The Effect of Oil Price Innovations on the Dynamic Relationship between Current Account and Exchange rate: Evidence from D-8 Countries

By
Saira Tufail* and Syeda Qurat-ul-Ain†

Abstract

The research aims to assess the dynamic relationship between current account and exchange rate and to analyze the effect of oil price innovations on their relationship for D-8 countries. The research is the time series analysis and covers the time span from 1981-2010. For achieving the objective of the study, recursive Vector Autoregression technique is used. Impulse response function and variance decomposition analysis is also conducted to forecast the results for next ten years. The results revealed that J-curve phenomenon exists in all oil importing countries of the group. Among oil exporting countries, J curve phenomenon exists for Egypt and Nigeria while for Iran, Marshal Lerner condition holds both in short and long run. The case of Malaysia is opposite to that of Iran where depreciation could not stimulate current account improvement even in long run. After including oil prices in the model, J-curve phenomenon continue to exist in Bangladesh and Turkey, though, it dampens the long run favorable effect of depreciation for current account for both of the countries. For Pakistan, in presence of oil prices exchange rate depreciation not only deteriorates current account in short run, this deterioration exacerbates in long run. Current account balance of Indonesia happens to improve with depreciation of exchange rate after inclusion of oil prices both in short and long run. For all oil exporting countries the role of exchange rate for improving current account balance strengthens in long run after the inclusion of oil prices. As far as the effect of oil prices on exchange rate and current account balance is concerned, increase in oil price improves current account balance for all oil importing countries in short run and deteriorates it in long run except Bangladesh. It causes depreciation of exchange rate for Indonesia, Pakistan and Turkey but appreciates the exchange rate for Bangladesh in short run and other way round in long run. On the other hand, all oil exporting countries experience deterioration of current account in response to oil price shock both in short and long run except Malaysia whose current account improves in long run. Moreover, appreciation of exchange rate due to long run increase in oil price is providing strong evidence of Dutch disease phenomenon among oil exporting countries. Given the results it is recommended that oil exporting countries should diversify their exports to overcome the recourse curse problem and oil importing countries should consider Bangladesh as role model to reduce the vulnerability of current account in face of oil price shocks.

Key Words: J-Curve Phenomenon, Oil Price shock, D-8, Vector Auto regression,
***JEL* Codes**: Q43, Q48, F31

* Lecturer Department of Economics, Fatima Jinnah Women University, Rawalpindi. Email:beatingmind@gmail.com
† Graduating student, Department of Economics, Fatima Jinnah Women University

Introduction

The effect of oil price shocks on global economy has been a great concern since 1970s and has instigated a great deal of research investigating macroeconomic consequences of oil price fluctuations. Later on, the instability in the Middle East and recent oil price hike confirmed the enduring significance of the issue. Though a voluminous body of literature has evolved examining the bearings of oil prices for internal sector of economies (to name a few, e.g., Barsky and Kilian 2004; Kilian 2008a; Hamilton 2008), the studies analyzing the external sector response to oil price shocks are very few (see, e.g. Kilian *et al.* 2007)

The determination of current account and exchange rate - the two major indicators of external sector - has been studied widely in theoretical and empirical literature but mostly the discussion of the two variables largely remained separate (Lee and Chinn, 1998). Similarly, investigation of simultaneous response of these two variables to an oil price shock remained relatively less ventured avenue of research. Initial work done on the relationship between current account and oil price couldn't ascertain conclusive link between these two variables.[‡] Recent work on the issue revealed the diversity of responses of current account of different countries to an oil price shock. For instance, oil price increase deteriorates current account balance of developing countries (OECD, 2004; Rebucci and Spatafora, 2006; Killian *et al*, 2007) but may improve it if the country happens to be a net oil-exporter. This implies that the relationship depends on the number of factors among which oil dependency of country, oil-intensity of production process[§]

[‡] See, for instance, Agmon and laffer (1978) Marion (1984), Marion and Svensson (1984).
[§] See, IMF, 2000

and responses of non-oil trade balance[**] and sources of oil price fluctuations[††]are of particular significance.

In this context exchange rate entails pivotal importance due to its role for adjusting current account imbalances as advocated by both traditional (Mundell, 1962; Flemming, 1962) and advance open economy macroeconomic approaches (obstfeld and Rogoff, 2000) to current account determination. However, the potency of exchange rate for smoothing current account imbalances may be considerably affected in circumstances where oil prices are volatile in nature. There exists a strand of literature ascertaining the relationship between oil prices and exchange rate for both oil importing and exporting countries. However, research examining the effect of oil price innovations on the effectiveness of exchange rate to lessen current account imbalances is in fact scant.

The paper bridges this gap by utilizing the data for D-8 countries. As a first step the existence of Marshal-Lerner condition and J-Curve phenomenon is explored for each country. Following Lee and Chinn (2006) a bivariate vector autoregressive model is employed as it minimizes the arbitrariness and helps to get several presumptions of open economy macroeconomics validated with least possible restrictions. However, unlike Lee and Chinn (2006) who employed reduced form model, our study assumes identification by Cholesky factorization considering exchange rate unaffected by contemporaneous innovations in current account. This is justifiable enough as former is conducted for G-7 countries where the exchange rate and current account are determined jointly, while later is conducted for D-8 countries where assuming exchange rate relatively exogenous seems more plausible. Given the information from the first exercise, model is extended to allow

---

[**] See, Gruber and Kamin, 2007
[††] Buetzer et al. (2012)

the inclusion of oil prices to achieve two objectives; a) to examine the effect of oil prices on the effectiveness of exchange rate to improve current account balance and; b) to examine the simultaneous response of both current account and exchange rate to changes in oil prices. For both of these objectives lower triangular identification scheme is followed ordering oil prices ahead of exchange rate and current account.

The choice of countries is very critical to our objectives due to a number of reasons. The countries not only differ as far as their trade in oil is concerned, but also with respect to oil intensity of production. Moreover, being the host of not only oil exporting (Iran, Nigeria and Egypt) and importing countries (Pakistan, Turkey, Bangladesh), but also that of countries transiting from being oil exporter to importer (Indonesia and Malaysia), the group is expected to provide very insightful and diverse outcomes for the targeted variables given the oil price shock of same magnitude and direction.[‡‡]

The rest of study is organized as follows. In section 2, a review of related literature is presented. In section 3, descriptive analysis of data is given. Section 4 reports the empirical results and section 5 concludes.

2. Related Literature

The relationship between current account balance and exchange rate is explicitly established in elasticity approach to balance of payment determination. Even the deviations from the basic model in the form of Marshal-Lerner condition and J-Curve phenomenon couldn't reprove the authenticity of approach. Empirical evidence on this issue is not only ample but also evolutionary. For instance, initial work on this issue including Cooper (1971), Laffer (1974) and Salant (1974) provided evidence in support of J-curve phenomenon using bivariate models of exchange rate and trade balance.

[‡‡] In the analysis part Indonesia is treated as oil importing country while Malaysia as oil exporting country.

However, according to Miles (1979) the inclusion of additional determinants of trade balance and balance of payment nullified the favorable contribution of exchange rate for trade balance while Bahmani-Oaskooee (1985) reinforced the existence of J-curve phenomenon even in a multivariate framework. Rose and Yellen (1989), Rose (1990) and Rose (1991) conducted studies for both developed and developing countries by using time series econometric techniques and couldn't found the evidence of cointegrating relationship between exchange rate and current account. Obstfeld and Rogoff (1995), on the other hand, assuming an infinite horizon monetary model of monopolistically competitive world economy showed that elasticity approach is valid if nominal prices in producer country are rigid and exchange rate pass-through is complete. Recently, by incorporating the standard assumptions of intertemporal macroeconomic models in vector autoregression framework, Lee and Chinn (2006) showed that the relationship between exchange rate and current account depends largely on the nature of shocks. For instance, temporary shocks depreciates the real exchange rate and improves current account balance while permanent shocks though appreciates the exchange rate but the effect on current account balance is not consistent.

Inclusion of oil prices in the modeling of exchange rate and current account is not only in concordance of elasticity approach but also consistent with both absorption and monetary approaches to balance of payment determination. This eminence arises from the fact that oil prices affect macroeconomy through a variety of channels most of which are either emanated from current account and exchange rate or have direct or indirect persuasion on these variables. For instance, Agmon and Laffer (1978) showed in context of monetary approach to balance of payment that oil price shocks deteriorate trade balance markedly.

This relationship is also reported in OECD (2004) Killian, Rebucci and Spataforta (2007). However, the size of the effect of oil price shock on trade balance is subject to the response of non-oil trade balance to oil price shocks (Agmon and Laffer, 1978; Gruber and Kamin 2007). Amano and Norden (1995), Backus and Crucini (2000) Chen and Rogoff (2003), Cashin *et al*. (2004) and Tokarick (2008) showed that effect of oil prices are transmitted to exchange rate through changes in terms of trade. According to Krugman (1983), Golub (1983) and Rasmussen and Roitman (2011) this effect occurs through the transfer of wealth from oil importing to exporting countries and is largely determined by the oil dependence of oil importing and import patterns of oil exporting countries. Recently, Bodenstein *et al*. (2007: 2011) showed that in order to stabilize the net foreign assets in face of positive oil price shock exchange rate depreciates (appreciates) for oil importing (exporting) countries. On the other hand, effect on current account depends on the rate of depreciation of non-oil terms of trade and adjustment of non-oil trade balance in face of oil price hike. The magnitude of effect of oil price increase vitally depends on the level of financial integration and efficiency of asset market.

The brief survey of literature strengthens the case for our research as none of the study reported above takes into account the relative effectiveness of exchange rate for adjusting current account imbalances with and without oil price innovations. Moreover, joint response of current account and exchange rate for both oil importing and exporting countries has not been assessed yet. The methodology to address these issues is discussed in forthcoming sections.

3. Descriptive Analysis

Graphical analysis of real exchange rate and current account balance of D-8 countries is presented in Figure 3.1.The data for this purpose has been accessed from international Financial Statistics from 1980 to 2012. Real exchange rate is taken in log form while current account balance is taken as percentage of GDP.

Oil Importing Countries

Since 1983 Bangladesh currency experienced 89 modifications of exchange rate among which 83 were depreciation with US dollar (Islam, 2003). Highest depreciation of exchange rate was recorded in 2006 when Taka reached its value to Tk. 70/USD in 2006 (Hossain and Ahmed, 2009). With the adoption of floating exchange rate regime in 2003, current account balance improved markedly. In 2009 highest current account surplus of 3.97 percent of GDP was recorded as in 2008 merchandise import decelerated to 4 percent from 26 percent of GDP. This, when coupled with better export performance caused improvement in current account balance.

Pakistan adopted floating exchange rate regime in 1982. In 2000, Pakistan switched from managed float to flexible exchange rate regime (Qayyum and Arshad, 2008). In the beginning of flexible regime, exchange rate depreciated by 1.5%. After 9/11 exchange rate appreciated against dollar but depreciated against other currencies (Kemal and Haider, 2005). The appreciation of exchange rate can be attributed to the massive inflow of foreign exchange (Siddiqui and Mahmood, 2005). This is also accompanied with the improvement in current account balance (5.3 percent of GDP). Apart from this improvement, Pakistan faced the persistent current account deficit in the period selected, that is, an average of 3.9 percent, 4.5 percent and 3.9 percent of GDP in 1980s, 90s and 2000s respectively.

Turkish exchange rate showed persistent increase till 2000 after which it became stable. In early 1980s implementation of export oriented growth policies was accompanied with devaluation of currency and resultantly high export growth was achieved. In 1989 with the implementation of 32 Decree, Turkey adopted flexible exchange rate regime and government lost its control over foreign exchange and interest rate. In 1994 Turkish economy experienced severe financial crisis and massive capital outflow due to which government decided to devalue its currency and switched from flexible to crawling peg exchange rate regime (Ertekin, 2003). Country reverted back to freely floating exchange rate regime in 2003 (Gormez and Yilmaz, 2007). However, country's continued to face an average deficit of 3 percent of GDP in 2000s which climbed up to 4 percent in 2011 (Rohn, 2012).

In 1980s managed floating exchange rate regime was followed in Indonesia. Due to Asian financial crises Indonesia switched from managed float to flexible exchange rate regime. The nominal exchange rate moved from rupiah 2400 per U.S dollar to almost rupiah 17000 in mid-1998 (Pratomo, 2005). In 1998 and 1999 currency depreciation was 70 percent. The post crisis drivers of exchange rate were oil prices, the term of trade, interest rate differential, risk premium and demand supply ratio of foreign exchange (Hausman et al., 2006). In 2011, one US dollar was equal to 9000 Rupiah and it is one of the low valued currencies of the world. From 1980 to 2012, Indonesia current account to GDP averaged -0.37 percent, highest was recorded in 2000 as 4.8 percent and lowest was recorded in 1983 as 7.8 percent of GDP.

Oil Exporting Countries

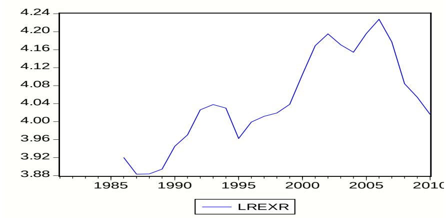
Until June 2000, Egypt followed fixed exchange rate regime and in 2001, government announced crawling peg system. On January 28, 2003, Egypt announced flexible exchange rate system. Till October the exchange rate had decline by 33 percent (Kamar and Bakardzhieva, 2003). After shifting to floating exchange rate system, Egyptian currency depreciated from 3.69 in 2000 to 6.13 in 2004. Egypt experienced average current account deficit of $1.3 billion from 1980 to 1989 and average surplus of $1.2 billion from 1990 to 1995. The reason of this surplus could be the adoption of trade liberalization policies and import bans and tariffs of range 5-10 percent protected 23 % of goods and services (Licari, 1997). From 1994 to 2001, country experienced current account deficit, till 2007 enjoyed surplus and then deficit.

Iranian currency experienced excessive devaluation in the last three decades. From 1979 to 2007 Iranian Rial depreciated from 165 Rials per dollar to 9357 Rial per dollar (Bahmani, 2008). From 1986-1988 Monetary Authority followed multiple exchange rate regimes because of Iran-Iraq war. After the war the economic adjustment policies began in 1993 including huge depreciation and Iran adopted a single exchange rate regime. The huge depreciation in 1993 may be due to the oil price shock of 1993. In 1995 government announced fixed exchange rate (300 Rials) due to the high inflation and foreign exchange fluctuations (Boroujerdi, 2004). In 2003 exchange rate then became stable till 2010. Although Iran is an oil exporting country and positive balance of trade in recent years (2003 onwards an average of 9 percent of GDP) is contributed to high oil prices, but

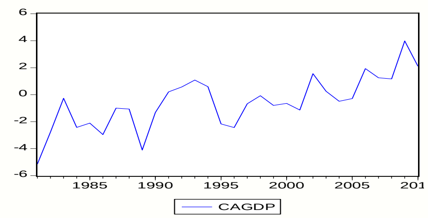
Figure 3.1: Graphical Analysis of Exchange Rate and Current Account in D-8 Countries

Bangladesh

Exchange Rate

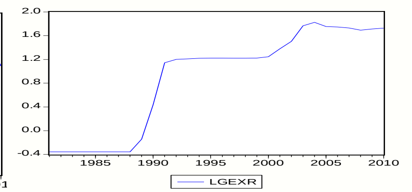


Current Account

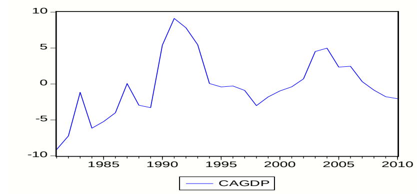


Egypt

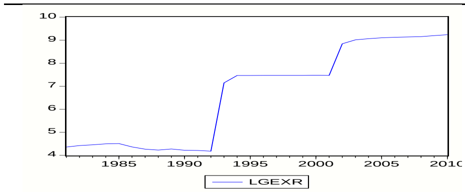
Exchange Rate

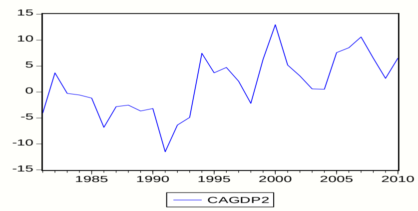


Current Account

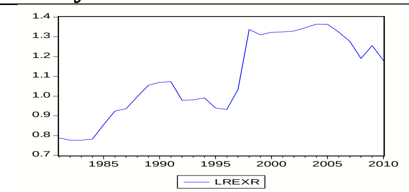


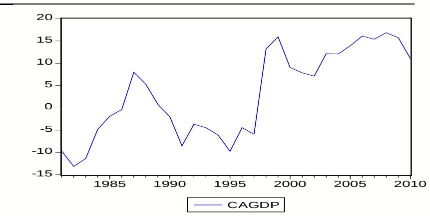
Iran



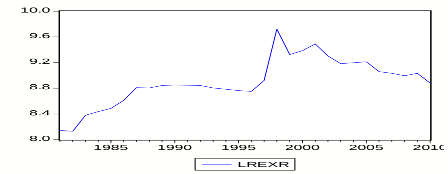


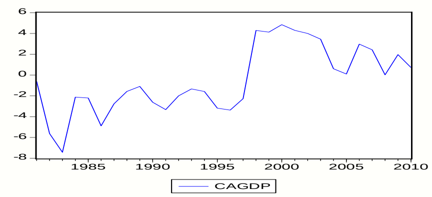
Malaysia



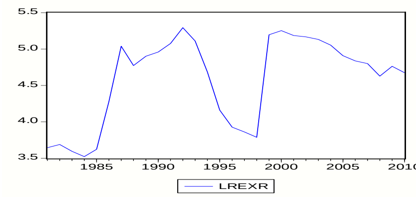


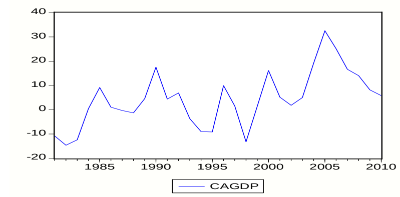
Indonesia



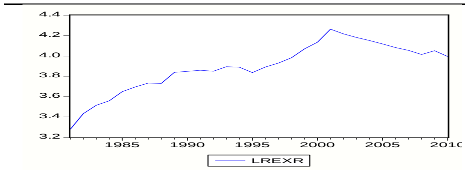


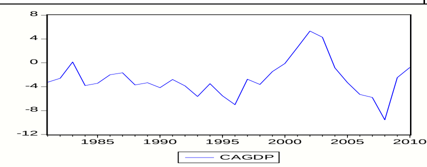
Nigeria



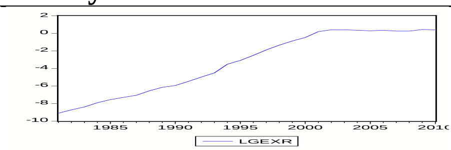


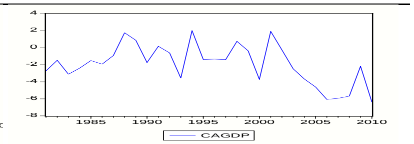
Pakistan





Turkey





Source: World Development Indicator(2013) current account of Iran in 80s and 90s faced deficit due to the eight year war with Iraq, inappropriate currency policies, high inflationary pressures and volatility in parallel exchange market (Heideri *et al*., 2012).

In Nigeria extensive exchange controls were applied in 1982. The period is also characterized with current account deficit of 15 percent of GDP. However, with the introduction of Structural Adjustment Program (SAP) in 1986, country followed floating exchange rate system and realized the improvement in current account balance. Massive depreciation in 1986 and 1994 occurred and led to the pegging of Naira (Omojimite and Akpokodje, 2010) and current account deficit of nine percent of GDP. With two years of surplus, 1996 and 1997 again in 1998 country faced the deficit of 13 percent of GDP. After 1998, economy enjoyed current account surplus.

Massive depreciation of 35 percent in Malaysian ringgit occurred in 1997. During the financial crisis, government pegged the ringgit against the US dollar. From 2005 to 2009, Malaysian economy followed floating exchange rate regime (Pourkalbass *et al*., 2011) and slight appreciation occurred in this time period. From 1980 until 2010, Malaysia recorded highest current account surplus in 2008 and deficit in 1982 of 13 percent of GDP. In 1980s managed floating exchange rate regime was followed in Indonesia. Due to Asian financial crises Indonesia switched from managed float to flexible exchange rate regime. The nominal exchange rate moved from rupiah 2400 per U.S dollar to almost rupiah 17000 in mid-1998 (Pratomo, 2005). In 1998 and 1999 currency depreciation was 70 percent. The post crisis drivers of exchange rate were oil prices, the term of trade, interest rate differential, risk premium and demand supply ratio of foreign exchange

(Hausman et al., 2006). In 2011, one US dollar was equal to 9000 Rupiah and it is one of the low valued currencies of the world. From 1980 to 2012, Indonesia current account to GDP averaged -0.37 percent, highest was recorded in 2000 as 4.8 percent and lowest was recorded in 1983 as 7.8 percent of GDP.

4. Model Specification

4.1. Model Construction

In present study two systems of equation are constructed to be estimated by VAR. Initially two variables system including current account (ca) and exchange rate (rexr) is constructed. Structural shock includes one standard deviation positive shock to exchange rate in order to observe the impact of current account. In the second step three-variable system of equations is developed and oil prices (oil) are included as third variable. The model is given as follows:

$$X_t = A(L)X_{t-1} + U_t \qquad (1)$$

Whereas for the first model X_t is the 2 × 1 vector of endogenous variables, i.e. $X_t' \equiv [rexr_t, ca_t]$. $A(L)$ is 2 × 2 matrix of lag polynomials and U_t is the 2 × 1 vector reduced form innovation , i.e., $U_t \equiv [u_t^{rexr}, u_t^{ca}]$. While for second model, X_t is the 3 ×1 vector of endogenous variables, i.e. $X_t' \equiv [oil, rexr_t, ca_t]$. $A(L)$ is 3 × 3 matrix of lag polynomials and U_t is the 3 × 1 vector reduced form innovation , i.e., $U_t \equiv [\mu_t^{oil}, u_t^{rexr}, u_t^{ca}]$. These innovations are independently and identically distributed with variance covariance matrix, where

$$E(U_t) = 0; E(U_t U_t') = \sum u_t$$

Amisano and Giannini (1997) suggested the following relationship between reduced form and structural shocks in the form of AB-model:

$$AU_t = BV_t \qquad (2)$$

V_t are the structural shocks, whereas, A and B are 2 × 2 and 3 × 3 matrices for two models respectively, which show the instantaneous relationship between variables and linear relationship between shocks and reduced form innovation respectively. The remaining steps involved in the construction of model are presented in Appendix A.

We employed recursive scheme of identification given the fact in our system variables can be arranged according to degree of endogeniety. In first system of equations including exchange rate and current account, exchange rate is considered relatively more exogenous than current account. This scheme of identification is considered more appropriate for developing country due to their limited ability to affect the value of dollar in international market. In the second system of equation oil prices are considered most exogenous variable for both oil-exporting and importing countries. Exchange rate is expected to be effected by oil price and its own innovations. While current account is considered to be affected by both exchange rate and oil prices and its own innovations.

These identification schemes are presented as follows:

$$\begin{bmatrix} 1 & 0 \\ -\alpha_{21} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_t^{trex} \\ \varepsilon_t^{ca} \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} u_t^{rexr} \\ u_t^{ca} \end{bmatrix}$$

For three variable VAR it is given as:

$$\begin{bmatrix} \alpha_{11} & 0 & 0 \\ \alpha_{21} & \alpha_{22} & 0 \\ \alpha_{31} & \alpha_{31} & \alpha_{33} \end{bmatrix} \begin{bmatrix} \varepsilon_t^{oil} \\ \varepsilon_t^{rexr} \\ \varepsilon_t^{ca} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} u_t^{oil} \\ u_t^{rexr} \\ u_t^{ca} \end{bmatrix}$$

Along with these short run restrictions, the same identification is used for the long run restrictions.

4.2. Data Description

The annual data for D-8 countries; Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Turkey from the year 1981 to 2010 is collected. The data set comprises of three main variables: current account, real exchange rate and oil price. All data has been retrieved from the World Development Indicators (2013) issued by World Bank, except of world oil price. The data for oil price was retrieved from International Financial Statistics issued by International Monetary Fund. Exchange rate and oil price are taken in log form and current account as percentage of GDP. The exchange rate is made real by multiplying it with consumer price index (2005=100) of USA and divided it with consumer price index of each country.

5. Estimation and Discussion of Results

5.1. Test of Stationarity

Due to the adoption of multiple exchange rate regimes and trade reforms, it was intuitive to assume the presence of structural instability in the exchange rate and current account balance for all D-8 countries. To affirm our assertion, the models for each country was checked for structural stability using chow break point test (results are reported in Appendix B). Given the presence of significant structural breaks for all countries, the power of conventional Augmented Dickey Fuller test becomes dubious. In order to overcome this problem Clemente, Montanes and Reyes (1998) test is applied that allows for two structural breaks. By applying both innovative outlier and additive outlier schemes, it was found that all series for each country are integrated of order one, i.e. *I(1)*. The results are reported in table 5.1.

Table 5.1: Clemente-Montanes-Reyes Unit Root Test (Double Mean Shift)

Country	Variables	Innovative Outlier				Additive Outlier			
		Level		Difference		Level		Difference	
		(rho)	*Break*	*(rho)*	*Break*	*(rho)*	*Break*	*(rho)*	*Break*
Bangladesh	*ca*	-0.83	1988, 2004	-1.79**	1988, 2004	-1.0	1987, 2003	-1.96**	1984, 1993
	lrexr	-0.49	1998,1995	-0.92**	1994, 2005	-0.43	1995, 2003	-0.83**	1995, 2004
Egypt	*ca*	-0.7	1988, 1993	-1.74**	1988, 1993	-0.6	1987, 1994	-1.43**	1992, 2001
	lrexr	-0.4	1984, 1988	-0.82**	1988, 1990	-0.5	1986, 1992	-0.82**	1988, 1990
Iran	*ca*	-0.90	1989, 1992	-8.01**	1993, 1999	-0.61	1989, 1995	-2.89**	1992, 1998
	lrexr	-0.37	1991, 2000	-0.89**	1992, 2000	-1.0	1994, 2003	-1.8**	1994, 2004
Indonesia	*ca*	-1.0	1996, 2002	-3.0**	1996, 1999	-0.91	1997, 2003	-1.87**	1996, 2000
	lrexr	-0.31	1997, 2000	-1.31**	1986, 1997	-0.42	1995, 2003	-1.60**	1988, 1996
Malaysia	*ca*	-0.62	1986, 1996	-1.30**	1986, 1997	-0.50	1995, 2000	-1.29**	1985, 2006
	lrexr	-1.0	1984, 1996	-1.54**	1991, 1997	-0.76	1987, 1999	-1.05**	1990, 1996
Nigeria	*ca*	-1.01	1982, 2002	-1.69**	1992, 2004	-1.0	1990, 2001	-1.70**	1991, 2007
	lrexr	-0.62	1984, 1997	-0.89**	1991, 1998	-0.22	1988, 1998	-0.66**	1992, 1997
Pakistan	*ca*	-1.0	1982, 2002	-1.69**	1992, 2004	-0.78	1990, 2001	-1.79	1991, 2007
	lrexr	-0.43	1997, 2002	-1.02**	1994, 2000	-0.60	1986, 1998	1.67**	1997, 1999
Turkey	*ca*	-1.18	1986, 2003	-2.7**	2003, 2007	-1.06	1986, 2003	-2.05**	2002, 2006
	lrexr	-0.67	1988, 2003	1.06**	1993, 2000	-0.79	1987, 2004	-1.2**	1992, 1999

** denotes rejection of null hypothesis at 5 percent level of significance

5.2. Lag Order Selection

Schwartz information criterion (SIC) is used to select appropriate lag length. The table 5.2 shows appropriate lag length selected for model with and without oil price for D8 countries.

Table 5.2: Lag Length Selection*

Countries	Without oil price	With oil price
	Lags	Lags
Bangladesh	1	1
Egypt	2	1
Iran	1	1
Indonesia	3	1
Malaysia	1	1
Nigeria	2	1
Pakistan	3	1
Turkey	2	1

*Selection is based on the minimum value of SIC

5.3. Marshal Lerner Condition and J-Curve in D-8 Countries

Table 5.3 shows that J-curve phenomenon exists in all oil importing countries of the group. Among oil exporting countries, J curve phenomenon exists for Egypt and Nigeria while for Iran Marshal Lerner condition holds both in short and long run. The case of Malaysia is opposite to that of Iran where depreciation could not stimulate current account improvement even in long run.

After including oil prices in the model, J-curve phenomenon continue to exist in Bangladesh and Turkey, though, it dampens the long run favorable effect of depreciation for current account for both of the countries. In case of Bangladesh the effectiveness of depreciation for improving current account reduces by 21.3 percent while for Turkey the magnitude of reduction is 81.4 percent in long run. The case of Pakistan presents the extreme example of oil price repercussions for the relationship between exchange rate

Table 5.3: Marshal Lerner Condition and J-Curve in D-8 Countries						
Bangladesh	***Without Oil Prices***		***With Oil Price***		***Percentage change***[8][9]	
	Short run	Long run	Short run	Long run	Short run	Long run
	ca	ca	ca	ca		
Rexr	-4.02*** (-19.17)	6.09*** (29.83)	-4.14*** (-20.27)	4.79*** (23.44)	-0.03	-0.21
Egypt						
	Short run	Long run	Short run	Long run		
	Ca	Ca	ca	ca		
Rexr	-10.76*** (56.94)	4.38*** (23.18)	-12.60*** (-67.86)	9.39*** (50.57)	-0.17	114.38
Iran						
	Short run	Long run	Short run	Long run		
	Ca	Ca	ca	ca		
Rexr	0.3* (1.69)	1.49*** (8.07)	-0.07 (-0.42)	2.54*** 13.4	-123.3	70.47
Indonesia						
	Short run	Long run	Short run	Long run		
	Ca	Ca	ca	ca		
Rexr	-4.88*** (-25.36)	3.63*** (18.86)	0.39** 2.11	2.54*** 13.4	107.99	-30.02
Malaysia						
	Short run	Long run	Short run	Long run		
	ca	Ca	ca	ca		
Rexr	-18.96*** (-102.08)	-14.5*** (-78.18)	-19.75** (-106.36)	5.59*** (30.11)	-4.17	138.55
Nigeria						
	Short run	Long run	Short run	Long run		
	Ca	Ca	ca	ca		
Rexr	-8.609*** (-45.55)	6.211*** (32.866)	-1.905** (-10.258)	7.932*** (42.715)	77.87	27.70
Pakistan						
	Short run	Long run	Short run	Long run		
	ca	Ca	ca	ca		
Rexr	-8.13*** (-42.29)	6.82*** (35.44)	-10.93** (-58.89)	-18.28*** (-98.48)	-34.4	-368.03
Turkey						
	Short run	Long run	Short run	Long run		
	ca	Ca	ca	ca		
Rexr	-14.69*** (-77.74)	9.47*** (50.126)	-7.88*** (-42.47)	1.759*** (9.47)	46.35	-81.42
***denote significance at 1 percent level, ** denotes significance at 5 percent level						

[8] It's calculated as difference in coefficient of exchange rate for current account for with and without oil prices model as percentage of coefficient of exchange rate for current account for model without oil price. The exercise is done for both short and long run.

[9] A negative value is showing decrease in the effectiveness of exchange rate for improving current account balance while a positive sign is showing the percentage increase.

and current account. In presence of oil prices exchange rate depreciation not only deteriorates current account in short run, this deterioration exacerbates in long run. Almost 34.4 and 368.0 percent reduction in effect of depreciation for current account is realized in short and long run respectively. In contrast, for Indonesia the inclusion of oil prices in the model makes the existence of Marshal Lerner condition possible in both short and long run. After the inclusion of oil prices short run improvement in current account due to exchange rate depreciation is more than 100 percent, however, for long run Indonesia does not remain different from the rest of oil importing countries revealing the reduction of 30 percent in the favorable effect of exchange rate depreciation.

Many interesting results stand out when oil prices are included in model for oil exporting countries. In short run, effectiveness of exchange rate depreciation for current account improvement deteriorates by 17, 123 and 5.5 percent for Egypt, Iran and Malaysia respectively and increase by 58 percent for Nigeria. However, for all exporting countries the role of exchange rate for improving current account balance strengthens in long run after the inclusion of oil prices. The improvement is magnificent for Malaysia, which is 139 percent. These interesting results are well consistent with the Malaysian policies of subsidizing oil prices (Arshad & Shamsuddin, 2005).[10]

[10] The cost of oil price subsidy in Malaysia increases with the increase in oil price which are not compensated by increased export revenues. Subsidized oil prices also encourage oil consumption leading to mounting oil bill and current account worsening. However, with a long run increase in oil prices oil export revenues increase to more than compensate initial mounted import bill leading to the existence of J-curve phenomenon

5.3.1. Impulse Response Functions and Variance Decomposition

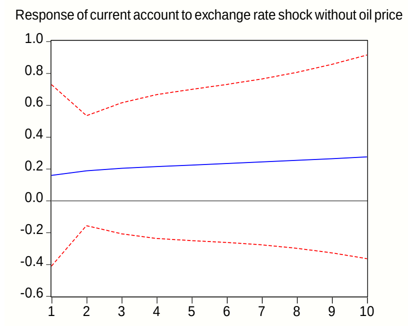
The relationship between exchange rate and current account for both models (with and without oil prices) is also forecasted with the help of impulse response functions. These impulses are derived on the basis of above specified identification scheme, in which Cholesky one-standard deviation shocks are given to exchange rate and response of current account balance is estimated over a period of ten years, 2011-2021, following the initial occurrence of the shocks. The impulses for all countries are plotted in figure 5.1.

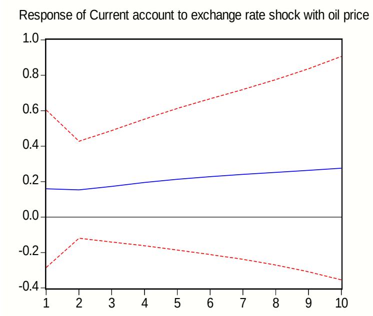
Among oil importing countries an obvious difference can be observed in response of current account to one standard deviation positive shock to exchange in rate in models with and without oil price for Pakistan and Turkey. This also holds for Egypt and Nigeria among oil exporting countries. These results are also consistent with the exercise done and results obtained in section 5.3.

Along with derivation of impulse response function, variance decomposition analysis is also conducted to analyze the contribution of each shock to the variance of n- period ahead forecast error of the variables. Table 5.4 presents the variance decomposition of current account balance with and without oil prices. For all oil importing countries, oil prices are contributing more than exchange rate in forecasted error of current account balance. For Indonesia, Turkey and Pakistan contribution of exchange rate reduces drastically after the inclusion of oil prices in model. However, for Bangladesh contribution of exchange rate after including oil prices remain almost same. For all oil importing countries, oil prices proved to be more important forecaster of current account balance as compared to exchange rate. This is also the case of Nigeria among oil exporting countries. However, for Egypt and Iran exchange rate is contributing more to

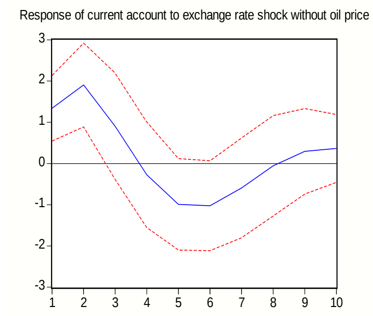
Figure 5.1: Impulse Response Function of Current Account Balance in Response to Exchange Rate Shock With and Without Oil Prices

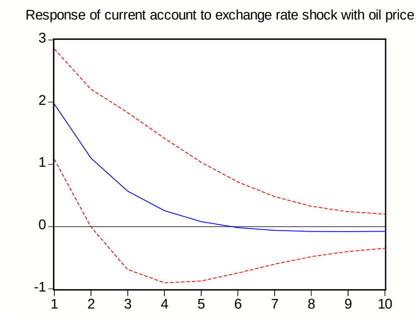
Bangladesh



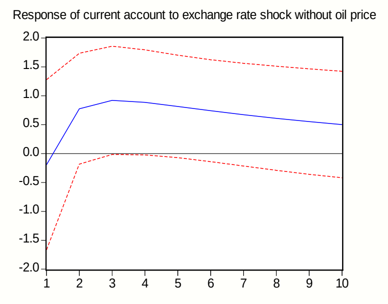


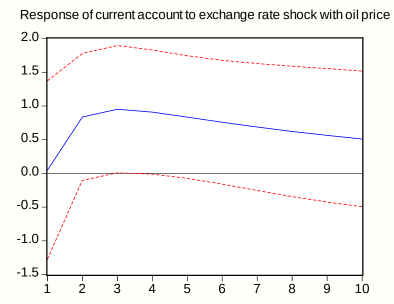
Egypt



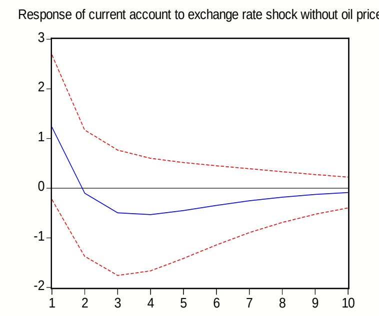


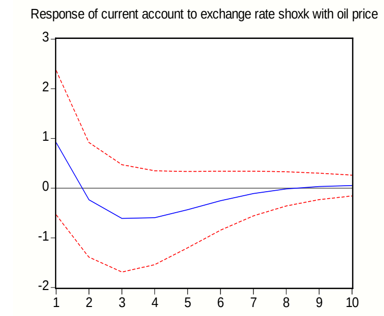
Iran





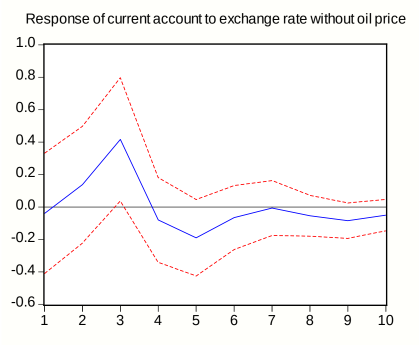
Malaysia

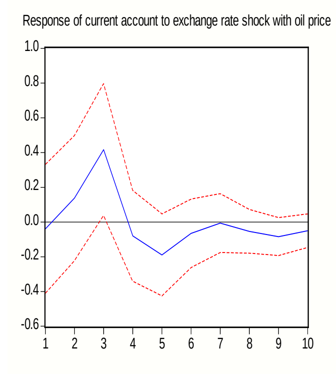


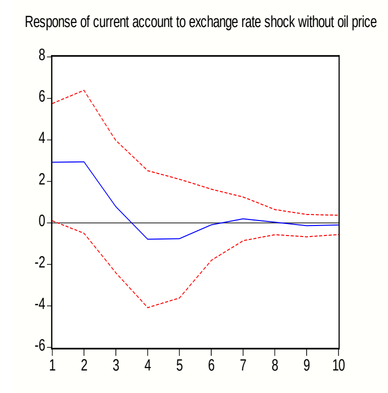


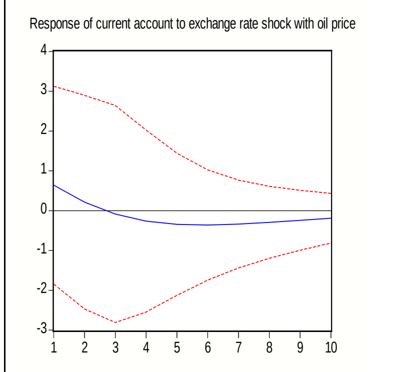
Indonesia

Nigeria

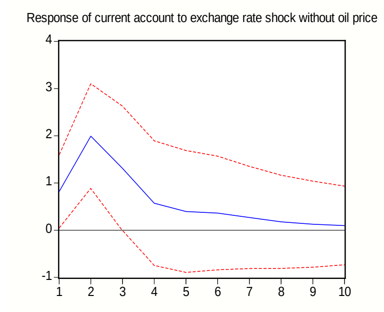


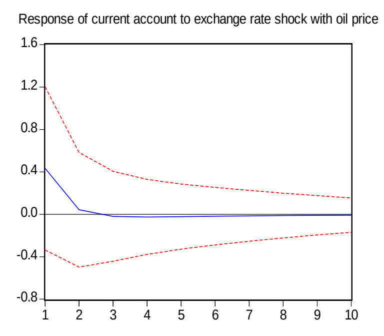


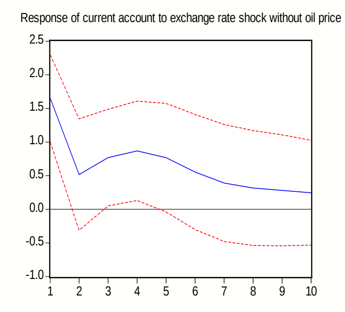


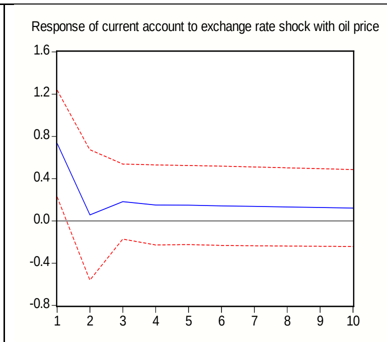


Pakistan **Turkey**









Source: Authors' own generated

Table 5.4: Percentage Contribution of Exchange Rate in Standard Error of Current Account Balance

Bangladesh

Percentage Contribution to Standard Error of Current Account Without Oil Price

Period	Forecasted Standard Error	Exchange Rate	Current Account
1	0.03	1.24	98.75
2	0.05	2.73	97.26
9	0.14	16.68	83.31
10	0.16	18.83	81.16

Percentage Contribution to Standard Error of Current Account With Oil Price

Period	Forecasted Standard Error	Oil Price	Exchange Rate	Current Account
1	0.21	9.24	1.93	88.82
2	0.25	21.97	3.02	75.00
9	0.27	29.88	16.71	53.40
10	0.27	28.96	19.164	51.86

Egypt

Percentage Contribution to Standard Error of Current Account Without Oil Price

Period	Forecasted Standard Error	Exchange Rate	Current Account
1	0.12	33.77	66.22
2	0.19	58.88	41.11
9	0.23	69.31	30.68
10	0.23	69.63	30.36

Percentage Contribution to Standard Error of Current Account With Oil Price

Period	Forecasted Standard Error	Oil Price	Exchange Rate	Current Account
1	0.26	5.23	48.28	46.48
2	0.35	4.44	46.12	49.42
9	0.56	5.59	42.25	52.15
10	0.57	5.86	42.15	51.98

Iran

Percentage Contribution to Standard Error of Current Account Without Oil Price

Period	Forecasted Standard Error	Exchange Rate	Current Account
1	0.61	0.23	99.76
2	0.85	3.76	96.23
9	1.40	21.96	78.03
10	1.43	22.87	77.12

Percentage Contribution to Standard Error of Current Account With Oil Price

Period	Forecasted Standard Error	Oil Price	Exchange Rate	Current Account
1	0.22	20.52	0.014	79.46
2	0.28	18.91	4.046	77.03
9	0.35	18.96	21.63	59.40
10	0.35	18.95	22.46	58.57

Indonesia

Percentage Contribution to Standard Error of Current Account Without Oil Price

Period	Forecasted Standard Error	Exchange Rate	Current Account
1	0.16	15.78	84.21
2	0.18	27.06	72.93
9	0.20	36.67	63.32
10	0.20	36.67	63.32

Percentage Contribution to Standard Error of Current Account With Oil Price

Period	Forecasted Standard Error	Oil Price	Exchange Rate	Current Account
1	0.25	15.03	0.13	84.82
2	0.29	18.35	1.68	80.00
9	0.41	31.44	11.20	57.35
10	0.41	31.84	11.22	56.925

Malaysia

Percentage Contribution to Standard Error of Current Account Without Oil Price

Period	Forecasted Standard Error	Exchange Rate	Current Account
1	0.06	9.37	90.62
2	0.07	7.56	92.43
9	0.08	10.90	89.09
10	0.08	10.92	89.07

Percentage Contribution to Standard Error of Current Account With Oil Price

Period	Forecasted Standard Error	Oil Price	Exchange Rate	Current Account
1	0.22	0.11	5.34	94.53
2	0.29	0.12	4.27	95.56
9	0.36	1.69	7.78	90.52
10	0.36	1.76	7.78	90.44

Nigeria

Percentage Contribution to Standard Error of Current Account Without Oil Price

Period	Forecasted Standard Error	Exchange Rate	Current Account
1	0.33	14.21	85.78
2	0.47	20.03	79.96
9	0.58	19.87	80.12
10	0.58	19.87	80.12

Percentage Contribution to Standard Error of Current Account With Oil Price

Period	Forecasted Standard Error	Oil Price	Exchange Rate	Current Account
1	0.23	39.06	0.55	60.37
2	0.28	34.96	0.51	64.51
9	0.33	34.06	1.05	64.87
10	0.33	34.08	1.09	64.81

Pakistan

Percentage Contribution to Standard Error of Current Account Without Oil Price

Period	Forecasted Standard Error	Exchange Rate	Current Account
1	0.04	14.80	85.19
2	0.07	50.45	49.54
9	0.12	60.33	39.60
10	0.12	60.41	39.58

Percentage Contribution to Standard Error of Current Account With Oil Price

Period	Forecasted Standard Error	Oil Price	Exchange Rate	Current Account
1	0.22	28.04	3.07	68.88
2	0.27	35.43	2.34	62.22
9	0.33	40.90	1.96	57.12
10	0.33	40.91	1.96	57.12

Turkey

Percentage Contribution to Standard Error of Current Account Without Oil Price

Period	Forecasted Standard Error	Exchange Rate	Current Account
1	0.11	63.56	36.43
2	0.15	65.29	34.70
9	0.24	76.14	23.85
10	0.24	76.33	23.66

Percentage Contribution to Standard Error of Current Accounts With Oil Price

Period	Forecasted Standard Error	Oil Price	Exchange Rate	Current Account
1	0.25	38.60	15.60	45.79
2	0.33	41.78	13.86	44.35
9	0.58	60.33	11.02	28.63
10	0.60	61.46	10.84	27.68

Source: Author's Calculations

the standard error of current account balance as compared to oil prices. The contribution of both oil prices and exchange rate in forecasted error of current account is negligible.

5.4. Impact of Oil Prices on Exchange rate and Current account

The above exercise calls for further investigation of the issue by analyzing the response of exchange rate and current account to oil price hike. Results are reported in table 5.5. Increase in oil prices improves current account balance for all oil importing countries in short run and deteriorates it in long run except Bangladesh. It causes depreciation of exchange rate for Indonesia, Pakistan and Turkey but appreciates the exchange rate for Bangladesh in short run and other way round in long run.

These results are supported by Wijnbergen (1984) who postulated that oil price hike may induce recessionary pressures in oil importing countries leading to investment cuts. This will lead to decreases in demand of imported goods - mostly of which are energy and capital - leading to temporary improvement in current account. These improvements may take a permanent path depending on the availability of alternative use of energy as in case of Bangladesh. The permanence of improvement in current account also depends on the elasticity of substitution between oil and other energy sources. This is also true for Bangladesh where oil can be easily substituted with natural gas and other non commercial sources of energy consumption.11 Moreover, Razzaqi and Sherbaz (2011) stated that growth of energy use is less than growth of GDP for Bangladesh showing the less reliance of production structure on oil and other sources of energy. This fact is further supported by their findings that Bangladesh has also experienced negative growth in the use of energy delineating the high elastic demand of energy with respect to energy

[11] about 66 percent of commercial energy demand is met by natural gas and more than 50 percent of household energy demand is met by non commercial resources

Table 5.5: Impact of Oil Prices on Current Account Balance and Exchange Rate

Bangladesh

	Short run		Long run	
	ca	rexr	ca	rexr
Oil	1.684*** (8.25)	-0.01 (-0.04)	6.48*** (6.49)	0.97*** (4.76)

Egypt

	Short run		Long run	
	Ca	rexr	Ca	Rexr
Oil	-1.67*** (-9.01)	-0.06 (-0.33)	-0.81 (-0.46)	-0.02 (-0.12)

Iran

	Short run		Long run	
	Ca	rexr	ca	Rexr
Oil	-8.07*** (-39.84)	0.44*** (2.34)	-0.69** (-1.96)	-0.12 (-0.64)

Indonesia

	Short run		Long run	
	Ca	rexr	ca	rexr
Oil	1.75*** 8.91	0.27 1.44	-2.32*** -4.5	-0.39 -2.09

Malaysia

	Short run		Long run	
	ca	rexr	ca	Rexr
Oil	-2.12*** (-11.31)	0.14 (0.46)	3.84*** (3.64)	-0.16 (-0.84)

Nigeria

	Short run		Long run	
	Ca	rexr	Ca	Rexr
Oil	-22.87*** (-121.00)	-0.153 (-0.824)	-1.293*** (-0.871)	-0.79 -4.256

Pakistan

	Short run		Long run	
	ca	rexr	ca	Rexr
Oil	4.96*** (26.66)	0.07 (0.38)	-5.30 (-1.56)	-0.28 (-1.50)

Turkey

	Short run		Long run	
	ca	rexr	ca	Rexr
Oil	2.98*** (15.79)	0.197 (1.06)	-3.267*** (-8.69)	-0.36*** (-1.977)

***denote significance at 1 percent level prices. The same argument can be put forward for exchange rate appreciation which is occurring due to increase in oil price in Bangladesh. Unlike Bangladesh current account position worsens after long run increase in oil price in other oil importing countries. However, this worsening is insignificant for Pakistan. This insignificance of oil price for current account balance of Pakistan cannot be justified by the arguments posited for Bangladesh. Contrary to Bangladesh, Pakistan has not specialized in production of other sources of energy rather the results are pointing toward the alarming situation in Pakistan. It is evident from results that efforts to increase the investment or overcome the recessionary shock of oil price hike are not enough in Pakistan leading to vicious circle of poor investment declining demand for goods needed to encourage investment leaving insignificant effect of oil price on current account.

On the other hand, all oil exporting countries experience deterioration of current account in response to oil price shock both in short and long run except Malaysia whose current account improves in long run. For Egypt, with one percent increase in oil price current account deteriorates by 1.67 percent and exchange rate appreciates by 0.06 percent. However, the effect of oil price on exchange rate merits less consideration due to its insignificance. Even in long run though insignificant yet negative effect of high oil prevails for both current account and exchange rate. This means that country's oil exports to world has not raised much to compensate fully for rising import bill leading to worsening of current account and appreciation of exchange rate. However long run adverse effect of oil price is less severe than its short run counterpart. The results are consistent with the actual situation prevailing in the county as growth rate of oil consumption has been more than that of production in the many years of sample selected.

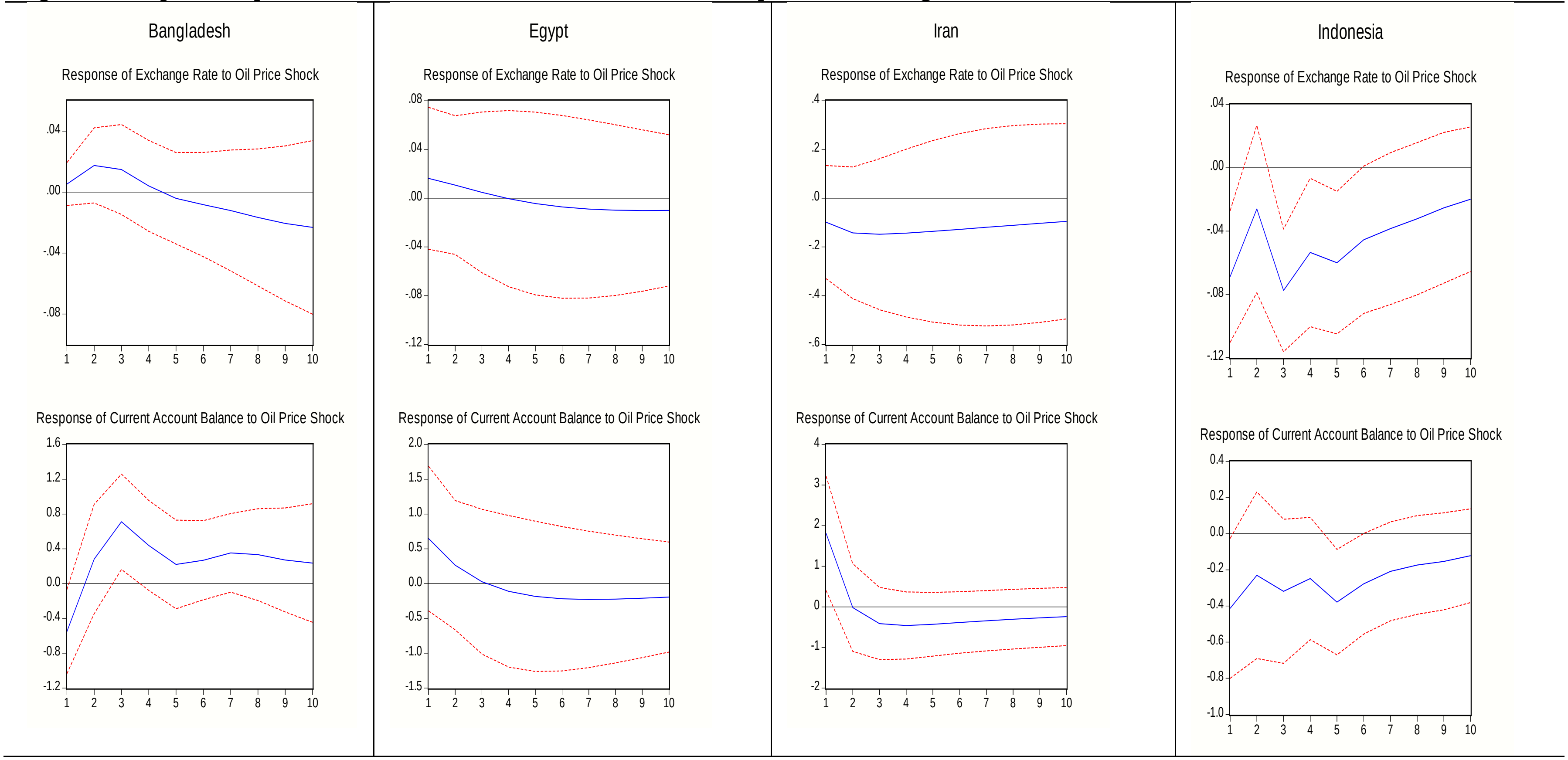
The effect of oil prices on current account in case of Iran is similar to that of Egypt, however, for Iran growth rate of oil production still exceeds than that of consumption. Farzanegan and Markwardt (2009) provided more plausible reason for these results for Iran. They showed that it's not the mounting import bill of oil as compared to oil-export receipts which leads to current account worsening rather these are the supply side wealth effects of increase in oil price that stimulates real imports of variety of other goods leading to the worsening of current account position in Iran. Morsy (2009) showed that with the increase in oil price major oil exporting countries experience surpluses that constitute of an average of 23 percent of GDP. However, given the increased wealth these countries spend significantly more on imports of goods and services, amounting to an average of 37 percent of GDP leading to the worsening of current account balance. Moreover, appreciation of exchange rate due to long run increase in oil price is providing strong evidence of Dutch disease phenomenon among oil exporting countries.

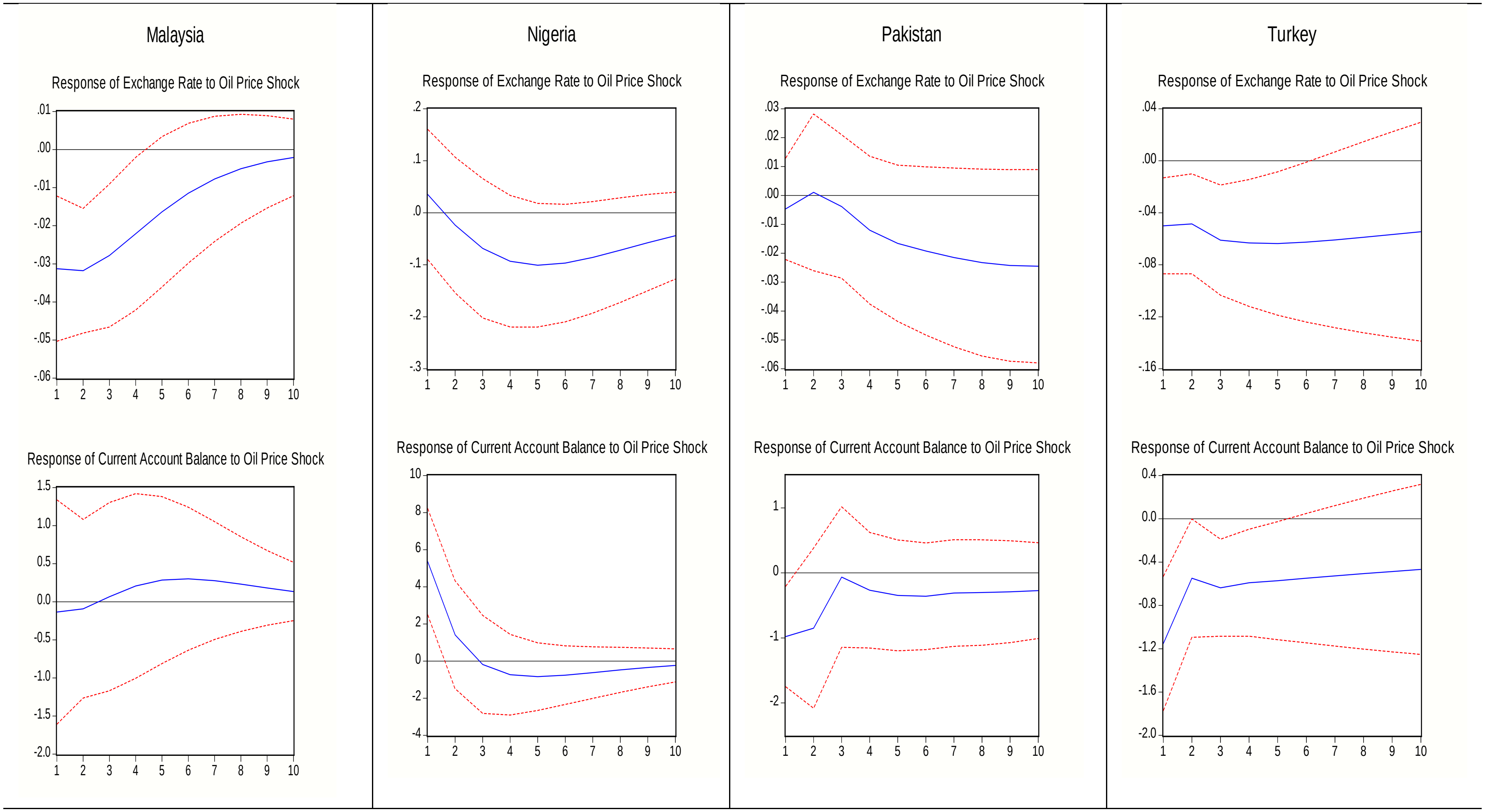
5.4.1. Impulse Response

Exchange rate of all oil importing countries is depreciating significantly in response to oil price shock except of Bangladesh whose currency is appreciating insignificantly. As far as current account balance is concerned, all oil importing countries are expected to experience significant improvement in their current account balance with one standard deviation shock to oil prices. Among oil exporting countries, Malaysia's exchange rate is depreciating significantly, however improvement in current account happens to be insignificant. For all other oil exporting countries the effect of one time positive oil price shock is appreciation of currency but insignificantly. However, current account balance is deteriorating significantly in Iran and Nigeria, insignificantly in Egypt. In

Malaysia current account balance is improving insignificantly in response to one standard deviation positive shock to oil prices.

Figure 5.2: Impulse Response Function of Current Account Balance in Response to Exchange Rate Shock With and Without Oil Prices





Source: Authors' own generated

Conclusion and Recommendations

The objective of this study is to explore the dynamic relationship between current account and exchange rate and to analyze the effect of oil price innovation on their relationship for D-8 countries. For achieving this objective Vector Autoregression (VAR) approach is employed. For achieving the objective, VAR is run four times for each country with short run and long run restrictions and with and without oil price innovation. Impulse responses are also used to analyze the response of current account to exchange rate shocks with and without oil price innovations. A variance decomposition analyses is then conducted to determine the contribution of exchange rate and oil price in the forecasted errors of current account. The annual data for each country is collected from 1981 to 2010 for current account, exchange rate and oil price.

The results revealed that J-curve phenomenon exists in all oil importing countries of the group. Among oil exporting countries, J curve phenomenon exists for Egypt and Nigeria while for Iran Marshal Lerner condition holds both in short and long run. The case of Malaysia is opposite to that of Iran where depreciation could not stimulate current account improvement even in long run. After including oil prices in the model, J-curve phenomenon continue to exist in Bangladesh and Turkey, though, it dampens the long run favorable effect of depreciation for current account for both of the countries. For Pakistan, in presence of oil prices exchange rate depreciation not only deteriorates current account in short run, this deterioration exacerbates in long run. Current account balance of Indonesia happens to improve with depreciation of exchange rate after inclusion of oil prices both in short and long run. For all oil exporting countries the role of exchange rate for improving current account balance strengthens in long run after the inclusion of oil prices.

As far as the effect of oil prices on exchange rate and current account balance is concerned, increase in oil price improves current account balance for all oil importing countries in short run and deteriorates it in long run except Bangladesh. It causes depreciation of exchange rate for Indonesia, Pakistan and Turkey but appreciates the exchange rate for Bangladesh in short run and other way round in long run. On the other hand, all oil exporting countries experience deterioration of current account in response to oil price shock both in short and long run except Malaysia whose current account improves in long run. Moreover, appreciation of exchange rate due to long run increase in oil price is providing strong evidence of Dutch disease phenomenon among oil exporting countries.

The recommendations drawn from present study are that for the oil exporting countries' exchange rate appreciates in face of oil price hike which results in Dutch Disease phenomena. As current account balance declines with exchange rate appreciations so these countries should maintain stability in their exchange rates and they should diversify their export base from oil to non oil export as well. Nigeria, Iran and Egypt should reduce their dependence on oil and natural resources and they should move towards industrial development as well.

Bangladesh emerged as a role model for other oil importing and developing countries through its results. Current account of Bangladesh shows improving trend both in face of high oil price hike and with exchange rate appreciation. It means Bangladesh has adopted alternative resources and lowered its reliance on oil resources.

Pakistan and turkey are oil importing countries; excessive increase in oil demand is causing reserve depletion in these countries which in turn causes imbalance in their current account. In order to improve current account balance, these countries should lower their demand of crude oil by discovering its alternatives like coal and gas reservoirs. These countries are also in dire need of widening their export base through proper planning and through building new infrastructure that can attract foreign investment in these countries.

References

Amano, R, A. and Norden, S. W. (1998), “Exchange Rates and Oil Prices.” Review of International Economics, Vol (6)

Amisano, G. and Giannini, C. (1997), “*Topics in Structural VAR Econometrics,* Springer, Edition.2.

Arshad, F. M., Shamsudin, M. N. (2005), “Food Security in Malaysia, http:// www.econ.upm.edu.my/~fatimah/foodsec.htm.

Bahamani, S.(2008), “Exchange Rate Volatility and Demand for Money in Iran”, School of Economic Development, College of Business Administration, Georgia Southern University.

Bahmani-Oskooee, M. (1985), “Devaluation and the J-Curve: Some Evidence from LDCs”, The Review of Economics and Statistics, Vol. 67 (3)

Barsky, R, B. and Kilian, L. (2004) "Oil and The Macroeconomy Since The 1970s," *Journal of Economic Perspectives,* Vol.18(4)

Boroujerdi, A.R. (2004), “A Study of the Real Exchange Rate Behavior and its Effects on Macroeconomic Variables”, *Iranian Economic Review,* Vol.9 (11).

Buetzer, S., Habib, M.M. and Stracca, L. (2012), “Global Exchange Rate Configurations: Do Oil Shocks Matter?” *Working Paper,* European Central Bank.

Cashin, P., Céspedes, L, F. and Sahay, R. (2004). “Commodity currencies and the real exchange rate”. *Journal of Development Economics*, Vol(75)

Clemente, J., Montañés, A., and Reyes, M. (1998), “Testing for a unit root in variables with a double change in the mean”, *Economics Letters*, Vol. 59

Cooper, R. N. (1971), "An Assessment of Currency Devaluation in Developing Countries," in G. Ranis (ed.), *Government and Economic Development*, New Haven: Yale University Press. Countries," *Economic Letters*, Vol (34)

Ertekin, M. (2003), "Exchange rate regimes and impact on foreign trade of Turkey" University of Illinois.

Farzanegan, M.R. and Markwardt, G (2009), "The Effect of Oil Price Shocks on the Iranian Economy, *Energy Economics,* Vol.31.

Fleming, J. M. (1962), "Domestic Financial Policies under Fixed and Floating Exchanges Rates", IMF Staff Papers, No. 9

Golub, S, S. (1983), "Oil Prices and Exchange Rates." *The Economic Journal*, Vol (93)

Gormez, Y. and Yilmaz, G (2007), "The Experience of Exchange Rate Regimes in Southeastern Europe".

Gruber, J. W. and Kamin, S.B. (2007), "Explaining the Global Pattern of Current Account Imbalances", *Journal of International Money and Finance*, Vol. 26(4)

Hamilton, J.D. (2008). "Oil and the macroeconomy". In: Durlauf, S., Blume, L. (Eds.), The New Palgrave Dictionary of Economics Online. Palgrave-Macmillan, London.December 31. http://www.dictionaryofeconomics.com.

Hausmann, R, Panizza, U and Rigobón, R. (2006), "The Long-Run Volatility Puzzle of the Real Exchange Rate." *Journal of International Money and Finance*, Vol.25 (1)

Heidari, H., Katircioglu, S.T. and Narmin, D. (2012), "Are current account deficits sustainable? New evidence from Iran using bounds test approach to level relationships" *Economics*, Vol. 6, No. 2012-46.

Hossain, M. and Ahmed, M. (2009), "Exchange Rate Policy Under Floating Regime in Bangladesh: An Assesment and Strategic Policy Options", BIDS-PRP Working Paper Series, Working Paper.2.

IMF, (2000), "Impact of Higher Oil Prices on Global Economy", Research Department, IMF

Kamar, B. and Bakardzhieva, D. (2003), "Economic Trilemma and Exchange Rate Management in Egypt", 10th annual Conference of the Economic Research, Forum from the Arab countries, Iran and Turkey.

Kemal, M. A. and Haider, R. M. (2005), "Exchange Rate Behaviour after Recent Float: The Experience of Pakistan", Paper presented at the 20th Annual General Meeting and Conference of Pakistan Society for Development Economists.

Kilian, L. (2008) "The Economic Effects of Energy Price Shocks." *Journal of Economic Literature*, Vol. 46(4)

Kilian, L. (2008). "Exogenous oil supply shocks: how big they are and how much do they matter for the U.S. economy?", Review of Economics and Statistics, Vol (90).

Kilian, L., Rebucci, A. and Spatafora, N. (2007), “Oil Shocks and External Balances,” *IMF Working Paper* No.110.

Krugman, P. (1983), “Oil and the Dollar”. NBER Working Papers 0554.

Lafer, A. B. and Agmon, T. (1978), “Trade, Payments and Adjustment: the Case of the Oil Price Rise”. Kyklos, Vol (31)

Laffer, A. B. (1974), "Exchange Rates, the Terms of Trade, and the Trade Balance," in *Effects of Exchange Rate Adjustments*, Washington, D.C.: Treasury Dept., OASIA.

Lee, J. and Chinn, M.D. (1998), “The Current Account and the Real Exchange Rate: A Structural VAR Analysis of Major Currencies”, NBER Working Paper No. 6495.

Lee, J. and Chinn, M.D. (2006) "Current Account and Real Exchange Rate Dynamics in the G7 countries", *Journal of International Money and Finance,* Vol.25

Licari, J. (1997), “Economic Reform in Egypt in a Changing Global Economy”, OECD Development Centre Working Paper No.129.

Marion, N.C. and Svensson, L. E.O**.** (1984), **“**Adjustment to Expected and Unexpected Oil Price Changes”, NBER Working Paper, wp. 0997

Miles, M. A (1979), "The Effects of Devaluation on the Trade Balance and the Balance of Payments: Some New Results," *Journal of Political Economy,* Vol (87)

Morsy, H. (2009), “Current Account Determinants for Oil-Exporting Countries”, IMF Working Paper

Mundell, R.A. (1962), "Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates", *Canadian Journal Economics,* Vol. 29

Obstfeld, M. and Rogoff, K. (1995), “Exchange Rate Dynamics Redux”, *Journal of Political Economy,*Vol.103, No 3.

OECD. (2004), “Oil price developments: Drivers, economic consequences and policy responses. In: OECD (Ed.), OECD Economic Outlook No. 76.

Omojimite, B. and Akpokodje, G. (2010), “The Impact of Exchange Rate Reforms on Trade Performance in Nigeria”, *Journal of Social Sciences,* Vol. 23 (1).

Pourkalbassi, F., Bahiraie, A., Hamzah, A. and Chinn, L (2011), “On the exchange rates behavior by PPP: A test on Malaysian ringgit and US dollar”, *African Journal of Business Management*, Vol. 5 (17)

Pratomo, W. A. (2005), “Exchange Rate of Indonesia: Does Rupiah Overshoot*”*, MPRA Working Paper No.7381.

Qayyum, A. and Arshad, M. (2008), “Long-run and short-run dynamics of the exchange rate in Pakistan: evidence from unrestricted purchasing power parity theory”, *The Lahore Journal of Economics*, Vol.13.

Rasmussen, T. and Roitman, A. (2011), "Oil Shocks in a Global Perspective: Are they Really that Bad?", *IMF Working Paper* WP/11/194.

Razzaqi, S. and Sherbaz, S. (2012), “Dynamic Relationship between Energy and Economic Growth: Evidence from D8 Countries”, *The Pakistan Development Review*, Vol.50 (4)

Röhn, O. (2012), “Current Account Benchmarks for Turkey”, OECD Economics Department Working Papers, No. 988.

Rose, A. K. (1990), “Exchange Rates and the Trade Balance: Some Evidence from Developing

Rose, A. K. (1991), “The Role of Exchange Rates in a Popular Model of International Trade: Does the ‘Marshall-Lerner’ Condition Hold?,” *Journal of International Economics*, Vol(30).

Rose, A. K. and Yellen, J. L. (1989), “Is There a J-curve?” *Journal of Monetary Economics*, Vol (24).

Salant, M. (1974), "Devaluations Improve the Balance of Payments Even if Not the Trade Balance," in *Effects of Exchange Rates Adjustments*. Washington, D.C.: Treasury Dept., OASIA.

Tokarick, S. (2008). "Commodity currencies and the real exchange rate", *Economic Letters* 101, pp. 60-62.

Wijnbergen, S. J.G. (1984), "The 'Dutch Disease': A Disease after All?”, Economic, Royal Economic Society, Vol. 94, No.373,, pp 41-55.

Appendix A

Recursive form of VAR can be obtained from reduced form by pre multiplying equation 1 with A as

$$AX_t = AA(L)X_{t-1} + AU_t \qquad (3)$$

Replacing AU_t by BV_t to get,

$$AX_t = AA(L)X_{t-1} + BV_t \qquad (4)$$

$$\begin{bmatrix} 1 & -\alpha_{12} \\ -\alpha_{21} & 1 \end{bmatrix} \begin{bmatrix} rexr_t \\ ca_t \end{bmatrix} = \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix} \begin{bmatrix} rexr_{t-1} \\ ca_{t-1} \end{bmatrix} + \begin{bmatrix} 1 & \gamma_{12} \\ \gamma_{21} & 1 \end{bmatrix} \begin{bmatrix} u_t^{rexr} \\ u_t^{ca} \end{bmatrix}$$

Solving the equation 4 for X_t we get

$$X_t = A^{-1}A(L)X_{t-1} + A^{-1}BV_t \qquad (5)$$

$$\begin{bmatrix} rexr_t \\ ca_t \end{bmatrix} = \begin{bmatrix} 1 & -\alpha_{12} \\ -\alpha_{21} & 1 \end{bmatrix} \begin{bmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{bmatrix} \begin{bmatrix} rexr_{t-1} \\ ca_{t-1} \end{bmatrix} + \begin{bmatrix} 1 & -\alpha_{12} \\ -\alpha_{21} & 1 \end{bmatrix} \begin{bmatrix} 1 & \gamma_{12} \\ \gamma_{21} & 1 \end{bmatrix} \begin{bmatrix} u_t^{rexr} \\ u_t^{ca} \end{bmatrix}$$

Summarized form of equation 5 can be written as:

$$X_t = A(L)X_{t-1} + \varepsilon_t \qquad (6)$$

Where as,

$$C(L) = A^{-1}A(L)$$

$$\varepsilon_t = A^{-1}BV_t$$

$$\begin{bmatrix} \varepsilon_t^{trex} \\ \varepsilon_t^{ca} \end{bmatrix} = \begin{bmatrix} 1 & -\alpha_{12} \\ -\alpha_{21} & 1 \end{bmatrix} \begin{bmatrix} 1 & \gamma_{12} \\ \gamma_{21} & 1 \end{bmatrix} \begin{bmatrix} u_t^{rexr} \\ u_t^{ca} \end{bmatrix}$$

Equation 6 conveys autoregressive representation of the model in which each variable is expressed as the function of the past values of itself and of the other variables of the system.

Secondly, it shows that reduced form innovations are the linear combination of recursive innovations.

In next step model is extended to allow for inclusion of oil prices (oil). The above given steps are replicated and three variable system of equation is constructed and final form is given as follows:

$$\begin{bmatrix} oil_t \\ rexr_t \\ ca_t \end{bmatrix} = \begin{bmatrix} 1 & -\alpha_{12} & -\alpha_{13} \\ -\alpha_{21} & 1 & -\alpha_{23} \\ -\alpha_{31} & -\alpha_{32} & 1 \end{bmatrix}^{-1} \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{13} \\ \beta_{21} & \beta_{22} & \beta_{23} \\ \beta_{31} & \beta_{32} & \beta_{33} \end{bmatrix} \begin{bmatrix} oil_{t-1} \\ rexr_{t-1} \\ ca_{t-1} \end{bmatrix} + \begin{bmatrix} 1 & -\alpha_{12} & -\alpha_{13} \\ -\alpha_{21} & 1 & -\alpha_{23} \\ -\alpha_{31} & -\alpha_{32} & 1 \end{bmatrix}^{-1}$$

$$\begin{bmatrix} 1 & \gamma_{12} & \gamma_{13} \\ \gamma_{21} & 1 & \gamma_{23} \\ \gamma_{31} & \gamma_{32} & 1 \end{bmatrix} \begin{bmatrix} u_t^{oil} \\ u_t^{rexr} \\ u_t^{ca} \end{bmatrix}$$

$$\begin{bmatrix} \varepsilon_t^{oil} \\ \varepsilon_t^{rexr} \\ \varepsilon_t^{ca} \end{bmatrix} = \begin{bmatrix} 1 & -\alpha_{12} & -\alpha_{13} \\ -\alpha_{21} & 1 & -\alpha_{23} \\ -\alpha_{31} & -\alpha_{32} & 1 \end{bmatrix}^{-1} \begin{bmatrix} 1 & \gamma_{12} & \gamma_{13} \\ \gamma_{21} & 1 & \gamma_{23} \\ \gamma_{31} & \gamma_{32} & 1 \end{bmatrix} \begin{bmatrix} u_t^{oil} \\ u_t^{rexr} \\ u_t^{ca} \end{bmatrix}$$

Appendix B

Chow Break Point Stability Test			
Bangladesh (2003)			
F-statistics	Probability	Log likelihood ratio	Probability
5.99	0.01	11.28	0.003
Egypt (1991)			
F-statistics	Probability	Log likelihood ratio	Probability
9.14	0.00	15.98	0.000
Iran (1999)			
F-statistics	Probability	Log likelihood ratio	Probability
5.99	0.08	5.73	0.05
Indonesia (1998)			
F-statistics	Probability	Log likelihood ratio	Probability
8.31	0.0016	14.82	0.0006
Malaysia (1998)			
F-statistics	Probability	Log likelihood ratio	Probability
5.52***	0.009	10.63	0.0049
Nigeria			
F-statistics	Probability	Log likelihood ratio	Probability
4.92	0.001	9.63	0.01
Pakistan (2000)			
F-statistics	Probability	Log likelihood ratio	Probability
12.64	0.000	20.38	0.000
Turkey (1989)			
F-statistics	Probability	Log likelihood ratio	Probability
3.85	0.03	7.78	0.02