} = \begin{pmatrix} A_{11}(L) & 0 & 0 & 0 \\ A_{21}(L) & A_{22}(L) & 0 & 0 \\ A_{31}(L) & A_{32}(L) & A_{33}(L) & 0 \\ A_{41}(L) & A_{42}(L) & A_{43}(L) & A_{44}(L) \end{pmatrix} \begin{pmatrix} \varepsilon^*_{st} \\ \varepsilon_{st} \\ \varepsilon_{dt} \\ \varepsilon_{mt} \end{pmatrix} \quad (2)$$

The reduced-form VAR model to be estimated is the following one:

$$X_t = B(L)X_{t-1} + u_t \quad (2)$$

where u_t represents a reduced-form disturbance vector. The moving average representation of equation (2) is as follows:

$$X_t = C(L)u_t \quad (3)$$

where $C(L) = (1 - B(L)L)^{-1}$ and the leading matrix of $C(L)$ is $C_0 = I$. The relationship between the structural and the reduced-form disturbances is:

$$u_t = A_0\varepsilon_t \quad (4)$$

In accordance with the assumption that the structural shocks in the vector $\varepsilon_t = (\varepsilon^*_{st}, \varepsilon_{st}, \varepsilon_{dt}, \varepsilon_{mt})'$ are orthogonal and serially uncorrelated, we can have $\Omega = Eu_t u_t' = EA_0\varepsilon_t\varepsilon_t' A_0' = A_0 A_0'$.

Together with the above long-run restrictions, $A(L)$ is the Cholesky lower triangle. Thus, by using $\varepsilon_t = A_0^{-1} u_t$ it is sufficient to identify the structural A_i matrix and the shocks $\varepsilon_t = (\varepsilon_{st}^*, \varepsilon_{st}, \varepsilon_{dt}, \varepsilon_{mt})$.

4. Data and Variables

The data in this paper covers the period 1970-2006 from the World Development Indicators (WDI) of the World Bank (2008) and International Financial Statistics (IFS) (2008) of the International Monetary Fund (IMF) and Chelem Dataset (2008). The variables are the world real GDP, domestic GDP, exchange rates and the price level. The world real GDP is the real production of the G7 countries — major trading partners of GCC countries. For ensuing empirical analysis, real GDP in each country is expressed in constant US dollars. The REER is converted into a single index (2000 = 100). For the price level we use the GDP deflator (fixed at 2000 = 100) as data for the consumer price index is not available for certain years in some countries. Using the Augmented Dickey-Fuller, Phillips-Perron and KPSS Tests, the variables are integrated of order one ($I(1)$) and their first differences are stationary ($I(0)$). Moreover, in the estimation of the VAR, optimal lags are chosen according to Schwartz criteria.

5. Empirical Investigation

5.1 Correlations across variables

Having examined the matrix of correlations for the GCC countries and the USA[2] for the period 1981–2006 in Tables (2) and (3), the following patterns emerge. Correlations across countries are smaller for real GDP growth, in contrast to correlations across price inflation. Real growth in Oman does not show any correlation with the rest of the countries in the sample, signifying major structural differences. The remaining economies show significant correlation coefficients especially between real growth in each of Saudi Arabia, Qatar and the UAE. Where correlations are not significant, there is a great dispersion in the evolution of growth rates, signifying the role of asymmetrical supply shocks. Finally, correlation results display significant correlations between USA and Saudi Arabia, Qatar and Kuwait.

The evolution of growth rates is displayed in Figure (1) and confirms divergence in the growth rates across GCC over time. Specifically, the graph exhibits more volatile growth rates for each of Saudi Arabia, Qatar and the UAE, in contrast to relatively more stable growth rates for Oman, Bahrain and Kuwait and stable growth in the USA. In sum, GCC countries do not exhibit strong signs of convergence of real growth rates, which will determine the prospect of a monetary union between these countries.

Across GCC, inflation rates exhibit high and significant correlations at the 5% level, reflecting more synchronized demand shocks, as evident in Figure (2). The highest coefficients are for co-movements between inflation in each of Saudi Arabia and Kuwait with inflation in the rest of the GCC.

5.2 Correlations with respect to external supply shocks

Correlations with respect to specific identified disturbances determine the degree of symmetry or asymmetry between shocks across countries— a crucial step in evaluating the suitability of the countries to join a monetary union. Specifically, shocks are symmetric if the

[2] The USA is added to the sample of GCC countries because it is both an important trading partner and nominal exchange rates across the GCC (except Kuwait) are pegged to the US dollar. Fluctuations in the real effective exchange rate capture movements in the US dollar relative to the currencies of other major trading partners and developments in relative prices.

correlation of structural disturbances is positive. In contrast, a negative correlation of the shocks across countries implies asymmetric adjustments.

Table (4) displays the correlations of external shocks which are positive and significant at the 5% level across GCC countries during the period 1970–2006. Countries of the region are highly open to the rest of the world with G7 countries being major trading partners for the region. The positive and significant correlations of external shocks across countries attest to mutual benefits for symmetric adjustments in the context of currency union.

5.3 Correlations with respect to domestic supply shocks

Correlations with respect to domestic supply shocks across countries of GCC are presented in Table (5). The correlations are generally negative or insignificant with the exception of few countries that display positive and significant correlations of structural supply shocks, namely Saudi Arabia and the UAE (+0.25) and Saudi Arabia and Qatar (+0.31). The latter evidence reflects symmetry of adjustments to supply shocks in these two countries. This result further confirms correlations between real GDP growth rates in Table (2). The table also displays high correlations between the USA and Kuwait (+0.42) and USA and Qatar (+0.48).

In contrast, the majority of correlations for Oman are negative with supply shocks in other countries, reflecting asymmetry of supply disturbances. Such evidence discounts the potential of Oman for integration in GCC currency union. The results also tend to present low positive significant correlation coefficients between Bahrain, Kuwait and Saudi Arabia. Overall, correlations with respect to supply shocks in GCC countries exhibit a relatively stronger case for symmetric adjustments in Saudi Arabia and the UAE, and to a lesser extent for Bahrain and Kuwait.

5.4 Correlations with respect to demand shocks

Table (6) presents correlations with respect to demand shocks across GCC countries. Significant and highly positive correlations are evident between Bahrain, Kuwait and Saudi Arabia and each of the remaining countries. For the rest of the countries correlation coefficients are insignificant, implying: (i) the absence of tight economic relationships between countries with respect to asymmetric shocks and, (ii) the absence of close coordination in the conduct of monetary and fiscal policies across GCC countries towards achieving specific convergence criteria. The underlying asymmetry is country-specific, structural transformation into international financial centers that are specialized in financial services and less dependent on bilateral or multilateral trade.

5.5 Correlations with respect to monetary shocks

The results in Table (6) display more significant and positive correlations between monetary shocks across GCC countries. Monetary shocks in Qatar exhibit significant correlations with monetary shocks in Bahrain, Kuwait and Oman. In turn, monetary shocks in Bahrain correlate with their counterparts in Kuwait, Oman and Qatar. The symmetric pattern of monetary shocks in GCC countries, although substantial, remains limited to a few countries and less prevalent compared to other monetary integration experiences (European Union (EU), and East Asia). Moreover, monetary shocks in UAE display negative coefficients with counterparts in other GCC countries (with the exception of Saudi Arabia), ruling out the potential of symmetric adjustments in the context of a currency union.

Overall, correlations with respect to various shocks do not display a strong support for the creation of a common currency zone that comprises member countries of the GCC. Nevertheless, significant positive correlations, where they exist, suggest that a currency union remains a feasible option in a sub-set of GCC countries, mainly Saudi Arabia and the United

Arab Emirates (UAE). Indeed, correlations with respect to supply shocks are the highest between these two countries, providing strong evidence in favor of symmetric adjustments.

5.6 Variance decomposition

We carry out variance decomposition analysis in order to show the contribution of each shock to movements in the four variables of the structural VAR model. Specifically, variance measures the cumulative fluctuations over a twenty-year horizon in the forecast error of changes in the VAR variables. The variance decomposition technique, by quantifying determinants of these fluctuations, identifies the contribution of the various shocks impinging on the economic system to the cumulative variability of the SVAR variables, namely world output, domestic output, exchanges rates and the price level.

Table (8) displays the variance decomposition results in the short-run, one-year forecast error, and in the long-run, twenty-year forecast error. Details of the variance decomposition over other forecast horizons are available upon request. The variance decomposition identifies the various shocks that are relatively more predominant in accounting for the variability of domestic output, exchanges rates and the price level. Differences across countries regarding sources of variability may be indicative of the underlying differences of the transmission mechanisms of the various shocks and accompanying policies.

The results in Table (8) do not display the variance decomposition of the change in world real output, reflecting the assumption in Section 3 that world real output evolves exogenously. Hence, shocks to domestic supply and demand, as well as monetary policy shocks do not affect the variability of world real GDP in the long run. Moreover, other results in the same table show that domestic supply shocks are the predominant shocks in the variability of domestic real output in the different countries of the region. More specifically, supply shocks seem to account for at least 51% of variability at different horizons but only 19 % in the case of USA. The dominant share of supply shocks in the GCC countries reflects the dominant share of oil production in determining output supply and real GDP growth.

Interestingly, however, external real output (shocks to world GDP) also plays a substantial part in explaining the variability of real output, especially in Saudi Arabia but remains less important when compared to the USA (at least 47 % in all horizons). As world GDP determines demand for oil and the oil price, fluctuations in the global economy determine growth in oil-producing countries, including GCC countries.

Price variations seem to be mainly dependant on domestic behavior, represented by demand shocks which have an important role in explaining the variability of price inflation in GCC countries, although at a decreasing rate over time. The contribution of monetary shocks appears less important to the variance of price inflation and is only substantial in the case of USA. Moreover, the variability of price inflation across GCC is also dependent on supply shocks to world GDP. The contribution increases over time especially in Kuwait, Qatar and Saudi Arabia, reflecting increased sensitivity of domestic price inflation to fluctuations in the oil price with global demand. In general, the results indicate that GCC inflation is highly dependent on fluctuations in domestic demand capturing government spending and exchange rate movements.

Fluctuations in real exchange rates were predominantly caused by demand shocks at all horizons for the GCC countries and the USA. Consequently, world or domestic supply considerations do not seem to play any role in explaining the variability of real exchange rates. Demand shocks account for over 37% of the variability in the real exchange rate in Oman and 74% in the USA. It has to be noted that the importance of demand shocks is decreasing over time especially in Oman and Qatar. This finding has policy implications for the choice of the exchange rate regime. GCC countries, in general, have opted to peg their

domestic currency to the US dollar to insulate the economy from fluctuations in the output supply. However, the dominant share of demand shocks would reinforce arguments to reconsider the benefit of a currency peg to the US dollar. To stem the effects of demand pressures, options may include introducing more flexibility in the exchange rate system or a peg to a weighted basket that includes, in addition to the US dollar, the currencies of major trading partners for GCC imports.

5.7 Impulse response

Having analyzed the results of the variance decomposition, it is beneficial to look at the impulse response function to evaluate the magnitude or the size of the response of each economy to the various shocks. The impulse response function tracks the dynamic effect of one standard deviation to each structural shock on variables of the VAR over a twenty-year horizon. A large-size shock means more disruptive effects on the economy. The more protracted these effects are in a given economy, the less likely that a common policy could unite the collective interests of member countries in the context of a currency union.

Figures (3) to (5) summarize the dynamic responses of domestic real output, the real exchange rate and the price level to domestic supply, domestic demand and monetary shocks, respectively. For domestic supply shocks, (Figure (3)) measures the effect of a unit shock on changes in real GDP over a twenty-year horizon. In general, the impulse responses of output in GCC countries to a supply shock are important but dissipating within the following five years, reflecting a high speed of adjustment. Figure (4) displays the responses of the real exchange rate to a demand shock which seem not to differ much across GCC member countries since the bulk of the adjustment occurs within a period of four to five years. Finally, in figure (5) we have the impulse responses of prices to a monetary shock. The adjustment of prices seems to occur within the same period, notwithstanding the high magnitudes in Qatar and Kuwait.

These results are also in line with the variance decomposition analysis. As supply shocks are highly dominated by oil production and the latter is subject to continued fluctuations over time, shocks are short-lasting, increasing the prospects of harmonizing the members' interests in the context of a currency union. Countries are considered good candidates for a currency union if they face small correlated disturbances and exhibit rapid adjustments to steady-state equilibrium.

6. Conclusion

The present study has focused on the feasibility of creating a currency union that comprises GCC countries. The approach to the investigation is a four-variable structural VAR model that comprises four shocks: global supply, domestic supply, domestic demand and monetary shocks. The methodology accounts for correlations across various shocks to identify their effects on economic variables across GCC member countries and evaluate the prospect of their integration in the context of a monetary union.

The highlights of the results are as follows. In general, correlation patterns with respect to the various shocks indicate that GCC countries of the region are still far from forming an optimal currency area. Nevertheless, for a subset of countries (Saudi Arabia, the United Arab Emirates and Qatar), it may be beneficial to take the lead in endorsing and fostering a common currency zone since these economies show relatively more significant and positive correlations of underlying disturbances. Oman appears more distant from other members of the GCC with respect to adjustments to various shocks.

However, a few factors bode well for the prospect of currency union across members of the GCC.

The variability of price inflation and GDP growth across GCC is highly dependent on fluctuations in the world economy and domestic supply shocks, increasing the prospect of a common monetary policy to counter inflationary pressures and addressing growth concerns across the group. As fluctuations of the real exchange rates of GCC countries seem to be relatively more dominated by demand shocks, a collective policy to protect members' interests can be managed to stabilize the real exchange rate of a common currency in the context of a union. The dynamics of the impulse response function demonstrates short-lived shocks and a tendency to revert to steady-state equilibrium, increasing the likelihood of abiding by a common policy stance in the context of a union. Despite achieving several milestones and the growing eagerness among policymakers and business leaders alike to accelerate regional integration, more labor mobility, openness and regional integration are still desired to secure a steady path towards a successful currency union for GCC members.

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Figure 1: Evolution of Real GDP Growth Rates in GCC Countries (1981–2006)

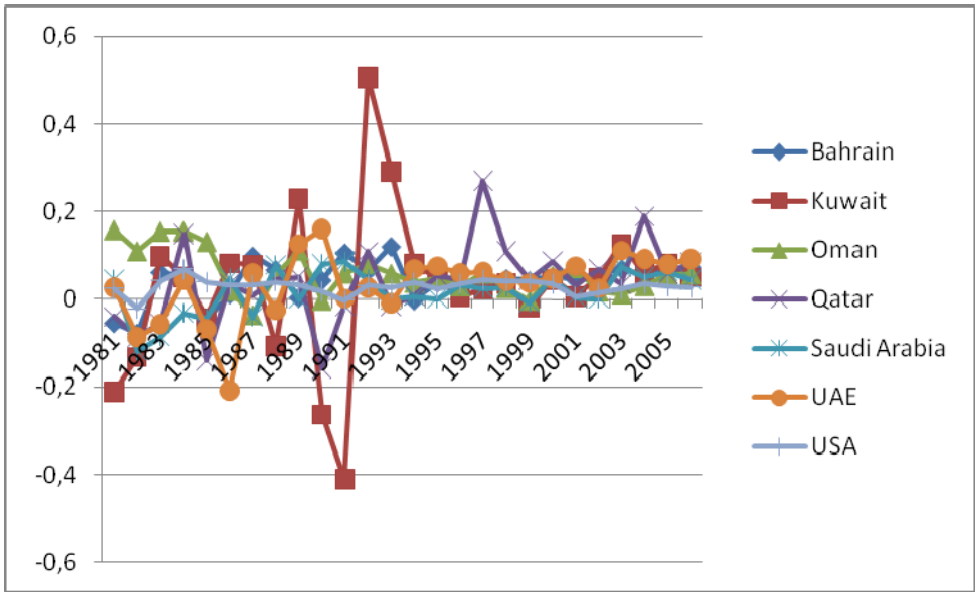
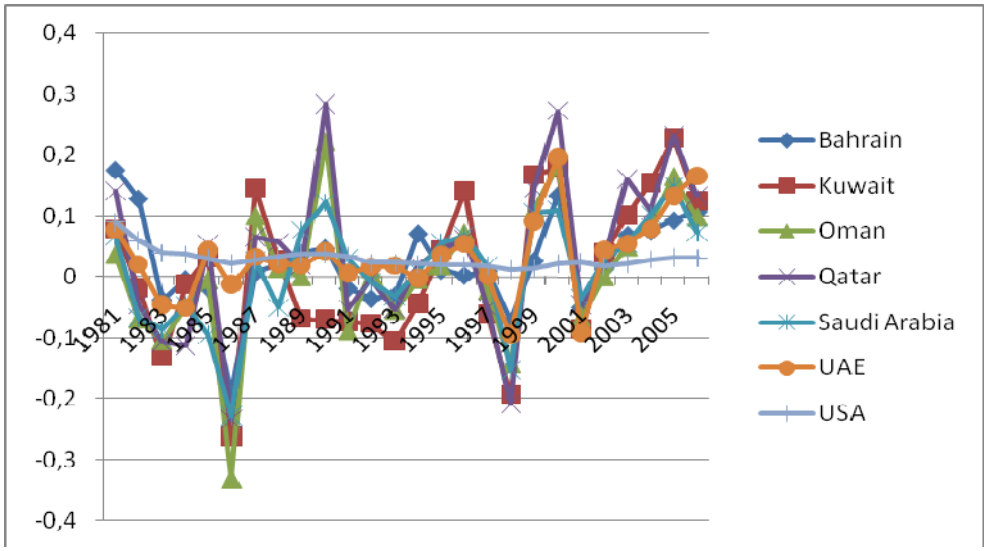
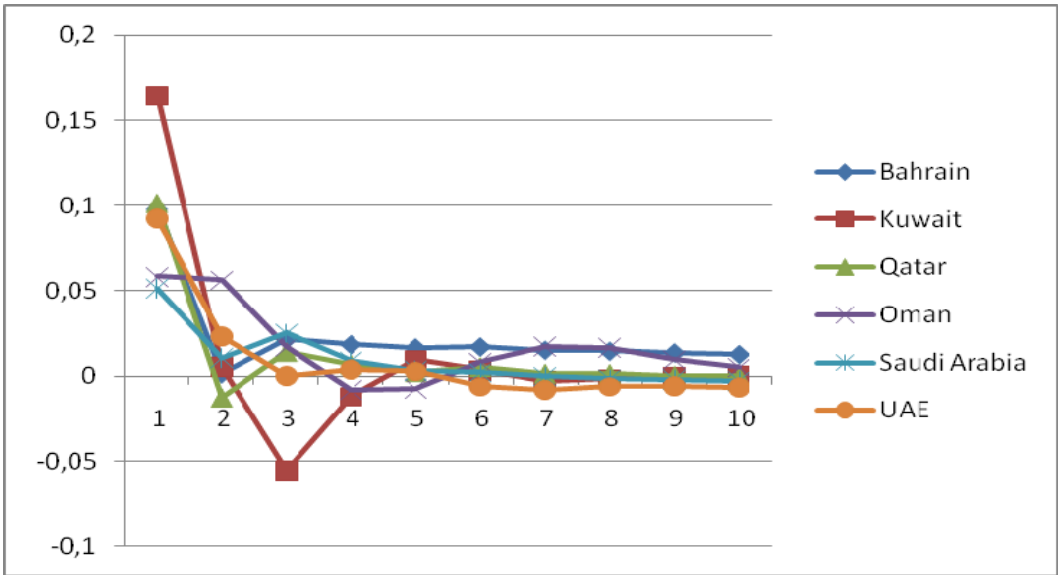


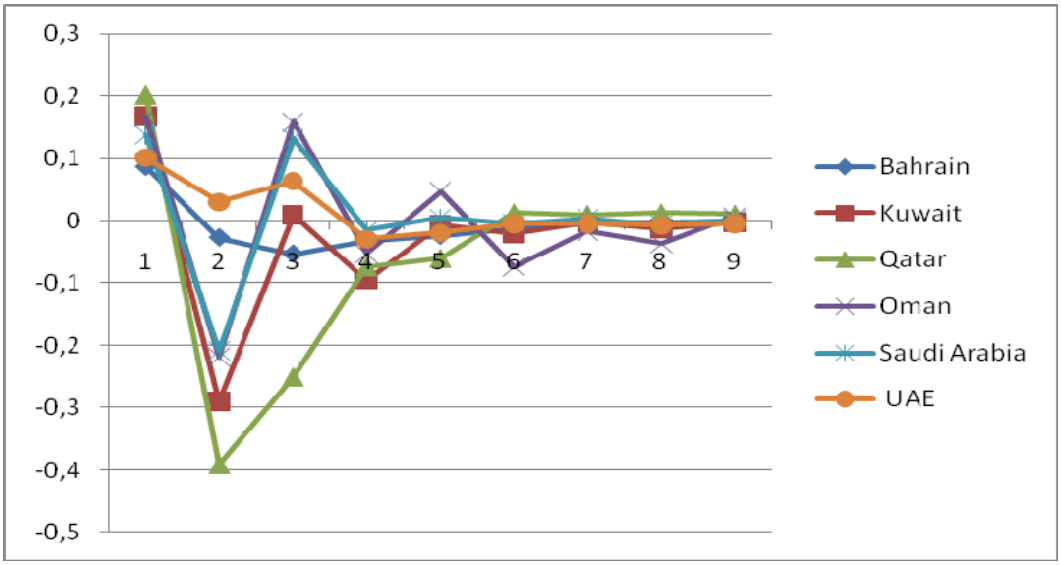
Figure 2: Evolution of Inflation Rates in GCC Countries (1981–2006)



Figures 3: Response of Real GDP to a Domestic Supply Shock



Figures 4: Response of REER to a Demand Shock



Figures 5: Response of Price Level to a Monetary Shock

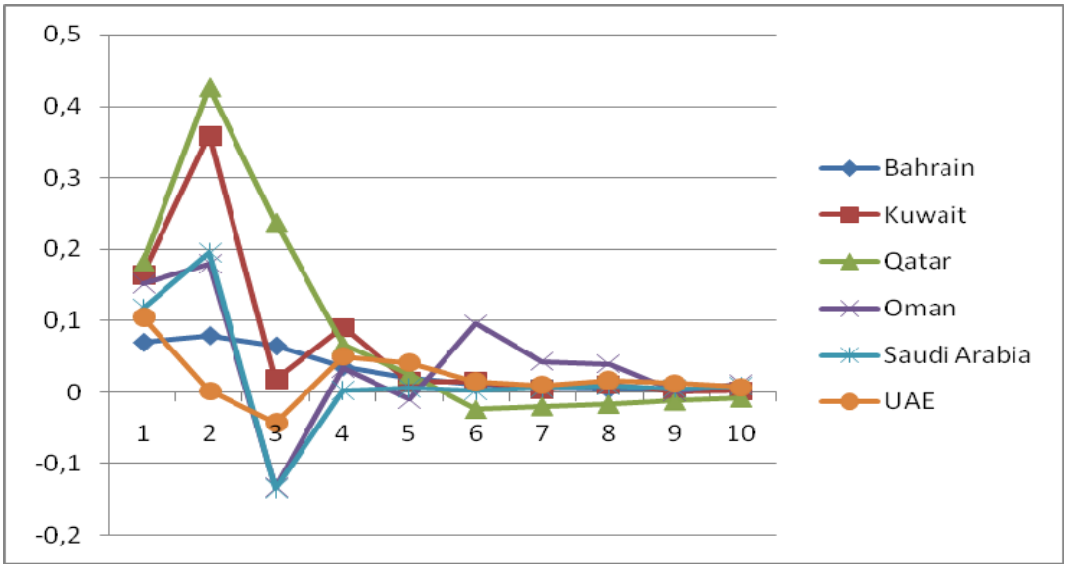


Table 1: Some Relevant Economic Indicators for the GCC Countries (2000–2007)

	Real GDP growth	Inflation (GDP deflator)	Non-oil real GDP growth	Oil production % GDP	REER index variation	Interest rate
Bahrain	6.46[1]	5.90	8.70	19.70[2]	1.74	3.53 (RR)[3]
Kuwait	7.15	7.80	9.90	46.29	6.18	4.04(MM)
Oman	4.26	6.93	7.80	30.73	2.18	1.92 (RR)
Qatar	10.34	10.48	12.80	54.73	7.24	3.59 (MM)
Saudi Arabia	3.64	6.71	4.25	32.00	2.93	3.71 (DR)
UAE	7.06	6.86	9.15	28.83	3.11	4.29 (RR)

Table 1: continued

	Monetary growth	Private credit growth	Central Government spending and net lending (%) GDP	Central Government balance (%) GDP	Current account balance (%) GDP	Rate of growth of total reserves (minus gold)
Bahrain	9.37	19.1	27.47	4.41	7.57	5.53
Kuwait	14.15	18.64	35.33	29.70	33.26	13.00
Oman	13.21	9.74	37.54	9.43	9.17	21.9
Qatar	34.47	27.3	31.82	9.32	26.36	34.9
Saudi Arabia	12.76	18.88	33.00	7.03	16.82	8.08
UAE	27.02	23.69	33.24	14.09	13.81	28.26

1/ the average growth rate. 2/ the mean ratio. 3/ RR: real interest rate, MM: money market rate, DR: Deposit rate.

Source: International Financial Statistics (2008) of the International Monetary Fund (IMF) and World Development Indicators (2008) of the World Bank.

Table 2: Correlation of GDP Growth Rates across GCC Countries (1981–2006)

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	USA
Bahrain	1.00						
Kuwait	-0.03	1.00					
Oman	0.16	-0.02	1.00				
Qatar	-0.17	0.39	-0.29	1.00			
Saudi Arabia	0.41	-0.14	-0.22	0.21	1.00		
UAE	0.06	-0.09	-0.42	0.23	0.62	1.00	
USA	-0.20	0.42	-0.21	0.54	0.61	0.15	1.00

The shaded values indicate the statistical significance at the 5% level.

Table 3: Correlation of Inflation Rates across GCC Countries (1981–2006)

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	USA
Bahrain	1.00						
Kuwait	0.66	1.00					
Oman	0.67	0.94	1.00				
Qatar	0.70	0.91	0.95	1.00			
Saudi Arabia	0.67	0.92	0.95	0.94	1.00		
UAE	0.56	0.85	0.83	0.87	0.84	1.00	
USA	0.67	0.49	0.49	0.54	0.52	0.44	1.00

Table 4: Correlations of World Supply Shocks

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	USA
Bahrain	1.00						
Kuwait	0.50	1.00					
Oman	0.55	0.64	1.00				
Qatar	0.68	0.74	0.75	1.00			
Saudi Arabia	0.39	0.80	0.50	0.75	1.00		
UAE	0.66	0.74	0.59	0.64	0.62	1.00	
USA	0.43	0.71	0.64	0.61	0.56	0.57	1.00

The shaded values indicate the statistical significance at the 5% level. We use the correlation statistic of Kendall and Stuart (1973) to test if the correlation is statistically significant at the 5 % level. The null hypothesis is that the correlation coefficient is equal to zero.

Table 5: Correlations of Domestic Supply Shocks

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	USA
Bahrain	1.00						
Kuwait	-0.12	1.00					
Oman	-0.15	-0.07	1.00				
Qatar	-0.07	0.28	-0.14	1.00			
Saudi Arabia	0.14	-0.20	-0.20	0.31	1.00		
UAE	0.06	-0.05	0.25	0.10	0.25	1.00	
USA	-0.06	0.42	0.15	0.48	-0.11	-0.12	1.00

The shaded values indicate the statistical significance at the 5% level. We use the correlation statistic of Kendall and Stuart (1973) for testing if the correlation is statistically significant at 5 % level. The null hypothesis is that the correlation coefficient is equal to zero.

Table 6: Correlations of Demand Shocks

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	USA
Bahrain	1.00						
Kuwait	0.33	1.00					
Oman	0.38	0.50	1.00				
Qatar	0.16	0.58	0.53	1.00			
Saudi Arabia	0.42	0.59	0.40	0.39	1.00		
UAE	0.40	0.47	0.17	0.07	0.43	1.00	
USA	0.46	0.30	0.14	-0.07	0.58	0.23	1.00

The shaded values indicate the statistical significance at the 5% level. We use the correlation statistic of Kendall and Stuart (1973) for testing if the correlation is statistically significant at 5 % level. The null hypothesis is that the correlation coefficient is equal to zero.

Table 7: Correlations of Monetary Shocks

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	USA
Bahrain	1.00						
Kuwait	0.25	1.00					
Oman	0.50	0.65	1.00				
Qatar	0.80	0.49	0.62	1.00			
Saudi Arabia	-0.49	-0.60	-0.57	-0.41	1.00		
UAE	-0.05	-0.58	-0.36	-0.08	0.40	1.00	
USA	-0.20	-0.29	0.02	-0.06	0.49	0.08	1.00

The shaded values indicate the statistical significance at the 5% level. We use the correlation statistic of Kendall and Stuart (1973) for testing if the correlation is statistically significant at 5 % level. The null hypothesis is that the correlation coefficient is equal to zero.

Table 8: Variance Decomposition of the Changes in Domestic Real Output, Real Exchange Rate and Price Level

	Domestic Real Output				Real Exchange Rate				Price Level			
	World supply shock	Supply shock	Demand shock	Mone tary shock	World supply shock	Supply shock	Demand shock	Mone tary shock	World supply shock	Supply shock	Demand shock	Mone-tary shock
Bahrain	9.97/ 18.4	90.03/ 71.43	0.00/ 0.95	0.00/ 9.2	0.02/ 2.50	2.01/ 2.21	97.97/ 70.47	0.00/ 24.8	1.66/ 9.95	0.204/ 12.51	69.12/ 31.17	29.0/ 46.3
Kuwait	15.19/ 14.82	84.8/ 80.35	0.00/ 0.56	0.00/ 4.26	12.77/ 16.72	1.57/ 5.02	85.64/ 54.12	0.00/ 24.14	8.76/ 21.39	0.35/ 7.61	81.65/ 44.13	9.23/ 26.86
Oman	2.25/ 25.3	97.75/ 51.74	0.00/ 9.64	0.00/ 13.27	5.87/ 13.20	2.2/ 37.45	91.92/ 37.97	0.00/ 11.35	0.52/ 18.76	4.411/ 37.05	88.18/ 34.83	6.87/ 9.34
Qatar	23.1/ 27.95	76.89/ 60.68	0.00/ 7.92	0.00/ 3.43	18.56/ 22.53	6.46/ 11.31	74.97 45.08	0.00/ 21.06	13.28/ 29.47	11.23/ 9.44	68.77/ 34.48	6.71/ 26.59
Saudi Arabia	3.01/ 29.72	96.99/ 59.36	0.00/ 4.87	0.00/ 6.05	15.45 17.44	3.58/ 17.81	80.97/ 45.14	0.00/ 19.6	9.89/ 24.77	10.53/ 19.51	67.95/ 32.28	11.61/ 23.42
UAE	0.21/ 22.43	99.79/ 63.20	0.00/ 3.47	0.00/ 10.88	0.55/ 2.61	4.87/ 32.19	94.57/ 59.20	0.00/ 5.99	0.967/ 14.69	7.51/ 30.49	73.17/ 40.26	18.35/ 14.54
USA	80.89/ 47.056	19.10/ 21.42	0.00/ 7.95	0.00/ 23.56	1.14/ 5.68	7.28/ 11.83	91.57/ 74.00	0.00/ 8.48	9.74/ 35.09	6.13/ 11.7	1.54/ 30.01	82.58/ 23.19

The different values show the percentage change of the forecast error variance in the world real output, domestic output, real exchange rate and price level resulting from each shock over an horizon of 20 years.