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DETERMINING REAL EXCHANGE RATE FLUCTUATIONS IN THE OIL-BASED GCC ECONOMIES

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ABSTRACT

This paper attempts to empirically determine the relationship between oil price fluctuations and movements in the dollar-pegged Gulf Cooperation Council (GCC) countries' exchange rates. Panel unit root tests are applied, followed by the estimation of a panel co-integration model to identify the long-run equilibrium relationship. Built on the co-integration test results, a Vector Error Correction Model (VECM) is then estimated to determine causality relationships and investigate the short run dynamics. A panel of annual data of real exchange rates, oil prices and three other variables are utilized, which were selected in reference to the literature. The time series cover the 32-year period of 1980 to 2012. Test results indicate that the series are integrated of order one and evidence is found that oil prices and GDP per capita have a long run co-integration relationship with real exchange rates. The estimated VECM confirms the long run relationship and identifies a short run causality running from oil prices to exchange rates. The model also shows that exchange rates correct for short run disequilibria slowly, at the speed of 4% annually. The results confirm the findings of past researchers and recommend reviewing the existing exchange rate regimes to mitigate the impact of oil price fluctuations on these economies.

Keywords: Real exchange rates, Oil prices, Unit root, Co-integration, Vector error correction model (VECM), Panel.

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1. INTRODUCTION

For many years, the oil-based GCC countries have enjoyed relatively stable nominal exchange rates, attributed to their well-coordinated economic policies that aided in eliminating currency shocks. These countries, however, have recently been complaining about the fluctuations in the value of their real exchange rates under the instability of oil prices and the persistent fall in the value of the United States Dollar (USD). This is because, with the exception of Kuwait[1], all of the GCC currencies are pegged to the USD. With limited control over their nominal exchange rates, the GCC countries were concerned that the peg would negatively impact their domestic prices, currencies and income, especially with the USD becoming easily susceptible to critical economic and political turmoil. For example, the dollar lost much of its value between 2001 and early 2008 in response to the deterioration of the US economic

1 The Kuwaiti dinar was pegged to a basket of currencies from March 1975 until January 2003, when it was pegged to the US dollar at the rate of KD 0.29963 per dollar. However, in 2007 the country delinked its currency from the USD, restoring its peg to a basket of currencies.

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growth and the rise of its current account deficit. A weakening of the USD against major currencies such as the Euro causes loss of purchasing power of the GCC currencies when importing, in addition to capital losses on their USD denominated foreign assets (Alotaibi, 2006).

With the GCC countries adopting a fixed exchange rate regime, whereby their monetary authorities intervene in the currency markets to keep their exchange rates close to the targeted US dollar exchange rate, it's important to pay attention to the purchasing power of these currencies. In this study, the real exchange rates are emphasized where the nominal exchange rates are adjusted for the relative price levels in home and foreign countries. This is because these rates provide information on the currency's strength with respect to the trading partners' currencies and the real costs of purchasing foreign goods and services as global prices change (Al-Mulali and Che, 2011).

The inability of the GCC nominal exchange rates, which are pegged completely or partially[2] to the USD, to adjust to the oil price shocks through appreciation/depreciation means the impact would be transferred to the GCC economies in the form of domestic inflation and higher prices relative to the foreign prices. This not only reduces trade competitiveness of these countries but also leads to the loss in real value of their currencies.

This paper attempts to investigate the stable equilibrium long run relationship between real exchange rates and oil prices. If such a relationship exists, then recurrent economic shocks to oil prices would lead to fluctuations in the real exchange rates of the GCC currencies and hence fluctuating domestic prices. Exchange rate fluctuations are also likely to impose threat on the stability of oil revenues in domestic currency. It is therefore important to determine the source of these fluctuations to minimize any adverse variations in oil receipts.

The detrimental impact of pegging GCC currencies to the USD on domestic prices, international competitiveness of these currencies and revenues leaves them with the options of either switching to a flexible or managed floating exchange rate regime, revaluating their currencies, or reviewing the peg to a single currency.

While several studies addressing this subject were conducted in the United States and many other developed economies, countries in the Middle East and the GCC region in particular received much less attention. With the special characteristics of being fast growing economies that are heavily dependent on oil, largely susceptible to any shocks in its prices, striving towards a currency union, and with their currencies pegged to the US dollar, the GCC region was particularly chosen to cover the gap in analyzing the relation between their real exchange rates and the impact of the prices of oil, which they export. The link of currency and oil price movements for such small, open and oil exporting economies with rapid growth rates is worth exploring, especially with the very few number of such studies conducted in this region. The results will aid in providing a better understanding of the relationship between the two variables in order to study and assist in developing the appropriate monetary and fiscal policies to eliminate any exchange rate instabilities.

Hence, considering the very few researches conducted on the GCC countries collectively and the shortage in the number of studies that have analyzed currencies that are pegged to their anchors, this study contributes to the existing literature through elaborating on those areas and proposing some policy recommendations for these countries.

In reality, a two variable model is never a realistic one. Therefore, the impact of other economic indicators on the real exchange rates must also be considered beside the oil price effect, to identify the role of economic fundamentals in explaining exchange rate movements. This paper aims to explore the relationship including these fundamentals.

Since oil prices are invoiced in US dollars and GCC currencies have no impact on them, only the effect that oil prices and other selected variables have on the real exchange rates of these countries' currencies will be studied in detail. The long-term equilibrium relationship using co-integration analysis will be examined along with the short run

2 It's believed that the US dollar has the largest weight in the basket of currencies that the Kuwaiti dollar is pegged to.

dynamics and causality relationships. Annual time series data covering the period from 1980 to 2012, involving significant oil price and other economic shocks, were utilized for this purpose.

The paper is organized as follows: Section 2 reviews the literature on the main findings concerning the oil price and exchange rate relationship. Section 3 describes the empirical exchange rate model adopted. Section 4 reports the empirical test results and section 5 discusses the main findings. Finally, section 6 concludes the paper and provides policy recommendations.

2. LITERATURE REVIEW

The relationship between exchange rates and crude oil prices has been widely discussed in the literature. The study of this relationship received much more attention for the United States dollar and currencies of industrial and developed economies, along with OPEC and other oil exporting countries. The bulk of the literature confirming the relationship between oil prices and exchange rates argues that movements in oil prices tend to determine the value of a currency.

The majority of the previous researches conducted in analyzing the relationship between exchange rates and prices of oil were directed towards identifying the impact of oil price instability on currency movements. The outcome of these studies produced a mix of results, depending on the country under examination. Some authors claim that positive oil price shocks appreciate the currency under study while others propose a wealth effect, higher demand side effect, and a weaker currency. In many cases, the discrepancies in these findings are attributed to the model specification, whether the country is a net importer or exporter of oil, the period under study, the exchange rate regime, the size of the economy, long term vs. short-term analysis, and the net trade position. Overall, while not fully explaining their movement, oil prices were thought to be a major determinant of the behavior of exchange rates. In most of the papers examined, a positive oil price shock leads to the currency appreciation of oil exporting countries and depreciates those of oil importing countries.

Chaudhuri and Daniel (1998) among others, study real oil prices in the post the Bretton Woods era and their link with the real exchange rates of 16 OECD countries. In 13 out of the 16 countries under study, their analysis shows that the two series are co-integrated. They also find that oil price fluctuations cause real exchange rate movements. Nikbakht (2010) performs panel analysis of seven OPEC members using monthly data from 2000 to 2007. He applies co-integration analysis and finds evidence that real oil prices are the driving force of fluctuations in the real exchange rates, proving a long run relationship between the two variables for pooled series.

Besides estimating VARs and ECMs, other various approaches were also adopted such as that by Chen and Chen (2007). Their results suggest that oil prices have significant forecasting power of the G7 countries' real exchange rates along with evidence of a long run nexus between the two variables using different oil price measures. In addition, Turhan *et al.* (2012) find that the relationship between oil prices and nominal exchange rates becomes more significant after the financial crises of 2008 for a number of selected emerging countries. They investigate this relationship using daily time series data, utilizing VAR and generalized impulse response functions in three time periods between 2003 and 2010.

A group of researchers claims that a rise in oil prices leads to the appreciation of the currency under study. For instance, Amano and Norden (1998) study Germany, Japan and the United States and confirm the major findings of Chaudhuri and Daniel (1998) discussed earlier. They also contend that in the long run an increase in the price of oil will lead to the real appreciation of the USD against the currencies of 15 other industrial countries post the Bretton Woods era. Similarly, Bénassy-Quéré *et al.* (2005) analyze the economies of the United States, Eurozone, OPEC and China. Based on their analysis, in the long run, a 10% increase in the price of oil causes 4.3% appreciation of the dollar, with a slow return of the dollar exchange rate to its long run equilibrium value. Additionally, Alotaibi (2006) studies the GCC case and concludes that positive oil price shocks dominate currency movements persistently in all GCC countries except Qatar and the UAE, where demand shocks are more dominant.

In a similar manner, Coudert *et al.* (2008) deduce that an increase in oil prices leads to the real appreciation of the oil exporter's currency in the long run and that pegged currencies follow the behavior of their anchors to a great extent. Likewise, Korhonen and Juurikkala (2009) reach almost the same conclusion for the real currency exchange rates in Iran and Venezuela using four-variable structural VAR models and argue that a positive oil shock would cause currency appreciation against the USD. Kumar Narayan *et al.* (2008) also provide evidence that a 10% increase in oil prices would lead to an appreciation of the Fiji dollar by 0.20%.

On the other hand, another group of researchers claims that a rise in oil prices would actually deteriorate the value of a currency causing it to depreciate against other currencies. For instance, Akram (2004) claims that rising oil prices affect nominal exchange rates in a negative non-linear way in the short run only, and claims that the strength of this effect depends on the level and trend of oil prices. Akram finds the relationship to be insignificant in the long run. Comparatively, Trygubenko (2005) employs a number of empirical models and concludes that rising oil prices significantly depreciate the USD in the short run. Like Akram (2004) however, he finds no relation between the two variables in the long run.

Similarly, Al-Mulali and Che (2011) find a long run relationship between the UAE dirham's real exchange rate and oil prices. However, while recognizing the impact of positive oil price shocks on domestic prices, the authors conclude that a 1% increase in oil prices causes 0.16% depreciation in the real value of the dirham. Lizardo and Mollick (2010) on the other hand, use a monetary model of exchange rates. They find evidence that the two variables are closely related in the long run. They also deduce that an increase in the real price of oil causes a nominal depreciation of the USD against the currencies of net oil exporters such as Canada and Mexico, while it appreciates against the currencies of major oil importing countries such as Japan and Denmark.

Some authors argue that in order to determine the impact of oil price shocks on exchange rates, the balance of payments and the country's net trade position must be emphasized. Krugman (1983a) for example, estimates a simple and theoretical three-country portfolio model involving OPEC, USA and Germany. He concludes that in the short run, an increase in the price of oil leads to the appreciation of the USD but in the long run the dollar would depreciate. Krugman (1983b) extended his analysis to estimate a more complicated model. He estimates three models, each with three cases involving OPEC and at least two oil importing countries. The models take into account the trade balance, a financial factor and the role of exchange rate expectations, in an attempt to identify the impact of OPEC actions on the bilateral trade. They demonstrate that oil shocks affect all countries and that their impact on exchange rates depends on the sensitivity of OPEC's expenditures to its wealth. However, as he points out, both of Krugman's models are an oversimplification of the factors in the real world.

Likewise Coleman *et al.* (2010) look into the nonlinear relation between exchange rates and oil prices for a sample of 13 African countries. They identify a long run relationship for some of the countries and clarify that the impact of oil prices on these countries' exchange rates varies from one country to another, which may be attributed to the country's net oil trade position.

3. THE MODEL

The model to estimate is a long run co-integration model, based on the model by Al-Mulali and Che (2011) with the real exchange rate as the dependent variable, expressed in the form:

$$ER_{it} = \alpha_i + \beta_{1i}OP_{it} + \beta_{2i}CA_{it} + \beta_{3i}GDPPC_{it} + \beta_{4i}FDI_{it} + \mu_{it}; \qquad (1)$$

Where;

ER = Real Exchange Rates

OP = Real Oil Prices

CA = Real Current Account balance

GDPPC = Real GDP Per Capita

FDI = Real Foreign Direct Investment inflows

i takes 6 values for the six respective countries of the GCC.

Due to data constraints, however, the trade balance variable in Al-mulali and Che Sab's model is substituted with the current account variable, which is also in line with the approaches adopted by Akram (2004) and Trygubenko (2005) where they model exchange rates as a function of the current account balance.

Real exchange rates are constructed using domestic and foreign price levels. They are calculated using the following equation:

RER= Nominal ER * (Domestic price levels/Foreign price levels)

The nominal exchange rate is the price of domestic currency in terms of the foreign currency (USD), i.e. the number of foreign currency units required for one unit of the domestic currency. The real exchange rate is hence the nominal exchange rate adjusted for the relative price ratio. The domestic GDP deflator is used to account for domestic price levels, while the US GDP deflator is used a proxy for foreign price levels.

The coefficients β_{1i} to β_{4i} are the long run coefficients to be estimated, while μ_{it} is a residual term. The significance of this long run co-integration model confirms the associated variables have a long run co-integration relationship with the real exchange rates.

Based on this theoretical model, a rise in the real exchange rate or an appreciation of the GCC currency is expected to result from either a rise in oil prices, a positive current account balance, an increase in GDP per capita, or positive FDI flows (FDI inflows).

As mentioned earlier, with fixed exchange rates the impact of these variables on the real exchange rate is explained through their impact on the relative prices. Higher oil prices are forecast to appreciate the dollar-pegged GCC currencies because they generate a higher flow of oil revenues into these economies, which induce higher government expenditures. This in turn stimulates a high and rapid growth of liquidity, which creates inflation in these economies. Domestic prices of goods and services would be higher than their foreign counterparts. With a fixed nominal exchange rate, this means the real exchange rate of the GCC currency must appreciate.

The current account indicates whether a country is a net borrower or a net lender. An increase in oil exports, driven both by an increase in their prices and quantities produced, will increase export revenues and cause a sudden rise in liquidity in these economies. This in turn raises domestic prices causing inflation and appreciates the real exchange rates of the GCC currencies, and once more domestic goods and services would be more expensive relative to foreign goods and services.

Moreover, the higher GDP per capita reflects high oil revenues that led to increased government expenditures and investments, and hence higher GDP. An increase in the level of expenditures and investment by the government tends to lead to higher inflation and a real appreciation of the GCC currencies relative to the dollar. Higher GDP per capita may also induce retailers to import more goods and services into the economy, hence contributing to the overall increase in domestic prices.

Finally, the model suggests a positive relationship between FDI inflows and the value of the currency. FDI inflows represent the capital supplied by a foreign direct investor to an enterprise residing in the economy. The higher these investment flows, the more international reserves accumulated at these countries' central banks and the higher is the growth of money. Excessive money supply growth would therefore put upward pressure on domestic prices and hence induce inflation and appreciate the real exchange rate.

4. TEST RESULTS

4.1. Panel Unit Root Tests

Panel Unit root tests are conducted at three specifications; once including an individual intercept, another including an individual intercept and trend and a third time without the intercept or trend. The lag length is selected using the Akaike (AIC) criterion with an observation based maximum lag length.

Five different null hypotheses are tested. The first two belong to the Levin, Lin & Chu (LLC) and the Breitung tests. The null hypothesis for these tests is the unit root, assuming the cross-sectional units share a common unit root process. The second two hypotheses belong to the Im, Pesaran and Shin (IPS) and Fisher type tests. The null hypothesis for these two tests is the unit root with the assumption that the cross sectional units have an individual unit root process. Finally, the fifth tested hypothesis is for the Hadri test, where the null hypothesis is no unit root, assuming a common unit root process for all cross-sectional units. The results of the five different tests conducted on the series at level are displayed below in Table-1.

Table-1. Panel unit root test results - series at level

With intercept						
Test	**Null Hypothesis**	**RER**	**OP**	**CA**	**GDPPC**	**FDI**
Levin, Lin & Chu	Unit Root	-7.94 (0.00)*	3.17 (1.00)	8.82 (1.00)	3.73 (0.99)	10.26 (1.00)
Im, Pesaran and Shin W-stat	Unit Root	-9.75 (0.00)*	3.96 (1.00)	6.12 (1.00)	4.16 (1.00)	2.35 (0.99)
ADF - Fisher Chi-square	Unit Root	99.81 (0.00)*	0.72 (1.00)	0.62 (1.00)	1.49 (1.00)	16.85 (0.16)
PP - Fisher Chi-square	Unit Root	102.71 (0.00)*	0.58 (1.00)	2.17 (1.00)	2.42 (1.00)	18.12 (0.11)
Hadri Z-stat	No Unit Root	4.11 (0.00)*	4.73 (0.00)*	6.25 (0.00)*	5.57 (0.00)*	3.79 (0.00)*
Notes: - * denotes significance at the 1% level and ** at the 5% level						
With intercept and trend						
Test	**Null Hypothesis**	**RER**	**OP**	**CA**	**GDPPC**	**FDI**
Levin, Lin & Chu	Unit Root	-2.60 (0.00)*	-2.45 (0.01)*	3.37 (1.00)	-1.30 (0.10)	15.69 (1.00)
Breitung t-stat	Unit Root	-4.47 (0.00)*	1.57 (0.94)	7.11 (1.00)	2.43 (1.00)	4.77 (1.00)
Im, Pesaran and Shin W-stat	Unit Root	-8.74 (0.00)*	1.71 (0.96)	3.72 (1.00)	0.39 (0.65)	1.09 (0.86)
ADF - Fisher Chi-square	Unit Root	84.94 (0.00)*	3.10 (0.99)	5.35 (0.95)	9.93 (0.62)	25.24 (0.01)*
PP - Fisher Chi-square	Unit Root	122.76 (0.00)*	1.74 (1.00)	2.66 (1.00)	4.57 (0.97)	20.31 (0.06)
Hadri Z-stat	No Unit Root	0.24 (0.41)	7.67 (0.00)*	9.19 (0.00)*	6.73 (0.00)*	4.26 (0.00)*
Note: * denotes significance at the 1% level and ** at the 5% level						
Without intercept or trend						
Test	**Null Hypothesis**	**RER**	**OP**	**CA**	**GDPPC**	**FDI**
Levin, Lin & Chu	Unit Root	1.153 (0.88)	1.94 (0.97)	2.25 (0.99)	2.22 (0.99)	2.46 (0.99)
ADF - Fisher Chi-square	Unit Root	7.66 (0.81)	1.52 (1.00)	2.55 (1.00)	1.74 (1.00)	12.19 (0.43)
PP - Fisher Chi-square	Unit Root	6.62 (0.88)	1.36 (1.00)	5.23 (0.95)	1.87 (1.00)	26.12 (0.01)*
Note: * denotes significance at the 1% level						

Note: The test is based on oil price data (British Petroleum, 2011) exchange rate data from the IFS (International Monetary Fund, 2014) GDP deflator, current account and GDP per capita data from the WEO database (IMF, 2014) and FDI data (World Bank, 2012) for the period 1980-2012.

The table clearly illustrates that, with the exception of the majority of the real exchange rate test results, the series are not stationary at level under the three specifications. Hence, they require further differencing to arrive at stationarity, which is a prerequisite for conducting co-integration tests. The unit root test results after first differencing are displayed below in Table-2.

Table-2. Panel unit root test results - series at first difference

With intercept						
Test	**Null Hypothesis**	**RER**	**OP**	**CA**	**GDPPC**	**FDI**
Levin, Lin & Chu t*	Unit Root	10.12 (1.00)	-6.59 (0.00)*	-0.63 (0.26)	-6.95 (0.00)*	-0.63 (0.27)
Im, Pesaran and Shin W-stat	Unit Root	-9.46 (0.00)*	-7.51 (0.00)*	-3.90 (0.00)*	-7.97 (0.00)*	-3.98 (0.00)*
ADF - Fisher Chi-square	Unit Root	99.43 (0.00)*	74.60 (0.00)*	59.93 (0.00)*	80.90 (0.00)*	60.63 (0.00)*
PP - Fisher Chi-square	Unit Root	152.55 (0.00)*	126.27 (0.00)*	100.27 (0.00)*	84.41 (0.00)*	120.133 (0.00)*
Hadri Z-stat	No Unit Root	-1.71 (0.96)	4.64 (0.00)*	5.76 (0.00)*	4.69 (0.00)*	-1.63 (0.95)
Note: * denotes significance at the 1% level						
With intercept and trend						
Test	**Null Hypothesis**	**RER**	**OP**	**CA**	**GDPPC**	**FDI**
Levin, Lin & Chu t*	Unit Root	17.94 (1.00)	-7.38 (0.00)*	5.35 (1.00)	-5.94 (0.00)*	-5.30 (0.00)*
Breitung t-stat	Unit Root	-3.70 (0.00)*	-11.91 (0.00)*	2.95 (1.00)	-5.08 (0.00)*	3.39 (1.00)
Im, Pesaran and Shin W-stat	Unit Root	-7.86 (0.00)*	-9.50 (0.00)*	-5.44 (0.00)*	-8.68 (0.00)*	-11.67 (0.00)*
ADF - Fisher Chi-square	Unit Root	78.11 (0.00)*	90.33 (0.00)*	60.35 (0.00)*	80.96 (0.00)*	122.13 (0.00)*
PP - Fisher Chi-square	Unit Root	1,433.02 (0.00)*	419.67 (0.00)*	384.00 (0.00)*	329.22 (0.00)*	364.31 (0.00)*
Hadri Z-stat	No Unit Root	-0.95 (0.83)	6.30 (0.00)*	7.99 (0.00)*	1.91 (0.03)**	0.02 (0.49)
Note: * denotes significance at the 1% level and ** at the 5% level						
Without intercept and trend						
Test	**Null Hypothesis**	**RER**	**OP**	**CA**	**GDPPC**	**FDI**
Levin, Lin & Chu t*	Unit Root	-15.85 (0.00)*	-14.11 (0.00)*	-8.17 (0.00)*	-10.48 (0.00)*	-6.90 (0.00)*
ADF - Fisher Chi-square	Unit Root	212.77 (0.00)*	172.00 (0.00)*	79.98 (0.00)*	116.67 (0.00)*	86.23 (0.00)*
PP - Fisher Chi-square	Unit Root	1,511.21 (0.00)*	172.58 (0.00)*	133.92 (0.00)*	123.22 (0.00)*	390.26 (0.00)*
Note: * denotes significance at the 1% level						

Note: The test is based on oil price data (British Petroleum, 2011) exchange rate data from the IFS (IMF, 2014) GDP deflator, current account and GDP per capita data from the WEO database (IMF, 2014) and FDI data (World Bank, 2012) for the period 1980-2012.

While some of the LLC and Hadri unit root test results displayed above in Table-2 may give mixed inferences, it’s very clear that with few exceptions (mostly in the Hadri test results), the null hypothesis of unit root can be firmly rejected at the 1% significance level using the three test specifications (intercept, intercept and trend, and none). This indicates that all of the tested series are stationary after first differencing.

The results of the Hadri tests are not in line with their counterparts in the other tests after first differencing. This applies to all variables expect the real exchange rates and FDI inflows. Despite them being generally consistent with these results at level, they fail to reject that the series contain unit root after differencing in the tests involving the intercept and the intercept with trend. This outcome is not surprising because previous studies have shown that under certain conditions, the Hadri test undergoes a remarkable size distortion and tends to over-reject the hypothesis of absent unit root, producing results that are different or opposing to those obtained by alternative unit root tests.

In summary, with the exception of few test outcomes, unit root test results clearly indicate that all of the five series are stationary after first differencing and are integrated of order 1 for the panel of six GCC countries. This qualifies them to the next step, which involves co-integration analysis.

4.2. Panel Co-Integration Tests

Following the identification of significant evidence that the series contain no unit root after differencing, the next step is to test for co-integration. This step is to identify whether co-integration vectors exist among the variables, knowing that all of them are integrated of the same order or are I(1) and when differenced, are I(0). In particular, the paper aims to identify whether a long-term co-integration relationship can be determined between the real exchange rates, oil prices and other variables.

Table-3. Pedroni (1999) panel co-integration test results

No deterministic Trend			
Within dimension	**Test Static**	**Between dimension**	**Test Static**
Panel v-Statistic	0.94 (0.17)	Group rho-Statistic	2.49 (0.99)
Panel rho-Statistic	1.44 (0.93)	Group PP-Statistic	-0.13 (0.45)
Panel PP-Statistic	1.44 (0.92)	Group ADF-Statistic	-2.67 (0.00)*
Panel ADF-Statistic	-2.07 (0.02)**		
Deterministic intercept and trend			
Within dimension	**Test Static**	**Between dimension**	**Test Static**
Panel v-Statistic	-0.18 (0.57)	Group rho-Statistic	3.64 (1.00)
Panel rho-Statistic	3.43 (1.00)	Group PP-Statistic	0.07 (0.53)
Panel PP-Statistic	3.66 (1.00)	Group ADF-Statistic	-2.41 (0.00)*
Panel ADF-Statistic	-2.69 (0.00)*		
No deterministic intercept or trend			
Within dimension	**Test Static**	**Between dimension**	**Test Static**
Panel v-Statistic	0.79 (0.22)	Group rho-Statistic	1.77 (0.96)
Panel rho-Statistic	0.25 (0.60)	Group PP-Statistic	-2.17 (0.02)**
Panel PP-Statistic	-0.48 (0.31)	Group ADF-Statistic	-4.12 (0.00)*
Panel ADF-Statistic	-3.14 (0.00)*		

Notes: - The null hypothesis is that there is no co-integration.

- * Indicates hypothesis rejection at the 1% significance level and ** at the 5% level.
- The test is based on oil price data (British Petroleum, 2011) exchange rate data from the IFS (IMF, 2014) GDP deflator, current account and GDP per capita data from the WEO database (IMF, 2014) and FDI data (World Bank, 2012) for the period 1980-2012.

Based on the approaches of Pedroni, Kao and Maddala and Wu panel co-integration tests, the null hypothesis of no co-integration will be tested using the optimal lag length of 2.

Tables-3, 4 and 5 report the results from the three panel co-integration tests used. With the exception of all the test results under the Group and Panel ADF statistics, and the Group PP statistic test result (without deterministic intercept and trend), the Pedroni test statics indicate the null of no co-integration cannot be rejected. This contradicts with the priori hypothesis of co-integration between real exchange rates and the remaining variables. However, the Kao and Maddala and Wu test results prove the opposite and provide evidence of co-integration in the model. More precisely, the Kao test results show that there's a long run equilibrium relationship between the series where the null hypothesis of no co-integration is rejected at the 10% level.

Similarly, the Maddala and Wu test results indicate the presence of co-integration between the five variables, where the null hypothesis of no co-integration ($r = 0$) can be firmly rejected at the 1% significance level. The test results suggest that the null hypothesis of the presence of at most 3 unique co-integrating vectors ($r \leq 3$) cannot be rejected. Therefore, there is some evidence supporting the hypothesis of the existence of unique co-integrating vectors among the tested variables.

Table-4. Kao (1999) residual co-integration test result

Null Hypothesis: No cointegration	Test Statistic	Probability
GCC panel	-1.51	0.07***

Note: - *** indicates hypothesis rejection at the 10% significance level.

- The test is based on oil price data (British Petroleum, 2011), exchange rate data from the IFS (International Monetary Fund, 2014), GDP deflator, current account and GDP per capita data from the WEO database (International Monetary Fund, 2014) and FDI data (World Bank, 2012) for the period 1980-2012.

Table-5. Maddala and Wu (1999) Fisher panel co-integration test result with a linear deterministic trend (intercept (no trend) in CE and VAR)

Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Probability	Fisher Stat.* (from max-eigen test)	Probability
None	149.90	0.00	84.51	0.00
At most 1	80.67	0.00	57.31	0.00
At most 2	35.95	0.00	27.53	0.01
At most 3	19.09	0.09	17.28	0.14
At most 4	17.03	0.15	17.03	0.15

Note: The test is based on oil price data (British Petroleum, 2011) exchange rate data from the IFS (IMF, 2014) GDP deflator, current account and GDP per capita data from the WEO database (IMF, 2014) and FDI data (World Bank, 2012) for the period 1980-2012.

Overall, while the majority of the Pedroni test results support the null hypothesis of no co-integration, evidence of long run equilibrium relationship between exchange rates and the other four variables is found from the other two test results. Therefore, the next step would be to estimate the VECM, to examine if the long run co-integration relationship, suggested by the Kao and Maddala and Wu tests, can be supported by the VECM analysis, and to determine short run causality relationships between the real exchange rates of the GCC currencies and the tested variables.

4.3. VECM and Long Run Causality

The VECM estimation results using the optimal lag order of 2 and including the three co-integrating vectors are displayed below in Table-6. Since three co-integrating vectors are involved, namely the exchange rate, current account and FDI vectors, only the vector of interest will be emphasized here, which is that related to the exchange rate.

Table-6. Estimated co-integration equation with respect to the real exchange rate

ER(-1)	CA(-1)	FDI(-1)	GDPPC(-1)	OP(-1)	C
1.00	0.00	0.00	0.44 (1.02) [0.43]	-2.78 (1.11) [-2.51]	5.28

Notes: - Standard error is in ( ) and t-statistic is in [ ]

- The test is based on oil price data (British Petroleum, 2011) exchange rate data from the IFS (IMF, 2014) GDP deflator, current account and GDP per capita data from the WEO database (IMF, 2014) and FDI data (World Bank, 2012) for the period 1980-2012.

Based on Table-6 which shows the co-integration equation obtained from the VECM estimation output displayed in Table-7 below, the normalized co-integration equation with respect to the exchange rate can be written as[3]:ER(-1) = -5.28 - 0.44GDPPC(-1) + 2.78 OP(-1)

Table-7. VECM estimation output

Error Correction:	D(ER)	D(CA)	D(FDI)	D(GDPPC)	D(OP)
CointEq1	-0.04	-0.82	-0.49	-0.04	0.01
	(0.01)	(0.52)	(0.09)	(0.01)	(0.01)
	[-5.20]	[-1.57]	[-5.42]	[-5.30]	[1.31]

Notes: - Standard errors are in ( ) and t-statistics of the estimated coefficients are in [ ]

- The test is based on oil price data (British Petroleum, 2011) exchange rate data from the IFS (IMF, 2014) GDP deflator, current account and GDP per capita data from the WEO database (IMF, 2014) and FDI data (World Bank, 2012) for the period 1980-2012.

From Table-7, the VECM equation for the exchange rate vector (D(ER)) is extracted, which in this case takes the form:

D(RER) = C(1)*(RER(-1) + 0.44*GDPPC(-1) - 2.78*ROIL(-1) + 5.28) + C(2)*(CA(-1) + 45.08*GDPPC(-1) - 46.40*ROIL(-1) - 285.42) + C(3)*(FDI(-1) + 14.60*GDPPC(-1) - 9.22*ROIL(-1) - 111.11) + C(4)

Where C1 is the coefficient of the ECT. OLS regression techniques are then used on this equation to determine whether the ECT coefficient is significant. The regression output is displayed below in Table-8. The results show that the long run coefficient C1 carries the expected negative sign and is significant at the 1% significance level, suggesting that the ECT has a significant effect in the co-integration equation and confirming the long run causality running from the oil prices to the exchange rates.

The value of the C1 coefficient indicates that the speed of adjustment or the correction of disequilibrium occurs at the rate of 4% every year. Hence, real exchange rates go through a mean-reverting process to their long-term equilibrium in the co-integration equation. The low value of -0.04 indicates the speed of adjustment towards equilibrium is very low.

[3] The estimated coefficients' table presents the co-integration equation with all variables on the left hand side. Therefore, to obtain the normalized co-integration equation, the signs of the model estimates are reversed to represent the relationship and compare with the anticipated hypothesis.

Table-8. VECM equation regression output

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.04	0.01	-5.20	0.00*
C(2)	0.00	0.00	1.87	0.06
C(3)	-0.01	0.00	-3.77	0.00
C(4)	-0.00	0.01	-0.16	0.87
R-squared	0.15	Mean dependent var		-0.00
Adjusted R-squared	0.13	S.D. dependent var		0.18
S.E. of regression	0.17	Akaike info criterion		-0.67
Sum squared resid	5.52	Schwarz criterion		-0.60
Log likelihood	68.24	Hannan-Quinn criter.		-0.64
F-statistic	10.80	Durbin-Watson stat		2.72
Prob(F-statistic)	0.00			

Notes: - * denotes significance at the 1% level

- The test is based on oil price data (British Petroleum, 2011) exchange rate data from the IFS (IMF, 2014) GDP deflator, current account and GDP per capita data from the WEO database (IMF, 2014) and FDI data (World Bank, 2012) for the period 1980-2012.

4.4. Tests for Short Run Causality

Next, the Wald causality test is carried to analyze the short causality running from the tested variables to the exchange rates. The VECM equation obtained above is used for this purpose to estimate an equation where the real exchange rate is taken as the dependent variable. The coefficients obtained for the tested variables (C5 to C8) are all tested for short run causality using the Wald test. For example, if the short run causality running from the current account balance to the exchange rates is tested, the current account equation coefficient is tested, where the null hypothesis of no causality is written as:

C(5) = 0

This means that the current account (lag) value does not cause changes in the exchange rate in the short run. Table-9 reports the short run causality test results, indicating that only oil prices cause real exchange rate changes in the short run.

Table-9. Wald test results for short run causality

Variable	Null Hypothesis	Chi-square Value	Probability	Short run causality
Current Account	C5 = 0	0.15	0.69	No
FDI inflows	C6 = 0	0.80	0.37	No
GDPPC	C7 = 0	0.43	0.51	No
Oil Prices	C8 = 0	3.70	0.05*	Yes

Notes: - *denotes rejection of null hypothesis at the 5% significance level

- The test is based on oil price data (British Petroleum, 2011) exchange rate data from the IFS (IMF, 2014) GDP deflator, current account and GDP per capita data from the WEO database (IMF, 2014) and FDI data (World Bank, 2012) for the period 1980-2012.

5. DISCUSSION OF THE RESULTS

The majority of the unit root tests at level suggest the variables contain unit roots and require differencing, as they fail to reject the null hypothesis of unit root. However, the series are found to be stationary after first differencing. Overall, confirming variables to be integrated of order (1) allows for proceeding with the co-integration testing.

For the co-integration analysis, the Kao and Fisher panel co-integration tests show evidence of long run relationships between real exchange rate series and the tested series, while a few of the Pedroni test results clearly identify such a relationship. The Maddala and Wu Fisher test suggests presence of three co-integrating vectors, which as identified by the VECM, are for the exchange rates, current account balance and FDI inflows. A co-integration equation is extracted from the exchange rate co-integration vector where it's revealed that oil prices have a long run equilibrium relationship with the GDP per capita and exchange rates. The most important finding in this equation is that oil prices are positively related to exchange rates, meaning that the increase in oil prices will lead to the real appreciation of the GCC currencies, which is in line with the paper's priori hypothesis.

The estimated co-integration model shows that only GDP per capita and oil prices have long run relationships with the real exchange rate and negates such a relationship with the current account balance and FDI inflows.

With respect to the GDP per capita, the result contradicts with the findings of Korhonen and Juurikkala (2009) who suggest that GDPPC does not have a long run co-integration relationship with exchange rates in oil dependent economies. In addition, while the long-term relationship with the real exchange rates was forecasted, the negative sign, which suggests that increasing GDP per capita leads to the currency deprecation, was not expected and is not justified. However, this result is in line with the findings of Al-Mulali and Che (2011) who find evidence of the long-term link and claim that higher government spending, resulting from increasing GDP levels, would lead to higher inflation and thus a depreciation of the real exchange rate of the dirham.

Nevertheless, Al-mulali and Che Sab find a long run relationship between the oil prices and FDI inflows, which could not be proved in this study.

As for the oil prices, the results are in line with the findings of Korhonen and Juurikkala (2009); Englama *et al.* (2010); Lizardo and Mollick (2010); Mohammadi and Jahan-Parvar (2010); Nikbakht (2010) and Al-Mulali and Che (2011) confirming the long run relationship between exchange rate and oil prices for oil exporting countries.

The positive sign of the oil price coefficient in the long run co-integration equation was expected and confirms the positive relationship between the real exchange rates of the GCC currencies and the real oil prices; a US$1.00 increase in the prices of oil leads to a US$2.78 equivalent appreciation in the value of the currency or 2.78 USDs more required in exchange for the GCC currency. These results confirm the findings of McGuirk (1983); Alotaibi (2006); Razzak (2007); Coudert *et al.* (2008); Kumar Narayan *et al.* (2008); Korhonen and Juurikkala (2009); Korhonen and Mehrotra (2009); Hasanov (2010); Lizardo and Mollick (2010) and Adeniyi *et al.* (2012) but contradict with those obtained by Al-Mulali and Che (2011) who find that a positive oil price shock depreciates the currency (UAE dirham in his case), rather than appreciate it.

The zero coefficients of the current account balance and FDI inflows in the co-integration equation were not in line with the expected hypothesis and contradict with the priori hypothesis and several researches on the real exchange rate determination. They indicate that none of these variables has a long run equilibrium relationship with the real exchange rates and that they tend to deviate arbitrarily from them. Hence, they can be omitted from the model.

VECM estimation has confirmed significance of the long run co-integration of exchange rates with oil prices and GDP per capita at the 1% significance level. It has also revealed a short run causality running from oil prices to exchange rates at the 5% significance level, while there's no short run causality with the current account balance, GDP per capita and FDI inflows. These results support the conclusions reached by Akram (2004); Trygubenko (2005); Englama *et al.* (2010); Lizardo and Mollick (2010) and Al-Mulali and Che (2011) stating that oil prices affect exchange rates in the short run.

The coefficient of the ECT suggests the model has dynamic stability and exchange rates adjust for short run disequilibria at the rate of 4% per year. This means that it takes around 25 years for the exchange rates to return to their equilibrium values and eliminate all deviations, which is relatively slow.

A long run relationship between exchange rates and oil prices means GCC countries are prone to any shocks in these prices in the long run, which can both influence their oil revenues and their currencies' purchasing power. GCC countries must therefore start to seriously consider reviewing some of their exchange rate related policies to avoid the volatility associated with oil price variations. GCC governments need to maintain balance between domestic price stability and currency stability especially that imported inflation, which is a serious problem in these economies, is believed to have primarily resulted from the existing exchange rate regimes (Razzak, 2007). They need to adopt an exchange rate regime that allows for both exchange rate stability and minimal inflation. The lack of such long term relationship with the current account balance means that the large export revenues do not fully contribute to the increased liquidity in the country as large sums of them (particularly the export revenues that increase foreign exchange reserves) are transferred or invested abroad, mostly in the USA, in the form of securities and other investments (Momani, 2008). Similarly, the lack of long run relationships with the FDI inflows means that the impact of these inflows is not transferred directly into the economy in the form of increased liquidity and the foreign exchange reserves generated from these inflows are invested abroad.

The short run causality test results indicate that exchange rates respond only to the short-term shocks in the oil prices and do not respond to those from the current account balance, GDP per capita, and FDI inflows. This means that the policies, required to address the impact of oil prices on exchange rates, need to be both short and long-term policies that aid in reducing real exchange rate fluctuations and should not give much consideration to the short run shocks stemming from the current account balance, GDP per capita and FDI inflows.

6. CONCLUSION AND POLICY RECOMMENDATIONS

This paper examined the relationship between the real exchange rates of the oil rich GCC countries and the real oil prices, along with a number of other variables, the choice of which was dependent on the literature. Specifically, a long run model was estimated, which modeled exchange rates as a function of oil prices, current account balance, GDP per capita and FDI inflows. The model hypothesized positive long run relationships between the exchange rates and these variables. Unit root tests were applied to the time series to avoid the problem of non-stationarity after which the (widely popular) panel co-integration and Vector Error Correction techniques were applied. Causality relationships were also examined, through the VECM analysis.

Test results provide evidence of stationarity of the variables after first differencing. The results also provide evidence supporting co-integration between real exchange rates and both the GDP per capita and oil prices, suggesting that negative GDP shocks and positive shocks in the real prices of oil in the long run would lead to the real appreciation of GCC currencies. Both long and short run causalities run from oil prices to real exchange rates. The results are in line with most of the findings in literature on oil dependent economies, affirming the long run relationship between oil prices and exchange rates of the oil exporters' currencies and the currency appreciation effect of the positive oil price shocks. They partially support the literature in identifying a long-term link with the GDP per capita, albeit not the expected positive impact. However, they do not provide any evidence for the positive relationship predicted by the estimated model, between exchange rates and the current account balance and FDI inflows, as they show that these variables have zero impact on the exchange rates in the long run.

The analysis of the relationship between real exchange rates and oil prices in the oil-based GCC region needs to be further investigated, particularly from a policy setting perspective. Assuming any alternatives to pricing oil in US dollars are costly or not feasible for GCC countries, it is recommended that the monetary authorities and policy makers of these countries review their existing exchange rate regimes and develop alternative regimes that have a more favorable reaction to oil price fluctuations.

The long run association and the appreciating affect that oil prices have on the GCC exchange rates leads to the conclusion that the US-pegged exchange rate regimes adopted by these countries are detrimental to their economies and are perhaps not the ideal regimes for them. With tightly dollar-pegged exchange rates, not allowing nominal exchange rates to appreciate, the impact of higher oil prices would be transmitted to the local prices instead, causing these countries to suffer from rapidly growing inflation rates. This in turn raises the real value of these currencies causing them to appreciate, reducing their competitiveness and undermining the long-term growth of the GCC economies.

Furthermore, the GCC countries mainly receive their oil revenues in US dollars. The peg of their currencies to the US dollar means a depreciating dollar against the currencies of other major GCC trading partners would cause inflation to be imported from aboard. This is because with depreciating US dollars, they have to pay higher import bills as prices in the rest of the trade partners would be relatively higher, because their currencies appreciate against the falling US dollar. GCC citizens would therefore have to suffer from imported inflation, which according to Razzak (2007) forms 2/3 of the domestic CPI inflation in these countries. In fact, the IMF has warned against imported inflation in these countries and stated that if oil exporters do not review their existing dollar-dependent exchange rate regimes and replace them with ones that better vary with the price of oil, they will continue to be exposed to growing prices (Momani, 2008). GCC countries can avoid this kind of inflation through abandoning their hard peg to the US dollar and pegging to a basket of their major trading partners' currencies.

Since the primary incentive for pegging GCC currencies to the US dollar was to have stable currencies and moderate rates of inflation, which were hardly achieved since 2002, it is recommended that these countries collectively follow the path of the Kuwaiti monetary authorities[4] through loosening their peg to the US dollar and pegging their currencies to a basket of currencies, to avoid a tight monetary policy stance resulting from the peg to one currency.

GCC countries need to adopt inflation targeting regimes for their exchange rates. Adopting such a regime of pegging to more diversified exchange rate reserves' portfolio balances the impact of volatile oil prices on these currencies and at the same time minimizes exchange rate fluctuations. For example, if the dollar depreciates, the other currencies in the basket would appreciate against the dollar, mitigating the negative impact of its depreciation on the GCC currencies and economies. Contrary to the case of Kuwait however, the weights in this basket must be more balanced among all trading partners' currencies and not necessarily give the dominant weight to the US dollar, as is believed the case in Kuwait.

These countries need to start considering their future trading partners carefully when establishing this basket, as it should include the most important trade partners with the highest trade flow and stable currencies i.e. the currencies that can act like anchors for GCC currencies and provide stability to the local economies. With the European Union, Japan, India, China, South Korea and the United States being significant trade partners with the GCC (Qatar National Bank Group, 2012) it's recommended that the euro, yen, rupee, renminbi, won, and the US dollar all be incorporated in the weighted basket of currencies.

Now that the GCC monetary authorities consider forming a monetary union and hence strive to coordinate their monetary policies, it's recommended that their proposed unified currency, referred to as the Khaleeji dinar, also be pegged to the basket of currencies. While expectations point to the US dollar as the proposed currency of peg, it's strongly discouraged to adopt such a peg bearing in mind the opposite business cycles and economic growth trends of the US economy and GCC economies and hence the unfavorable influence that a depreciating dollar may have on these economies.

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[4] Kuwait enjoyed relatively moderate rates of inflation as the peg of the dinar to a basket of currencies succeeded to some extent in mitigating the level of domestic inflation compared to the period when it abandoned the peg Al-Mulali and Che, (2011).

In general, if the GCC countries prefer to enjoy the high oil revenues and maintain currency stability, then inflation is inevitable in these economies and the monetary officials must find ways to deal with it. If on the other hand, the priority is to stabilize inflation rates, which is a significant issue in these countries, then the current exchange rate regimes must be reviewed. Monetary authorities have the option of either allowing their currencies to float freely, revaluating them against the dollar, or pegging them to a basket of currencies belonging to relatively stable economies. The first option is not really achievable because GCC countries don't have the technical expertise yet to abandon the fixed exchange rate regime, handle independent policymaking, and encourage free capital mobility (Razzak, 2007). The second option can be implemented in a one-time swift manner, where the nominal exchange rate of the GCC currencies against the dollar is adjusted through appreciating it and then monitoring and revisiting the peg from time to time. This revaluation, however, will be harmful to many infant and growing industries in the region as it affects their international competitiveness, making domestically produced goods and services more expensive and foreign imports cheaper.

Thus, the third option is strongly recommended where these countries are advised to start considering the peg of their currencies to a basket of currencies that belong to their trading partners with fairly stable economies.

This study can be further improved through examining the influence of other variables that can factor into the fluctuations of GCC exchange rates such as the terms of trade, foreign exchange reserves and oil drilling and production activities. Subject on the availability of data, the sample size can also be expanded to include all of the major international oil price shocks in order to segregate the impact of different oil price scenarios and obtain a more accurate representation of the exchange rate-oil price link.

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REFERENCES

Adeniyi, O.A., O. Omisakin, J. Yaqub and A. Oyinlola, 2012. Oil price-exchange rate nexus in Nigeria: Further evidence from an oil exporting economy. International Journal of Humanities and Social Science, 2(8): 113-121.

Akram, Q.F., 2004. Oil prices and exchange rates: Norwegian evidence. Econometrics Journal, 7(2): 476-504.

Al-Mulali, U. and S.N. Che, 2011. The impact of oil prices on the real exchange rate of the dirham: A case study of the United Arab Emirates (UAE). OPEC Energy Review, 35(4): 384-399.

Alotaibi, B., 2006. Oil price fluctuations and the gulf cooperation council (GCC), 1960-2004. (Doctoral Dissertation). Department of Economics in the Graduate School, Southern Illinois University Carbondale. Retrieved from ProQuest Digital Dissertations Database.

Amano, R. and S. Norden, 1998. Oil prices and the rise and fall of the U.S. real exchange rate. Journal of International Money and Finance, 17(2): 299-316.

Bénassy-Quéré, A., V. Mignon and A. Penot, 2005. China and the relationship between the oil price and the Dollar. Working Paper, 2005-16, CEPII.

British Petroleum, 2011. Statistical review of world energy different issues. Available from http://www.bp.com/statisticalreview.

Chaudhuri, K. and B. Daniel, 1998. Long-run equilibrium real exchange rates and oil prices. Economic Letters, 58(2): 231-238.

Chen, S. and H. Chen, 2007. Oil prices and real exchange rates. Energy Economics, 29(3): 390-404.

Coleman, S., J. Cuestas and E. Mourelle, 2010. Exchange rates and oil prices in Africa: A nonlinear relationship? Working Paper, 2011015. The University of Sheffield, Department of Economics.

Coudert, V., C. Couharde and V. Mignon, 2008. Do terms of trade drive real exchange rates? Comparing oil and commodity currencies. Working Paper (2008- 32). CEPII.

Englama, A., D.O. Omotunde, T.S. Ogunleye and F.U. Isma'il, 2010. Oil prices and exchange rate volatility in Nigeria: An empirical investigation. Economic and Financial Review, 48(3): 31-48.

Hasanov, F., 2010. The impact of real oil price on real effective exchange rate: The case of Azerbaijan. Discussion Papers Series, 1041. German Institute for Economic Research.

IMF, 2014. World economic outlook database. Available from http://www.imf.org.

International Monetary Fund, 2014. International financial statistics database GCC economic indicators, 1970-2012. Available from http://elibrary-data.imf.org.

Kao, C.D., 1999. Spurious regression and residual-based tests for cointegration in panel data. Journal of Econometrics, 90(1): 1–44.

Korhonen, L. and T. Juurikkala, 2009. Equilibrium exchange rates in oil-exporting countries. Journal of Economics and Finance, 33(1): 71–79.

Korhonen, L. and A. Mehrotra, 2009. Real exchange rate, output and oil: Case of four large energy producers. Bank of Finland Discussion Papers 6/ 2009. Institute for Economies in Transition.

Krugman, P., 1983a. Oil and the dollar. In: Bhandari, J., Putnam, B. (Eds.). National bureau of economic research Working Paper, 0554. Economic interdependence under flexible exchange rates. Cambridge: Massachusetts Institute of Technology. pp: 179–190.

Krugman, P., 1983b. Oil shocks and exchange rate dynamics. In: Frankel, J.A. (Ed.), Exchange rates and international macroeconomics. Chicago: University of Chicago Press. pp: 259-284.

Kumar Narayan, P., S. Narayan and A. Prasad, 2008. Understanding the oil price-exchange rate nexus for the Fiji Island. Energy Economics, 30(5): 2686–2696.

Lizardo, R.A. and A.V. Mollick, 2010. Oil price fluctuations and U.S. Dollar exchange rates. Energy Economics, 32(2): 399-408.

Maddala, G.S. and S. Wu, 1999. A comparative study of unit root tests with panel data and a new simple test. Oxford Bulletin of Economics and Statistics, 61(S1): 631-652.

McGuirk, A., 1983. Oil price changes and real exchange rate movements among industrial countries. International Monetary Fund Staff Papers, 30(4): 843-884.

Mohammadi, H. and M. Jahan-Parvar, 2010. Oil prices and exchange rates in oil-exporting countries: Evidence from TAR and M-TAR models. Journal of Economics and Finance, 22: 1-14.

Momani, B., 2008. Gulf cooperation council oil exporters and the future of the Dollar. New Political Economy, 13(3): 293-314.

Nikbakht, L., 2010. Oil prices and exchange rates: The case of OPEC. Business Intelligence Journal, 3(1): 83-92.

Pedroni, P., 1999. Critical values for cointegration tests in heterogeneous panels with multiple regressors. Oxford Bulletin of Economics and Statistics, 61(Special Issue): 653–670.

Qatar National Bank Group, 2012. GCC trade hits new records as Asia rises in prominence. Available from http://www.qnb.com.qa.

Razzak, W., 2007. In the middle of the heat: The GCC countries between rising oil prices and the sliding greenback. MPRA Paper, 6591. Germany: University Library of Munich.

Trygubenko, V.O., 2005. The effect of oil prices and other determinants on the United States Dollar effective exchange rate. Southern Methodist University. Thesis Paper Retrieved from ProQuest Digital Dissertations Database.

Turhan, I., E. Hacihasanoglua and U. Soytasb, 2012. Oil prices and emerging market exchange rates. Working Paper, 1201. Research and Monetary Policy Department. Central Bank of the Republic of Turkey.

World Bank, 2012. Data bank. Available from http://data.worldbank.org/.