

ECONOMIC  
RESEARCH  
FORUM



منتدى  
البحوث  
الاقتصادية

2008

# working paper series

GULF MONETARY UNION  
AND REGIONAL INTEGRATION

M. Kabir Hassan and Ashraf Nakibullah

Working Paper No. 453

# Gulf Monetary Union and Regional Integration

**M. Kabir Hassan and Ashraf Nakibullah**

**Working Paper 453**

**December 2008**

M. Kabir Hassan , Dept. of Economics and Finance, University of New Orleans, USA  
Email: [mhassn@uno.edu](mailto:mhassn@uno.edu)  
Ashraf Nakibullah, Dept. of Economics and Finance, College of Business, University of Bahrain  
Email: [ashrafna@buss.uob.bh](mailto:ashrafna@buss.uob.bh)

## Abstract

Currencies of the GCC countries have long been *effectively* pegged to the US dollar. Since 2003 the GCC countries have formally started pegging their currencies to the US dollar as a first step towards the proposed monetary union in 2010. The prevailing dollar peg and the absence of any significant current and capital account restrictions led some to believe that these countries have lost monetary independence. Contrary to this belief, the paper presents evidence that interest rates of the GCC countries did not converge to the interest rates of the US implying that the assets of the GCC countries are not perfect substitutes to the US assets. This imperfect asset substitutability has allowed the GCC countries to maneuver their monetary policies and the central banks of the GCC countries have had some control over their money growth rates by sterilizing the changes in international reserves. Results indicate that the monetary authorities of these countries used domestic credit policy to attain domestic policy objective of price level stability while engaging in sterilized foreign exchange intervention. This result implies that the proposed GCC central bank should be able to maintain the monetary independence as a group and can reap the benefit of monetary efficiency of the proposed Gulf Monetary Union in 2010.

## ملخص

ظلت عملات دول مجلس التعاون الخليجي لفترة طويلة مرتبطة بالدولار الأمريكي على نحو فعال؛ فمنذ عام 2003، شرعت هذه الدول رسميا في ربط عملاتها بالدولار الأمريكي كخطوة أولى نحو الاتحاد النقدي المقترح إقامته عام 2010. وقد أدى الارتباط السائد بالدولار مع غياب أي قيود ذات بال سواء كانت **حالية** أو **مرتبطة** بحساب رأس المال إلى الاعتقاد بأن هذه الدول قد فقدت استقلالها الاقتصادي.

في المقابل، تقدم الورقة البينة على أن معدل الفائدة على عملات دول مجلس التعاون الخليجي لم يتناحى مع معدل الفائدة على الدولار الأمريكي مما يوحي أن أصول دول مجلس التعاون الخليجي ليست بديل كاملة للأصول الأمريكية.

وقد أتاح هذا النقص في التطابق لدول مجلس التعاون الخليجي حرية المناورة في سياساتها المالية كما أتاح للبنوك المركزية في هذه الدول قدرا من السيطرة على معدلات النمو النقدي عن طريق امتصاص أية تغيرات في الاحتياطات الدولية. وتشير النتائج إلى أن السلطات النقدية في هذه الدول قد استخدمت سياسة ائتمان محلية لتحقيق ما تهدف إليه السياسة المحلية من استقرار في مستوى الأسعار في الوقت الذي تقوم فيه بالتدخل القائم على امتصاص آثار تدخل العملات الأجنبية. وتلمح هذه النتيجة إلى أن البنك المركزي المقترح لدول مجلس التعاون الخليجي يجب أن يكون قادرا على الحفاظ على الاستقلالية النقدية كمجموعة ويمكن أن يجنى ثمار الكفاءة النقدية للاتحاد النقدي الخليجي المقترح البدء به عام 2010.

## 1. Introduction

In June 1982 the Gulf Cooperation Council (GCC) countries Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates agreed to coordinate, among other things, their financial, monetary, and banking policies and enhance cooperation between monetary agencies and central banks and eventually to establish a common currency. The finance ministers of the six GCC countries decided in October 13, 2001 to deepen economic integration by setting a target date for monetary union and a common currency pegged to the US dollar by 2010. The purpose of this paper is to evaluate this important regional entity (monetary union) from the perspectives of the past monetary performance and policy.

Until January 1, 2003, with the exception of Kuwait (whose currency was pegged to a basket of major currencies), currencies of the GCC countries were *effectively* pegged to the US dollar. Since then the GCC countries formally started pegging their currencies to the US dollar as a first step towards the monetary union. The prevailing dollar peg and the absence of any significant current and capital account restrictions did not eliminate altogether the scope of monetary policy operations pursued by each of these countries (Jadresic, 2002; Abed et.al., 2003). Monetary policy has been directed at maintaining a stable exchange rate and controlling inflation (Fasano and Iqbal, 2003). In fact, these targets of monetary policy are not different from the present universal target of price stability. However, others have argued that by pegging the exchange rates, these countries have lost monetary independence. For example, Karam (2001), by invoking impossible trinity arguments, has presumed that these countries have lost monetary independence as a stabilization tool.<sup>1</sup> Karam offers no evidence to his presumption.

One common deficiency of the research on monetary policy of the GCC countries is the lack of empirical evidence to show how these countries pursued their monetary independence. This is an important point because after the monetary union, the decentralized GCC central bank should be able to pursue the same policy options as a group to maintain the monetary independence. Rather than accepting an unsubstantiated assumption of monetary independence or lack of it, this paper presents empirical evidence of monetary and domestic credit policy performance of each country in the past to draw inferences for the future.

Sterilization and monetary independence are related. There is an ongoing debate, especially in the context of the fixed exchange rates regimes, whether the central banks are able to sterilize the effects of a change in foreign asset holdings on the domestic money growth. In a sterilized intervention, a central bank engages in offsetting open market operations so that there is no impact on the domestic monetary base or money supply. Sterilized intervention constitutes a potentially useful independent policy tool. Discussions and debates under floating exchange rates system have focused on sterilized intervention in influencing (or changing) exchange rates<sup>1</sup>. A central bank can use sterilized intervention to keep the exchange rate fixed and at the same time can change the domestic money supply (hence monetary independence) to affect domestic output and inflation.<sup>2</sup>

Karam's (2001) view, mentioned above, is nothing but the prediction of the famous Mundell-Fleming model. The fundamental problem with fixed exchange rate and capital mobility is that the smaller (non-reserve) country loses control of its monetary policy. An attempt to increase the domestic money supply, no matter how small, leads to a temporary fall in the domestic interest rate, relative to the world interest rate (or the domestic currency depreciates), and the resulting capital outflow induces losses of foreign exchange reserves that return the money supply to its original value. In this case sterilization is not a policy option for a country under fixed exchange rate. The key assumption of this result is that the arbitrage operations in the international capital

---

<sup>1</sup> In case of the GCC countries, sterilized intervention seems to have been used to keep the exchange rate fixed

<sup>2</sup> A macroeconomic policy regime can choose at most two elements of the "impossible trinity" of (i) full freedom of cross-border capital movements, (ii) a fixed exchange rate, and (iii) an independent monetary policy oriented toward domestic objectives. See, Obstfeld and Taylor (1966) for details.

market prevent the domestic interest rate from departing systematically from that of the world capital market<sup>3</sup>.

Surging capital inflows to developing countries in the recent past posed a challenge to the macroeconomic management (World Bank, 1997). Surging capital inflows may become a double-edged sword by inflicting destabilizing side effects (Lee, 1997). Sterilization has been used as the first line of defense against the surge in inflows so that the economy does not get to the point of overheating (Schadler, 1994).

Empirical evidence, however, shows that central banks have practiced sterilized intervention during the fixed exchange rates episodes. Herring and Marston (1977) present empirical evidence based on the German experience of fixed exchange rate in the 1960's. They found that approximately 90 percent of the change in foreign exchange reserve was sterilized each quarter by the Bundesbank. Thus, they concluded that "despite the high interest-sensitivity of German capital flows, the authorities maintained a substantial degree of control over the German money supply" (p. 340). Darby (1983), using quarterly data for Canada, France, Germany, Italy, Japan, and the United Kingdom, showed that the central banks of these countries exercised monetary control under the Bretton Woods system of fixed exchange rate. Mastropasqua, Micossi, and Rinaldi (1988) examined the functioning of the exchange-rate mechanism of the European Monetary System (EMS) over the period of March 1979 to June 1987. They found that all the four countries (Germany, France, Italy and Belgium) under the study had sterilized intervention during the period. Stockman (1993) presents empirical evidence that countries were able to conduct independent monetary policies under Bretton-Woods. Svensson (1994) finds similar evidence of short-term monetary independence within the EMS.

Implicit in this is the assumption that the domestic structure of interest rates is represented by a single rate and, likewise, that the structure of foreign rates is represented either by a "world" interest rate or the interest rate in a dominant country. For the GCC countries, the dominant country is the United States.

It becomes an empirical issue to determine whether the monetary authorities of the GCC countries pursued any sterilized intervention and have had any monetary autonomy. In particular, the paper attempts to answer the following three questions: (1) Are the capital markets between the US and the GCC countries completely integrated? (2) Do the monetary authorities of the GCC countries have any control over domestic money growth? (3) Do the monetary authorities of the GCC countries sterilize changes in international reserve? (4) What are the implications of the findings for a successful currency union in the GCC countries?

The empirical evidence is presented using the quarterly data for the GCC countries. Quarterly data are appropriate for analysis of these issues because there is a relevant "short run" within which central banks can and have exercised monetary control under pegged exchange rates. Availability of quarterly data poses one of the limitations of the study. The main data source is the *International Financial Statistics* (IFS) tape. For some countries, quarterly data for important variables are missing. The United Arab Emirates is the worst in terms of data availability. Because of this limitation sample period starts in the beginning of the nineties and the starting dates vary from country to country. The sample period ends with the latest available data.

The rest of the paper is organized as follows. Exchange rate arrangements and interest rate policies of the GCC countries are described in section 2. Section 3 presents the test results whether the capital markets between the US and the GCC countries are completely integrated. This section also discusses and presents results relating to monetary control. Section 4 discusses

---

<sup>3</sup> This implies that the domestic interest rates are determined abroad, not by domestic monetary policy.

The effectiveness of sterilized intervention is very controversial. See, for example Sarno and Taylor (2001) for a recent survey on sterilized intervention with flexible exchange rates.

sterilization issues and presents empirical results for the GCC countries. Section 5 concludes the paper.

## 2. Exchange Rates Arrangements of the GCC Countries

The rial Omani (RO) has officially been pegged to the US dollar at the fixed rate of RO 1 = \$2.6008. The Bahrain dinar (BD), the Qatar riyal (QR), the Saudi riyal (SRIs), and the UAE dirham (Dh) were officially pegged to the SDR till the end of 2002. However, in practice or effectively, these currencies were also pegged to the US dollar at fixed rates: BD1 = \$2.6596 since December 1980, QR 3.6415 = \$1 since 1979, SRIs 3.745 = \$1 since June 1, 1986, and Dh 3.6710 = \$1. For example, figure 1 shows the movements of BD and US dollar rates in terms of the SDR for the period 1990:1-2002:4. Note that the BD per SDR is much smaller than the US dollar per SDR. To bring two lines in figure 1 close to each other, the BD per SDR exchange rate is multiplied by a factor of two. It shows clearly that the BD rate in terms of the SDR appreciates or depreciates whenever the US dollar in terms of the SDR appreciates or depreciates. A plot of a line showing the SDR per BD against a line showing the US dollar per SDR would give two lines as a mirror image of each other. This implies that the BD exchange rate in terms of the SDR is solely determined by the US dollar. This implies, the BD has been unofficially but *effectively* fixed to the US dollar (BD0.377 = US\$1) since December 1980. The similar pattern would emerge for other three currencies implying that those currencies were also *effectively* fixed to the dollar.

The Central Bank of Bahrain (the Bahrain Monetary Agency) has formally pegged the BD to the US dollar effective from December 25, 2001. The official exchange rate remains at BD0.377 to one US\$ and the dollar is sold by the agency to all commercial banks in the archipelago at the rate of BD.377 per US dollar. The rial Omani (RO) has officially been pegged to the US dollar since 1986. From January 1, 2003, the other three countries Qatar, Saudi Arabia, and the UAE have also formally started pegging their currencies to the US dollar.

Kuwait seems to pose a trivial exception. The exchange rate of the Kuwait dinar (KD) is determined on the basis of a fixed but adjustable relationship between the KD and a weighted basket of currencies, with the weights reflecting the relative importance of these currencies in Kuwait's trade and financial relations. The Central Bank of Kuwait sets the rate for the dollar on the basis of the latest available market quotations for that currency in relation to the other currencies included in the basket. The dollar appears to have a very large weight in the currency basket. It is evident from figure 2 that the movements of the KD against the SDR almost perfectly match the movements of the US dollar against the SDR for the period 1991:1-2005:1. This confirms that the KD was also effectively pegged to the dollar.

## 3. Evidence of Imperfect Capital Mobility and Monetary Control

If capital movements are perfect, a country on a fixed exchange rate cannot break ranks with foreign interest rates and thereby cannot run an independent monetary policy.<sup>4</sup> Since the effectiveness of the monetary policy depends on the cross-border capital movements, capital mobility is an important and crucial issue for the monetary policy of the proposed Gulf Monetary Union (GMU) intending to maintain the fixed exchange rate against the US dollar.<sup>4</sup>

The IMF has developed three indicators of the overall degree of openness of the economy to capital movement: indices of controls on current payments and transfers denoted by CC1, indices of capital controls denoted by KCI, and indices of exchange and capital controls denoted by ECI – an average of the two former indices. These indices for the GCC countries are shown in table 1. As you can see from table 1, overall these countries maintain few restrictions on capital movements though the restrictions on inflows (measured by KCI inflows) seem to be greater than

---

<sup>4</sup> See the impossible trinity arguments in footnote 1.

outflows (measured by KCI outflows). These indices are comparable to the largest industrial countries (Karam, 2001). However, these indices reflect the *de jure* rather than *de facto* incidence of controls. These measures of capital control are misleading and perilous (Obstfeld, 1993). A better measure is to compare interest rates available within different national jurisdictions.

The relationship between interest rates available within different national jurisdictions is a direct indicator of capital mobility (Obstfeld, 1993). With perfect capital mobility, that is, when domestic and foreign bank deposits or domestic and foreign currency assets are perfect substitutes (equally desirable) and a zero risk premium, the foreign exchange market is in equilibrium only when interest parity condition holds. The exact form of the interest parity condition is:

$$1 + R_t^{gcc} = \left[ \frac{E_{t+1}^e}{E_t} (1 + R_t^{us}) \right] \quad (1)$$

where  $R_t^{gcc}$  is the nominal interest rate of a GCC country at time  $t$ ,  $R_t^{us}$  is the US nominal interest rate at time  $t$ ,  $E_t$  is the nominal (spot) exchange rate at time  $t$ , defined as units of home currency per unit of foreign currency and  $E_{t+1}^e$  is the expected nominal exchange rate to be prevailed in one period ahead. With assumption of zero transaction costs, interest differential ( $d_t$ ) is defined as

$$d_t \equiv (1 + R_t^{gcc}) - \left[ \frac{E_{t+1}^e}{E_t} (1 + R_t^{us}) \right] \quad (2)$$

For the GCC countries, except Kuwait,  $d_t = R_t^{gcc} - R_t^{us}$ , and the differential is simply  $E_t E_{t+1}^e d_t = R_t^{gcc} - R_t^{us}$ .

Depending on the availability of data on interest rates in different countries, three types of nominal interest rates are considered: three-month Treasury bill rates, money market rates and lending rates (prime rates). Treasury bill rate is an indicator of general interest rate movements, the money market rate is the stance of monetary policy and the lending rate is an indicator of cost of business borrowing from banks. The first two are short-term interest rates while the third is a short and medium term interest rate. Market participants watch the overnight money market closely because it affects interest rates throughout the economy. Analysis of these rates would give a broad idea of overall capital mobility.

All three interest rates series are available for Bahrain. Figure 3 plots the quarterly series of interest differentials for Treasury bill rates, money market rates, and prime rates. There remains a huge difference between Bahrain and the US prime rates. Even for Treasury bill rates and money market rates, large discrepancies (sometimes more than 100 basis points) remain. As can be seen from figure 3, both Bahrain Treasury bill rates  $d_t$  and money market rates were consistently higher than the US Treasury bill rates and money market rates.<sup>5</sup>

Quarterly series for money market rates and prime rates are only available for Kuwait. In case of Kuwait for calculating in (2), we have assumed, Interest differentials between Kuwait and the US are plotted in figure 4. There has been a substantial difference of interest rates between these two countries. Except for few quarters, interest rates have consistently been above the US interest rates.  $d_t E_{t+1}^e = R_t^{gcc} - R_t^{us}$ .

Data on interest rates are not available for Saudi Arabia and the UAE. Only data available for Oman and Qatar is the prime rates (lending rates) that can be compared to the US prime rates. Moreover, there is no data for Qatar prime rates after second quarter of 1995. Prime rate differential between Oman and the US and the same differential between Qatar and the US for a

<sup>5</sup> The money market rates of the GCC countries are comparable to federal funds rate for the US. Both of these series are placed in line 60b of IFS.

short period are shown in Figure 5. As can be seen from figure 5, there is significant interest differential between Oman and the US and between Qatar and the US. Moreover, these differentials fluctuated significantly over the sample period.

Overall, with the fixed exchange rates of the GCC countries against the US dollar, interest rates of the GCC countries did not converge to the interest rates of the US. This implies assets of the GCC countries are not perfect substitutes to the US assets and it confirms the existence of obstacles to the movements of funds between the GCC countries and the US.

Obstfeld (1993) suggests that one should go beyond this casual observation and analyze the statistical properties of to determine the factors impeding capital movements. He postulates a simple data generating process for the deviation as  $d_t$ ,

$$d_t = \kappa + \gamma t + \sum_{i=0}^{\infty} \phi^i \xi_{t-i} \quad (3)$$

where the deterministic term,  $\kappa + \gamma t$ , is the unconditional mean deviation from the interest parity condition and the deviation has a trend change of  $\gamma$  basis points per quarter. The term  $\kappa + \gamma t$  is referred as the “country premium” relative to the US. In our case it would capture the country or political risk premium of the assets of the GCC countries relative to the US assets. Aliber (1973) defined the political risk as “the probability that the authority of the state will be interposed between investors in one country and investment opportunities in other countries” (p. 1453). The infinite stochastic sum in (3) represents a random and possibly persistent deviation from  $\kappa + \gamma t$ . If profit opportunity persists, random deviations are eventually eliminated but political risk premiums are not ultimately eliminated. The parameter  $\phi$  ( $0 < \phi < 1$ ) can be interpreted as a measure of the geometric rate at which capital flows eliminate interest differentials. Then using (3), one can write

$$d_t - \phi d_{t-1} = (1 - \phi)\kappa + \gamma t - \phi\gamma(t-1) + \xi_t + \left[ \sum_{i=1}^{\infty} \phi^i \xi_{t-i} - \sum_{i=1}^{\infty} \phi^i \xi_{t-i} \right]$$

to obtain an estimable form

$$d_t = \kappa(1 - \phi) + \gamma\phi + \gamma(1 - \phi)t + \phi d_{t-1} + \xi_t. \quad (4)$$

Parameter estimates of equation (4) are presented in table 2. Estimates were obtained using nonlinear least squares estimation of (4). We start with the money market rate. It is one of the most watched interest rates and is the stance of monetary policy. Most reliable estimates are also obtained for this rate. As we can see from table 2, estimated risk premium parameters ( $\kappa$ ) for money market rates are highly statistically significant with negative significant trend for both Bahrain and Kuwait. Compared to Bahrain and Kuwait assets are riskier than Bahrain and requires a premium of 278 basis points.<sup>6</sup>

The parameter  $\phi$  is a measure of the geometric rate at which capital flows eliminate interest differentials. For money market rates, estimates of  $\phi$  indicate that deviations from interest parity are significantly persistent for both countries Bahrain and Kuwait. Also, adjustments are not rapid for Kuwait. For example in case of Kuwait, .19 percent of a random deviation from the deterministic risk premium is not eliminated within the year.  $\approx$

---

<sup>6</sup> These estimates make sense. The sample period for Kuwait starts immediately after the Gulf War of 1990. The perception of investment risk in Kuwait seems did not diminish after the US invasion in Iraq. The region remains most volatile compared to other GCC countries.



Treasury bill rate is another important interest rate because it is an indicator of general interest rate movements. Unfortunately, data on Treasury bill rates for the GCC countries are not available except Bahrain. Estimates presented in table 1 show that the estimated risk premium parameter ( $\kappa$ ) for Treasury bill rate for Bahrain is statistically significant at the 10 percent level without significant trend. Estimate of  $\phi$  indicates that deviations from interest parity are significantly persistent. In the case of Treasury bill rate of Bahrain, the adjustment is very slow and  $.914 \approx 69$  percent of a random deviation from the deterministic risk premium is not eliminated within the year.

Prime rates data are available for all four countries, though for Qatar the sample period is very short. Results in table 2 indicate that in the case of prime rates a risk premium over 200 basis points is required for Bahrain, Kuwait and Oman. The large values of the Durbin's h-statistic indicate that the estimates are less precise and may underestimate the parameter  $\kappa$ <sup>7</sup>. Estimates of  $\phi$  for all four countries indicate that deviations from interest parity are significantly persistent and adjustments are very slow. Overall, the presence of risk premium is a symptom of the GCC capital market rigidities and the persistent random deviations are enough to suggest that the monetary authorities of the GCC countries may have had some room to maneuver monetary policy.<sup>8</sup>

Since GCC countries and the US assets are not perfect substitutes and the central banks of the GCC countries could have used monetary autonomy to affect its own inflation as figure 6 suggests. Figure 6 plots the quarterly CPI inflation rate differentials ( $d\pi_t$ ) between the GCC countries and the US and defined as

$$d\pi_t \equiv \pi_t^{gcc} - \pi_t^{us},$$

where  $\pi_t^{gcc}$  is the (annualized) inflation rate of a GCC country and  $\pi_t^{us}$  is the (annualized) US inflation rate. As can be seen from figure 6, there is a marked difference between the inflation rate of the GCC countries and the US. During the sample period the US had steady inflation but inflations of the GCC countries display some wild swings. Given the fixed exchange rates, inflation rates of the GCC countries should converge, but there is no sign of convergence. Except for few quarters inflation rates of the GCC countries persistently remained below the US rate and sometimes more than 5 percent per year below the US inflation rate.

The natural interpretation of the inflation differentials between the GCC countries and the US is that the GCC countries had different money growth rates than the US despite fixing their exchange rates. This means central banks of the GCC have had some control over their money growth rates by sterilizing the changes in international reserves.

#### 4. Sterilization

From a stylized balance sheet of a monetary authority, the monetary base (MB) is given by the identity

$$MB \equiv NFA + DC$$

where NFA is the net foreign asset and DC is the domestic credit made available by the monetary authority. DC is the net domestic asset (NDA) minus the net worth in the liability side of the balance sheet of monetary authorities. Foreign exchange market intervention by a monetary authority involves a sale or purchase of foreign assets. When a monetary authority buys (sells) foreign assets, as the above identity shows, its own monetary base increases (or decreases) by the

<sup>7</sup> An attempt to correct serial correlation was failed.

<sup>8</sup> Obstfeld (1993) has reached such conclusion when analyzing interest differentials of the United Kingdom and Germany relative to the US during Bretton Woods period.

amount of the purchase (sale). In a sterilized intervention, the monetary authority sale (purchase) domestic currency bills so that the effects on the monetary base of changes in net foreign assets are in fact offset one-for-one by the effects of changes in domestic credit. That is, in the full sterilized intervention monetary base remains unchanged

$$\Delta MB = \Delta DC + \Delta NFA = 0$$

so that domestic credit is changed as

$$\Delta DC = -\Delta NFA$$

where  $\Delta$  is a first difference operator.

Sterilization is fruitless or self-defeating policy under a fixed exchange rate when domestic and foreign currency assets are perfect substitutes. Suppose the non-reserve country pursues an expansionary fiscal policy to increase output and employment. This policy raises output but also causes inflation. Suppose the central bank tries to avoid inflation by sterilizing the increase in the money supply by selling domestic assets. But as soon as the central bank sells domestic assets to reduce the money supply, it will have to buy more foreign assets to keep the exchange rate fixed. This implies sterilization is a self-defeating policy. This conclusion that sterilization is a self-defeating policy hinges on the important assumption that the domestic and foreign currency assets are perfect substitutes.<sup>9</sup>

However, we have shown that the GCC currency denominated and the US dollar denominated assets are not perfect substitutes. In this case sterilized intervention is possible and can be effective. In particular, consistent with the empirical evidence presented above, we would like to show how a central bank of a GCC country can combine a change in the money supply with a sterilized purchase or sale of its foreign assets to hold the exchange rate fixed while altering the domestic interest rate.

When assets are not perfect substitutes, the equilibrium condition (1) in the foreign exchange market changes to

$$R_{gcc} = R_{us} + \hat{e} \kappa (B, DC) \quad \kappa_1 > 0 \quad \kappa_2 < 0 \quad (5)$$

where  $\kappa$  is a risk premium (as in equation 2) that reflects the difference between the riskiness of domestic (GCC) and foreign assets and  $e \equiv [(E_e - E)/E]$ .  $\hat{e} \kappa_1$  and  $\kappa_2$  are partial derivatives with respect to its arguments. That is, risk premium depends positively on stock of domestic government debt (B) and negatively on the domestic credit (DC) of the central bank. Note that the stock of central bank domestic assets is often known as domestic credit, so that we can use these terms interchangeably.

To fix the idea, suppose the initial domestic interest is with initial domestic real money supply  $(M/P)_0$  and domestic credit  $DC_0$  given B. They are consistent with the simultaneous equilibrium of the foreign exchange market and domestic money markets when exchange rate is fixed at  $R_0^{gcc} \bar{E}$  given the US interest rate  $R_{us}$ . Now suppose a domestic (GCC) monetary authority would like to fight inflation by raising its domestic interest rate to  $> R_{us}$ . The monetary authority can increase domestic interest rates by decreasing money supply to  $(M/P)_1 < (M/P)_0$ . The domestic money market moves to new equilibrium with higher domestic interest rates. As can be seen from equation (5), foreign exchange market equilibrium will now be disturbed. To restore foreign exchange market equilibrium or to maintain the fixed exchange rate ( $= 0$ ), the monetary authority has to sell domestic assets with the purchase of foreign assets. The new domestic assets  $DC_1$  will

---

<sup>9</sup> Standard text books (see, for example, Krugman and Obstfeld, 2003) in international economics discuss conditions where sterilization can be effective.

be lower than  $DC_0$  ( $DC_1 < DC_0$ ). This will increase the risk premium  $R_1^{gcc} R_0^{gcc} \hat{\epsilon}_K$  which is a negative function of DC. Thus the sterilized sell of domestic assets with the purchase of foreign assets would keep the exchange rate fixed by increasing the risk premium while having no further effect on the domestic money supply. So, in the final equilibrium we have lower domestic assets, higher risk premium, fixed exchange rate, lower real domestic money supply, higher domestic interest rate ( $> R_{us}$ ) and lower inflation. From the position of  $(M/P)_1$ , if the monetary authority would like to increase output and employment, it can increase money supply to decrease interest rate and the sterilized foreign exchange intervention would keep the exchange rate fixed.  $R_1^{gcc} R_0^{gcc}$

The foregoing analysis shows that monetary policy and exchange rate can be managed independently of each other when sterilized intervention is effective. Evidence presented so far seem to indicate that the central banks of GCC countries have used sterilized intervention to hold the exchange rate fixed by varying money supply to achieve domestic economic objective of controlling inflation rates. Before turning to statistical evidence, we look at the graphical representation of the movements of changes in domestic credit (domestic assets) and net foreign assets of the GCC countries presented in figures 7 to 12. As can be seen from figures 7 to 12, these two series, for all six GCC countries, move very closely in opposite direction. Large decreases (increases) in net foreign asset were followed almost equally large increases (decreases) in domestic credit indicating a full-sterilization by all six GCC countries.

#### 4.1 Empirical Evidence

Empirically the offsetting sterilization coefficient is estimated using reaction functions of central banks. A typical reaction function provides a formal statement of the behavior of monetary authorities working through the banking system and takes the following form:

$$\Delta DC_t = \alpha_1 \Delta NFA_t + \alpha_2 \Delta GAP_t + \alpha_3 \pi_t + Q\beta + u_{1t}, \quad (6)$$

where  $GAP_t$  is the first difference of the deviation of GDP from trend,  $\pi_t$  is the inflation rate, vector  $Q$  is seasonal dummies and  $u_{1t}$  is error term. Domestic credit (DC) should respond negatively to increase in foreign exchange reserves (NFA). Thus, the existence and extent of sterilization are measured by the coefficient of the change in net foreign asset ( $\alpha_1$ ) in the reaction function (6). If  $\alpha_1 = 0$  (no sterilization), then the reaction function determines domestic credit exogenously with respect to net foreign asset. If  $\alpha_1 = -1$  (complete sterilization), then the central bank adjusts domestic credit in whole to offset the effects of net foreign asset on money supply. If  $-1 < \alpha_1 < 0$ , then partial sterilization occurs. Two policy objective variables ( $GAP_t$  and  $\pi_t$ ) are included to capture monetary authority's behavior in relation to its domestic credit policy. Domestic credit should respond positively to the cyclical shortfalls of GDP (GAP) and negatively to the inflation rate. Thus, if the monetary authority follows a stabilizing or countercyclical policy, one would expect  $\alpha_2 > 0$  and  $\alpha_3 < 0$ .

For GCC countries oil contributes about one-third to total GDP and together, these countries account about 45 percent of the world's proven oil reserves. Obviously, economic policies of these countries are targeted towards promoting non-oil GDP growth. Moreover, it is understood that monetary or domestic credit policy is directed at maintaining a stable exchange rate and controlling inflation; fiscal policy has been the primary instrument to achieve other economic objectives. This implies  $GAP_t$  variable in equation (6) may not be as important as for many other countries and if at all relevant, it should be measured as the deviation of non-oil GDP from trend.

However, except for Bahrain, data for non-oil GDP are not available.<sup>10</sup> For some countries, using deviation from trend for inflation rate ( $\tilde{\pi}_t$ ) rather than inflation rate ( $\pi_t$ ) seems to be more appropriate because the central banks will not activate monetary policy if inflation rates are within their assigned targets or stay on trend. Figure 6 gives a clue that inflation could be modeled in this way for GCC countries.

In estimating equation (6), for all countries a time trend was considered and found to be statistically significant. Initial estimation results indicated the presence of serial correlation. The other serious problem is the possibility of simultaneity bias. The foreign component of the monetary base (NFA) cannot safely be considered as an exogenous variable. The equation (6) can be inverted to show the offset of domestic monetary operations through endogenous capital flows which affect NFA. Indeed, changes in domestic credit are liable to affect domestic interest rates and, through this channel, international capital flows and NFA. This means, the NFA variable is correlated with the error term  $u$ , implying inconsistency of OLS estimates. To avoid these problems, the equation is estimated by the 2SLS (two-stage least squares) with a serial correlation correction. The following variables were used as instruments: constant, a time trend, seasonal dummies,  $\pi_t$  or  $\tilde{\pi}_t$ ,  $GAP_t$ , and all lagged values in the equation.

The case of Bahrain is considered first and estimates of equation (6) for Bahrain are first presented in Table 3. The case of Bahrain is more interesting and deserves special attention. Bahrain is the smallest in size of all the GCC countries. It can be termed as a city state and falls within the description of a “mini-state” by Khatkhate and Short (1980).<sup>11</sup> In discussing the monetary and central banking problems of a mini-state, Khatkhate and Short (1980) apply small open economy models to show that monetary policy for a mini state is more circumscribed than conventional small open economy model. This implies Bahrain would be among the countries of the world least likely to have monetary control and would be an ideal example of a GCC country that would have lost monetary independence due to pegged exchange rate regime. However, results presented in table 3 for Bahrain reveal otherwise and now turn to those results.

In table 3, for Bahrain  $GAP_t$  is the first difference of the deviation of non-oil GDP<sup>12</sup> from trend. The annual non-oil GDP is taken from Bahrain’s *National Accounts* (not available in IFS). Results reported in column (1) (table 3) are obtained with inflation rate following the usual practice of previous researchers (Herring and Marston, 1977). The sterilization coefficient  $\alpha_1$  is negative and highly significant. The estimated value of  $\alpha_1$  is  $-0.63$  indicating about two-third of the effects of net foreign asset on money supply was adjusted. As expected, the estimated

---

<sup>10</sup> Moreover, quarterly data for GDP or non-oil GDP for GCC countries are not available. So, it was necessary to interpolate the annual series to a quarterly basis. First, annual GDP is obtained, and then interpolated to a quarterly series using the method applied by Goldstein and Khan (1976). Note that there is a typo in an equation in page 223 of Goldstein and Khan (1976).

<sup>11</sup> Though a mini-state is small in terms of population and physical area, it is mainly judged on the basis of its economic characteristics. Goods that are produced by a mini-state tend to be exported, goods that are sold in a mini-state tend to be imported, and goods that are produced and consumed within a mini-state tend to be services. This description fits perfectly for Bahrain. Judging in terms of population and physical area Bahrain can be labeled as a city state.

<sup>12</sup> 12 Average share of crude petroleum and related products in Bahrain’s GDP for the sample period is about 20 percent. However, non-oil sector is heavily dependent on oil sector. Thus, as a domestic objective, the Bahrain’s monetary authority would be more interested to the cyclical shortfalls in the non-oil GDP rather than the GDP that would include all sectors of the economy.

coefficient of  $GAP_t$  is statistically insignificant. The estimated coefficients of  $\pi_t$  is highly statistically significant but with a counter intuitive positive sign.

Equations for Bahrain were reestimated using the deviation of inflation rate from trend ( $\tilde{\pi}_t$ ). As argued above, a central bank would be more concerned with  $\tilde{\pi}_t$  rather than actual inflation rate. Results are reported in column (2) in table 3. The estimated value of  $\alpha_1$  is now  $-0.71$  indicating more than two-third of the effects of net foreign asset on money supply was adjusted. The coefficient of  $\tilde{\pi}_t$  has the expected negative sign and highly statistically significant (at the zero percent level) confirming a countercyclical domestic credit policy. The estimated coefficient of  $\tilde{\pi}_t$  is  $-10.09$  indicating that a one percent increase in the deviation of inflation rate from its trend would make the Bahrain Monetary Agency (BMA, the central bank of Bahrain) to decrease domestic credit by 10 million Bahraini Dinar (BD). It seems that the BMA sets an inflation rule as the main guide for monetary policy implementation. The coefficient of  $GAP_t$  has the expected positive sign but statistically insignificant. This result is also not surprising. As mentioned above, Bahrain is an oil-exporting mini (island) state. The non-oil sector evolves around the oil and gas sector. The BMA only takes a passive role in ensuring that the non-oil sector functions smoothly around the oil-sector by regulating the financial intermediaries in the country. Since  $GAP_t$  variable is irrelevant, results reported in column (3) in table 3 are without this variable. Overall results are unchanged.

Results of the rest of the GCC countries are presented in table 4. For UAE neither the data on any price level (either annual or quarterly) nor the GDP data are available. For Qatar the annual CPI data were interpolated to a quarterly series. For most of the countries, equations were estimated without the irrelevant  $GAP_t$  variable. The sterilization coefficient  $\alpha_1$  is negative and highly significant for all GCC countries. The estimated values of the coefficient  $\alpha_1$  are  $-1.03$ ,  $-0.9$ , and  $-0.97$  for Kuwait, Oman, and Saudi Arabia, respectively, indicating a full sterilization of the effects of net foreign asset on money supply by these countries. The estimated values of  $\alpha_1$  for Qatar and UAE indicating about two-third of the effects of net foreign asset on money supply were adjusted by these two countries. The estimated coefficients of the inflation rate variables  $\pi_t$  for Kuwait, Oman and Qatar and  $\tilde{\pi}_t$  for Saudi Arabia are all negative though insignificant. However, the expected negative sign itself is an indication that the GCC countries directed their domestic credit policies to price stability.

Finally, the significance of seasonal dummies indicates the point that much of the variation in the domestic credit policy instruments is in the defense of monetary stability rather than in active pursuit of other policy goals.

## 5. Conclusion

Theoretical it is argued that the central bank of a small open economies with fixed exchange rate system cannot sterilize the effects of a change in foreign asset holdings on the domestic monetary base and hence no control or influence on the domestic money supply. It only determines how the demand-determined quantity of money is supplied by reserve flows and domestic credit creation. However, empirical evidence shows that during the Bretton Woods period of fixed exchange rate, central banks of many countries had sterilized intervention and they exercised monetary control. Empirical evidence also show that the countries under the European Monetary System (EMS) – which has a system of fixed and adjustable exchange rates – have had sterilized intervention.

The GCC countries have maintained an official pegged exchange rate either against the SDR or the US dollar, but have had *effective* fixed exchange rate against the US dollar and has had no restrictions over capital movements. This observation has led some writers on GCC economy to claim (without evidence) that these countries have readily accepted the loss of monetary independence. Rather than accepting an unsubstantiated assumption of monetary independence or lack of it, this paper presents empirical evidence of monetary and domestic credit policy performance of each of the GCC country in the past to draw inferences for the monetary union of 2010.

Fixed exchange rate coupled with perfect capital mobility would render loss of monetary independence. So, we have first tried to present evidence whether capital markets between the GCC countries and the US are completely integrated. Evidence overwhelming indicates that capitals are not perfectly mobile between these countries. This finding itself suggests that the monetary authorities of the GCC countries have had some room to maneuvering monetary policy. Given the exchange rates arrangement between the GCC countries and the US, one would expect that inflation rates between GCC countries and the US would converge in the long run. However, there were no sign of converge of the inflation rates and there were substantial differences. This implies money growth differentials between the GCC countries and the US seemed to have a significant influence on the inflation differentials between these two countries; again, implying that the monetary authorities of the GCC countries were able to sterilize changes in international reserves to affect monetary growth rates.

Finally, we have tested the hypothesis of sterilization by estimating money supply reaction functions of the monetary authorities of the GCC countries. Kuwait, Oman, and Saudi Arabia sterilized fully the effects of net foreign asset on money supply. For other three countries Bahrain, Qatar, and the UAE had their two-third of the effects of net foreign asset on domestic money supply was neutralized. Results overall support the hypothesis that the monetary authorities used domestic credit policy to attain domestic policy objective of price stability while engaging in sterilized foreign exchange intervention in order to alter domestic interest rates by keeping the exchange rate fixed. That is, exchange rate and monetary policy were managed independently of each other by effective sterilized intervention.

These results, especially of Bahrain, have important implications for proposed GCC monetary union in 2010. Being a tiniest nation, it still maintained an independent monetary policy given the fixed exchange rate system. If Bahrain can do that then there is no reason why the GCC countries as a whole cannot maintain an independent monetary policy by forming the GCC central bank. The GCC central bank should be able to pursue the same policy options as a group to maintain the monetary independence and can reap the benefit of monetary efficiency of the monetary union.

## References

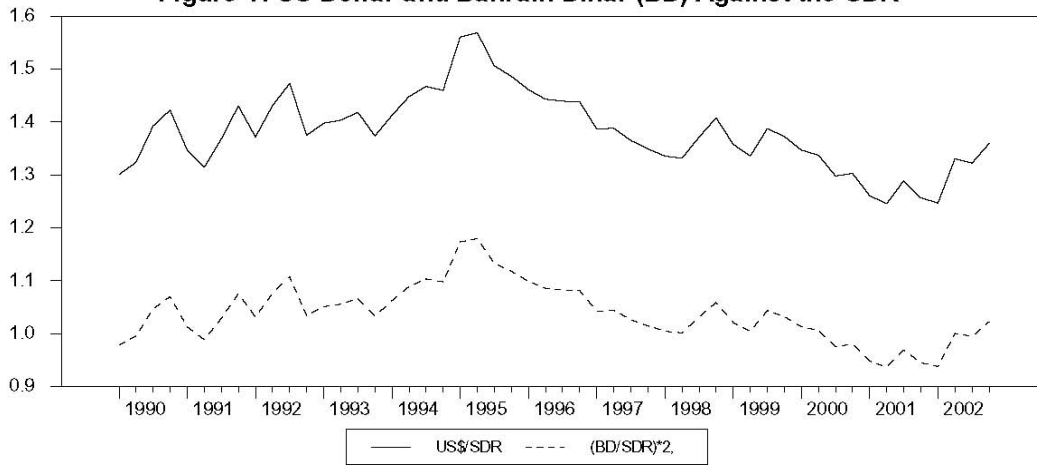
- Abed, George T., S. Nuri Erbas, and Behrouz Gueromi, (2003) The GCC Monetary Union: Some Considerations for the exchange Rate Regime, IMF Working Paper, WP/03/66.
- Darby, M. R. (1983) Sterilization and monetary control: Concepts, issues, and reduced- form test, in *The International Transmission of Inflation*, ed. by Michael R Darby et. al. (University of Chicago Press: Chicago), 291-313.
- Fasano, Ugo and Zubair Iqbal (2003) GCC Countries: From Oil Dependence to Diversification, IMF.
- Goldstein, M. and M. Khan (1976) Large versus small price changes in the demand for imports, *Staff Papers* (International Monetary Fund), March, 23, 200-225.
- Herring, R. J. and R.C. Marston, (1977) Sterilization policy: The trade-off between monetary autonomy and control over foreign exchange reserves, *European Economic Review*, 10, 325-343.
- Jadresic, Ebtasam, (2002) On the Common Currency for the GCC Countries, IMF Policy Discussion Paper, PDP/02/12.
- Karam, P. D., (2001) *Exchange Rate Policies in Arab Countries: Assessment and Recommendations*, Arab Monetary Fund, Abu Dhabi.
- Krugman, P. R. and M. Obstfeld (2003) *International Economics*, 6th Edition, Addison- Wesley Publishing Company.
- Lee, Jang-Yung, (1997), *Sterilizing Capital Inflows*, International Monetary Fund, March, Washington DC.
- Mastropasqua, C., S. Micossi, and R. Rinaldi, (1988) Interventions, sterilization and monetary policy in European monetary system countries, 1979-87, in *The European Monetary System*, ed. by F. Giavazzi, S. Micossi, and M. Miller Cambridge University Press.
- Obstfeld, M. (1983) Exchange rates, inflation, and the sterilization problems, *European Economic Review*, 21, 161-189.
- Obstfeld, M. (1993) The adjustment mechanism,” in *A Retrospective on the Bretton Woods System*, ed. By Michael D. Bordo and Barry Eichengreen, The University of Chicago Press, 201-268.
- Obstfeld, M. and K. Rogoff (1995) The mirage of fixed exchange rates, *Journal of Economic Perspectives*, Fall, 73-96.
- Obstfeld, M. and A. M. Taylor (1996) The Great Depression as a Watershed: International Capital Mobility Over the Long Run, *NBER Working Paper series*.
- Sarno, L. and M. P. Taylor (2001) Official intervention in the foreign exchange market: Is it effective and, if so, how does it work?, *Journal of Economic Literature*, September, 839-68.

Stockman, A. C. (1993) International transmission under Bretton Woods, in *A Retrospective on the Bretton Woods System*, ed. By Mi. D. Bordo and B. Eichengreen, The University of Chicago Press, 317-356.

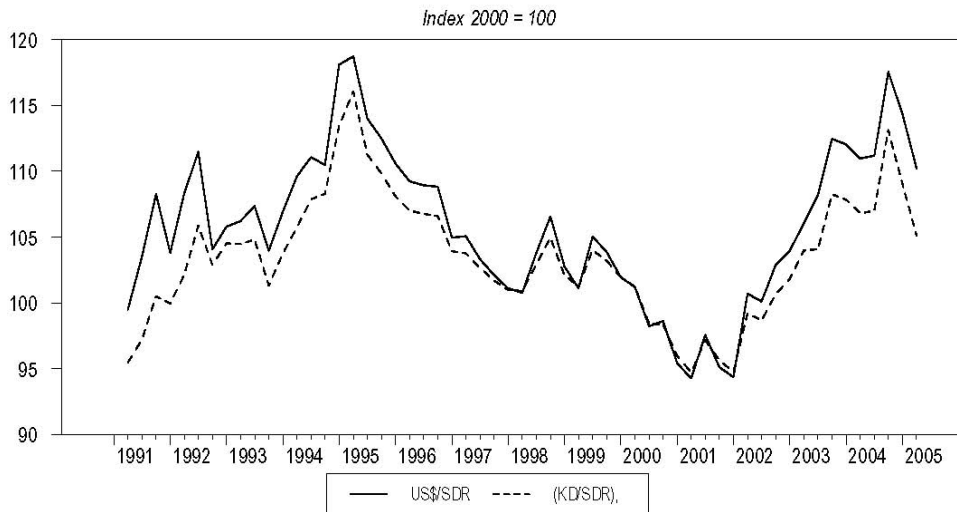
Svensson, L.E.O. (1994) Why exchange rate bands? Monetary independence in spite of fixed exchange rates” *Journal of Monetary Economics*, 33, 157-99.



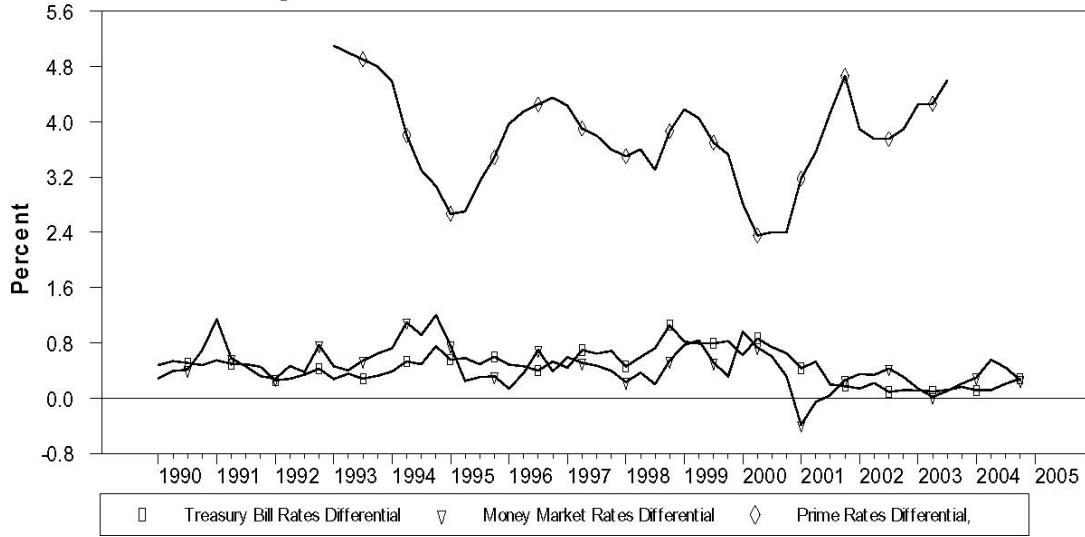
**Figure 1: US Dollar and Bahrain Dinar (BD) Against the SDR**



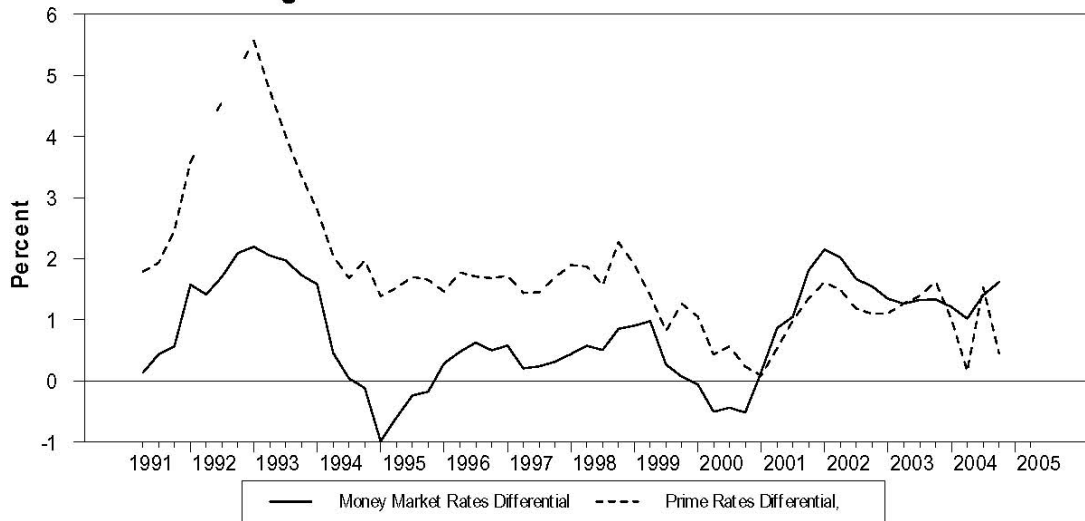
**Figure 2: US Dollar and Kuwait Dinar (KD) Against the SDR**



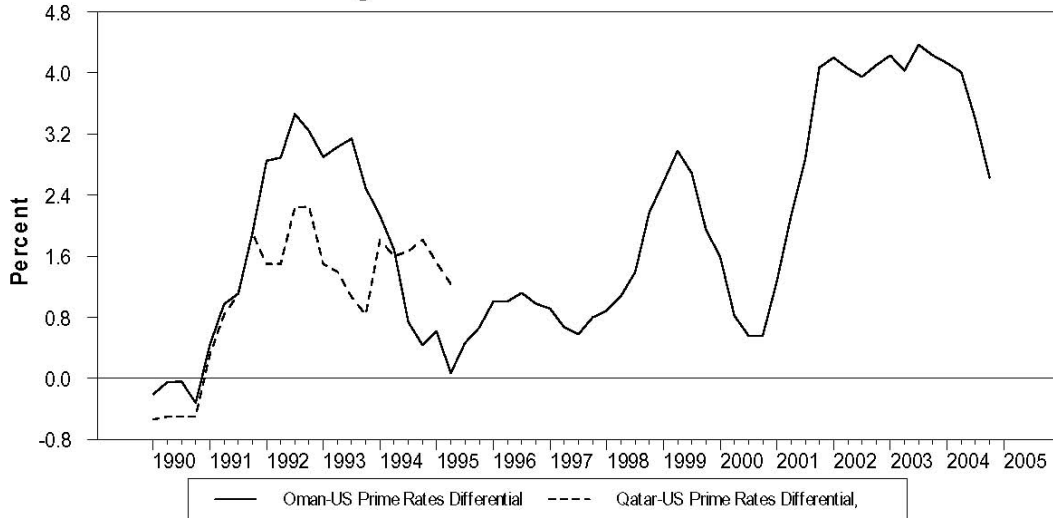
**Figure 3: Bahrain-US Interest Rates Differential**



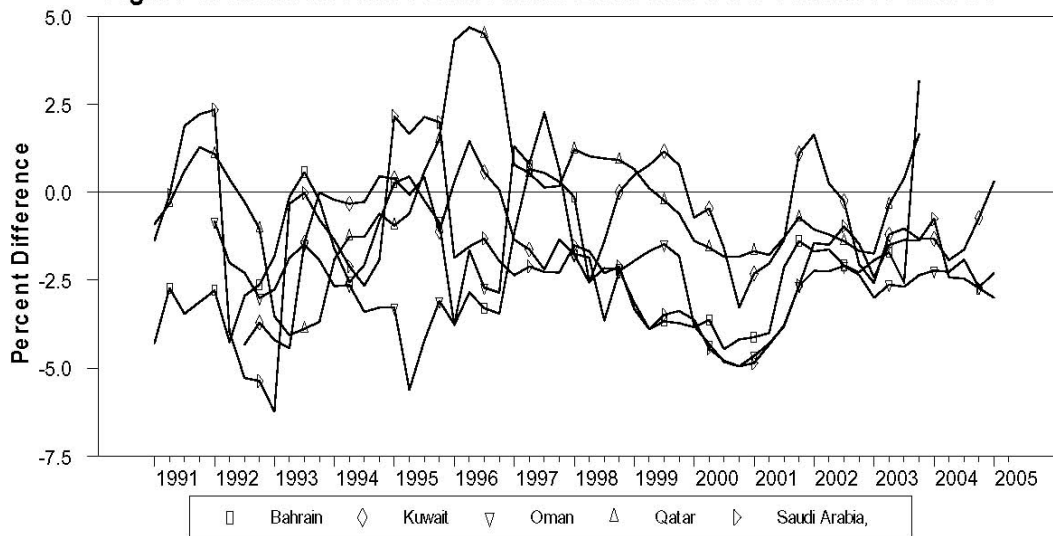
**Figure 4: Kuwait-US Interest Rates Differential**



**Figure 5: Prime Rates Differential**

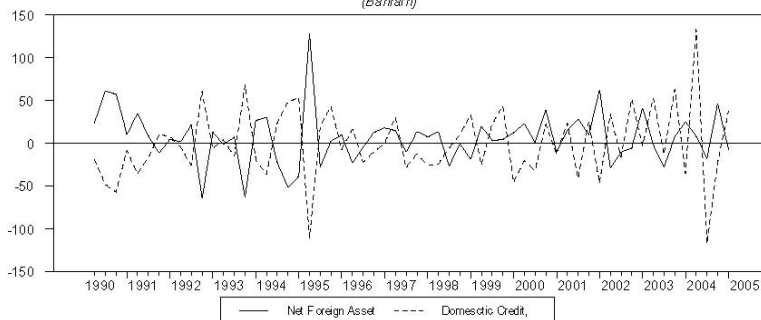


**Figure 6: Inflation Rates Differential Between GCC Countries and US**

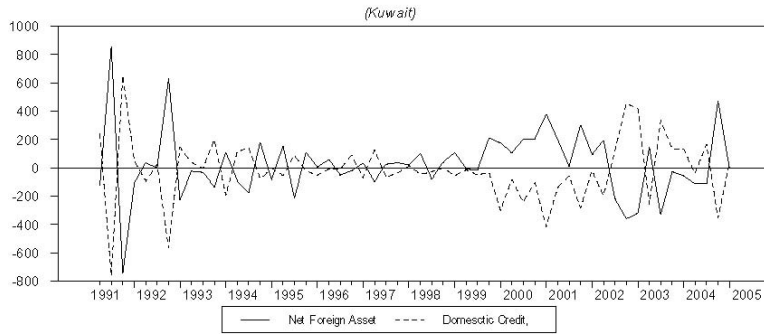


**Figure 7: Changes in Net Foreign Asset and Domestic Credit**

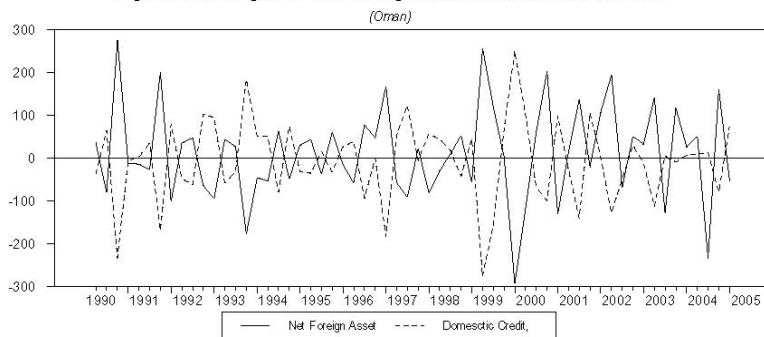
*(Bahrain)*



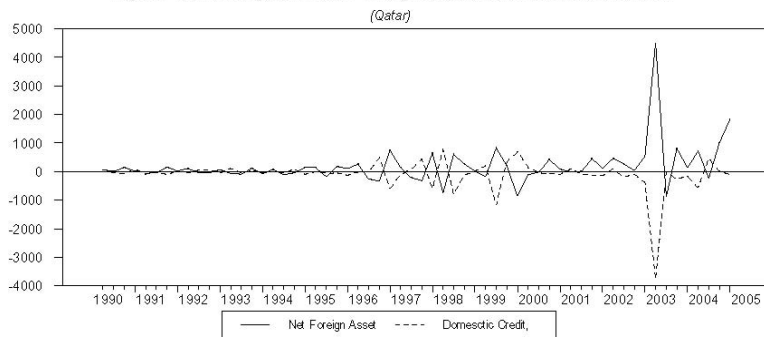
**Figure 8: Changes in Net Foreign Asset and Domestic Credit**



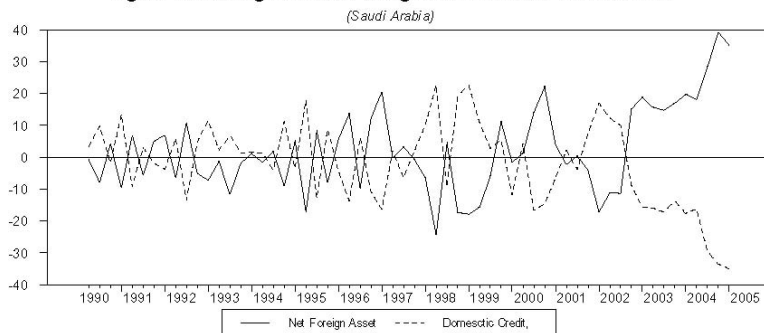
**Figure 9: Changes in Net Foreign Asset and Domestic Credit**



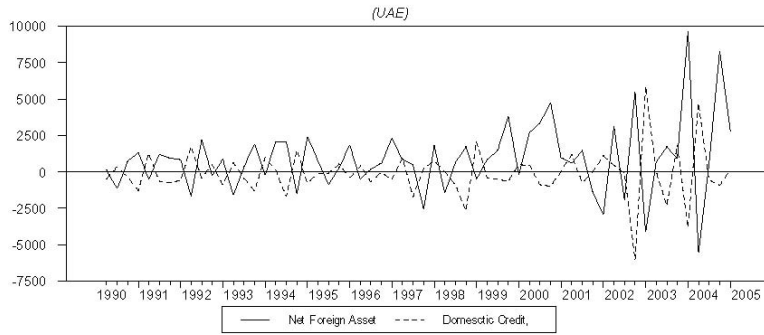
**Figure 10: Changes in Net Foreign Asset and Domestic Credit**



**Figure 11: Changes in Net Foreign Asset and Domestic Credit**



**Figure 12: Changes in Net Foreign Asset and Domestic Credit**



**Table 1: Measures of Exchange and Capital Controls in GCC countries**

	KCI	KCI inflows	KCI outflows	CCI	ECI
Bahrain	0.18	0.30	0.15	0.04	0.11
Kuwait	0.24	0.35	0.18	0.06	0.15
Oman	0.18	0.30	0.11	0.07	0.13
Qatar	0.09	0.17	0.04	0.06	0.08
Saudi Arabia	0.32	0.40	0.27	0.08	0.20
UAE	0.13	0.26	0.05	0.03	0.08
Group Average	0.19	0.30	0.13	0.06	0.13
Other Arab					
Countries average	0.48	0.50	0.47	0.29	0.38

Source: Karam (2001), tables 3.2 and 3.3, P. 30-31.

**Note:** KCI denotes indices of capital controls, CCI denotes indices of controls on current payments and transfers, and ECI denotes indices of exchange and capital controls.

$$d_t = \kappa + \gamma + \sum_{i=0}^{\infty} \phi^i \zeta_{t-i}$$

**Table 2** Non-linear estimates of  $\kappa$   $\gamma$   $\phi$   $h$

**Bahrain**

Money market rate 0.69 -0.007 0.54 1.16  
 (1990:3-2005:1) (5.01) (1.96) (4.84)  
 [0.00] [0.054] [0.00]

Treasury bill rate 0.67 -0.006 0.91 0.55  
 (1991:1-2005:1) (1.69) (0.72) (15.30)  
 [0.096] [0.47] [0.00]

Prime rate 2.10 0.03 0.86 2.69  
 (1993:1-2003:03) (1.08) (0.89) (11.23)  
 [0.28] [0.37] [0.00]

**Kuwait**

Money market rate 2.78 -0.04 0.66 0.33  
 (1993:1-2005:2) (6.60) (3.41) (8.76)  
 [0.00] [0.00] [0.00]

Prime rate 2.10 0.04 0.86 3.26  
 (1992:1-2005:2) (1.08) (0.89) (11.23)  
 [0.28] [0.37] [0.00]

**Oman**

Prime rate 2.04 0.012 0.92 4.23  
 (1990:3-2005:1) (0.84) (0.25) (0.00)  
 [0.41] [0.81] [0.00]

**Qatar**

Prime rate 1.39 0.005 0.79 0.32  
 (1990:2-1995:2) (0.74) (0.06) (5.13)  
 [0.47] [0.96] [0.00]

**Note:** Sample period is shown in parentheses below each interest rate. The absolute values of t-statistics are in parentheses and their corresponding P-values (significance levels) are in brackets below their respective coefficients.  $h$  is the Durbin's h-test statistic for first-order serial correlation.

**Table 3: 2SLS Estimates of  $\Delta DC_t = \alpha_1 \Delta NFA_t + \alpha_2 \pi_t + Q\beta + ut$ :**

Bahrain

(1) (2) (3)

 $\Delta NFA_t$  -0.63 -0.713 -0.711

(2.28) (2.715) (2.423)

[0.023] [0.007] [0.015]

GAP<sub>t</sub> 0.861 0.815

(0.872) (0.837)

[0.383] [0.403]

 $\pi_t$  10.183

(2.67)

[0.007]

 $\tilde{\pi}_t$  -10.097 -9.863

(2.769) (2.711)

[0.006] [0.007]

Q4 29.446 27.602 26.898

(3.175) (3.094) (2.853)

[0.001] [0.002] [0.004]

 $\bar{R}^2 = 0.71$   $\bar{R}^2 = 0.72$   $\bar{R}^2 = 0.72$  D-W = 1.93 D-W = 1.93 D-W = 1.93

**Note:**  $\Delta$  is the first-difference operator. The absolute values of t-statistics are in parentheses and their corresponding P-values (significance levels) are in brackets below their respective coefficients. Equations were estimated with a constant which were positive and highly significant. Usable sample period is 1991:3 – 2001:4. GAP<sub>t</sub> is the first

difference of the deviation of non-oil GDP from trend,  $\pi_t$  is the inflation rate,  $\tilde{\pi}_t$  is the deviation of inflation rate from trend and Q4 is the fourth quarter seasonal dummy.

**Table 4: 2SLS Estimates of  $\Delta DC_t = \alpha_1 \Delta NFA_t + \alpha_2 \pi_t + Q\beta + u_t$**

---

	Kuwait	Oman	Qatar	Saudi Arabia	UAE				
$\Delta NFA_t$	-1.03	-0.899	-0.616	-0.966	-.687				
	(15.39)	(4.79)	(5.27)	(43.01)	(5.627)				
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]				
GAP <sub>t</sub>	0.009								
	(.128)								
	[0.946]								
$\pi_t$	-5.528	-5.56	-30.197						
	(0.578)	(0.594)	(0.606)						
	[0.563]	[0.553]	[0.544]						
$\tilde{\pi}_t$									
		-0.338							
	(0.991)								
	[0.321]								
Q1	11.83	157.48	4.02	1173.27		(0.469)	(1.815)	(4.262)	(2.452)
	[0.639]	[0.070]	[0.000]	[0.014]					
Q2	36.787	196.56	3.758	1118.49					
	(1.219)	(2.059)	(2.189)	(2.353)					
	[0.223]	[0.039]	[0.029]	[0.019]					
Q3	-13.816								
	(0.907)								
	[0.364]								
Q4	119.53	46.36	317.71	6.951	700.81				
	(3.63)	(3.351)	(3.698)	(4.010)	(1.457)				
	[0.000]	[0.001]	[0.000]	[0.000]	[0.145]				
$\bar{R}^2$	= 0.91	$\bar{R}^2$ = 0.89	$\bar{R}^2$ = 0.92	$\bar{R}^2$ = 0.96	$\bar{R}^2$ = 0.52	D-W = 2.35	D-W = 1.96	D-W = 1.97	D-W = 2.37
						D-W =			1.97

---

**Note:** Q1 – Q4 are seasonal dummies. Sample periods: Kuwait 1992:2 – 2005:2, Oman 1991:4-2002:4, Qatar 1990:4-2003:4, Saudi Arabia 1990:4-2005:2, and UAE 1990:4-2005:2. For other notations, see notes to table 3.