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

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1. 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 sectors of economies [to name a few, e.g., Barsky and Kilian (2004); Kilian (2008a,b); Hamilton (2008)], the studies analysing 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 could not ascertain conclusive link between these two variables.[1] 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[2] and responses of non-oil trade balance[3] and sources of oil price fluctuations[4]are of particular significance.

In this context exchange rate attains pivotal importance due to its role for adjusting current account imbalances as advocated by both traditional [Mundell (1962);

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[1]See, for instance, Lafer and Agmon (1978), Marion and Svensson (1984).
[2]See, IMF (2000).
[3]See, Gruber and Kamin (2007).
[4]Buetzer, *et al.* (2012).

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 utilising 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 minimises 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 factorisation considering exchange rate is unaffected by contemporaneous innovations in current account. This is justifiable 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 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 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.[5]

The rest of study is organised 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 the study.

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 could not prove 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.

[5]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 favourable 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 (1991) conducted studies for both developed and developing countries by using time series econometric techniques and could not find 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 depreciate the real exchange rate and improve current account balance while permanent shocks though appreciate 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 either emanate from current account and exchange rate or have direct or indirect effects on these variables. For instance, Lafer and Agmon (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 [Lafer and Agmon (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 stabilise 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 changes. 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. MODEL SPECIFICATION

3.1. Model Construction

In present study two systems of equations 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:

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

Whereas for the first model X_t is the 2 × 1 vector of endogenous variables, i.e. X'_t [$rexr_t$, 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 [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:

$$AU_t = BV_t \quad \dots \quad (2)$$

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 its 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.

3.2. Data Description

The annual data for D-8 countries; Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan and Turkey from the year 1981 to 2011 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 dividing it with consumer price index of each country.

4. ESTIMATION AND DISCUSSION OF RESULTS

4.1. 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 model 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 1.

4.2. Lag Order Selection

Schwartz information criterion (SIC) is used to select appropriate lag length. The Table 2 shows appropriate lag length selected for model with and without oil price for D-8 countries.

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

Table 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 continues to exist in Bangladesh and Turkey, though, it dampens the long run favourable effect of depreciation for current account for both of the countries. The case of Pakistan presents the extreme example of oil price repercussions for the relationship between exchange rate 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. 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.

Table 1

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

		Innovative Outlier				Additive Outlier			
		Level		Difference		Level		Difference	
Country	Variables	*(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.

Table 2

*Lag Length Selection**

Countries	Without Oil Price Lags	With Oil Price 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.

Table 3

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

Bangladesh	Without Oil Prices		With Oil Price		Percentage Change[6,7]	
	Short Run	Long Run	Short Run	Long Run	Short Run	Long Run
	Ca	Ca	Ca	Ca		
Rexr	–4.02***	6.09***	–4.14***	4.79***	–0.03	–0.21
	(–19.17)	(29.83)	(–20.27)	(23.44)		
Egypt						
	Short run	Long run	Short run	Long run		
	Ca	Ca	Ca	Ca		
Rexr	–10.76***	4.38***	–12.60***	9.39***	–0.17	114.38
	(56.94)	(23.18)	(–67.86)	(50.57)		
Iran						
	Short run	Long run	Short run	Long run		
	Ca	Ca	Ca	Ca		
Rexr	0.3*	1.49***	–0.07	2.54***	–123.3	70.47
	(1.69)	(8.07)	(–0.42)	13.4		
Indonesia						
	Short run	Long run	Short run	Long run		
	Ca	Ca	Ca	Ca		
Rexr	–4.88***	3.63***	0.39**	2.54***	107.99	–30.02
	(–25.36)	(18.86)	2.11	13.4		
Malaysia						
	Short run	Long run	Short run	Long run		
	Ca	Ca	Ca	Ca		
Rexr	–18.96***	–14.5***	–19.75**	5.59***	–4.17	138.55
	(–102.08)	(–78.18)	(–106.36)	(30.11)		
Nigeria						
	Short run	Long run	Short run	Long run		
	Ca	Ca	Ca	Ca		
Rexr	–8.609***	6.211***	–1.905**	7.932***	77.87	27.70
	(–45.55)	(32.866)	(–10.258)	(42.715)		
Pakistan						
	Short run	Long run	Short run	Long run		
	Ca	Ca	Ca	Ca		
Rexr	–8.13***	6.82***	–10.93**	–18.28***	–34.4	–368.03
	(–42.29)	(35.44)	(–58.89)	(–98.48)		
Turkey						
	Short run	Long run	Short run	Long run		
	Ca	Ca	Ca	Ca		
Rexr	–14.69***	9.47***	–7.88***	1.759***	46.35	–81.42
	(–77.74)	(50.126)	(–42.47)	(9.47)		

***Denote significance at 1 percent level, **Denotes significance at 5 percent level.

[6]It's calculated as difference in coefficient of exchange rate for current account 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.

[7]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.

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 for Egypt, Iran and Malaysia respectively and increases 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 significant for Malaysia, which is 139 percent. These interesting results are well consistent with the Malaysian policies of subsidising oil prices [Arshad and Shamsuddin (2005)].[8]

4.3.1. Impulse Response Functions and Variance Decomposition

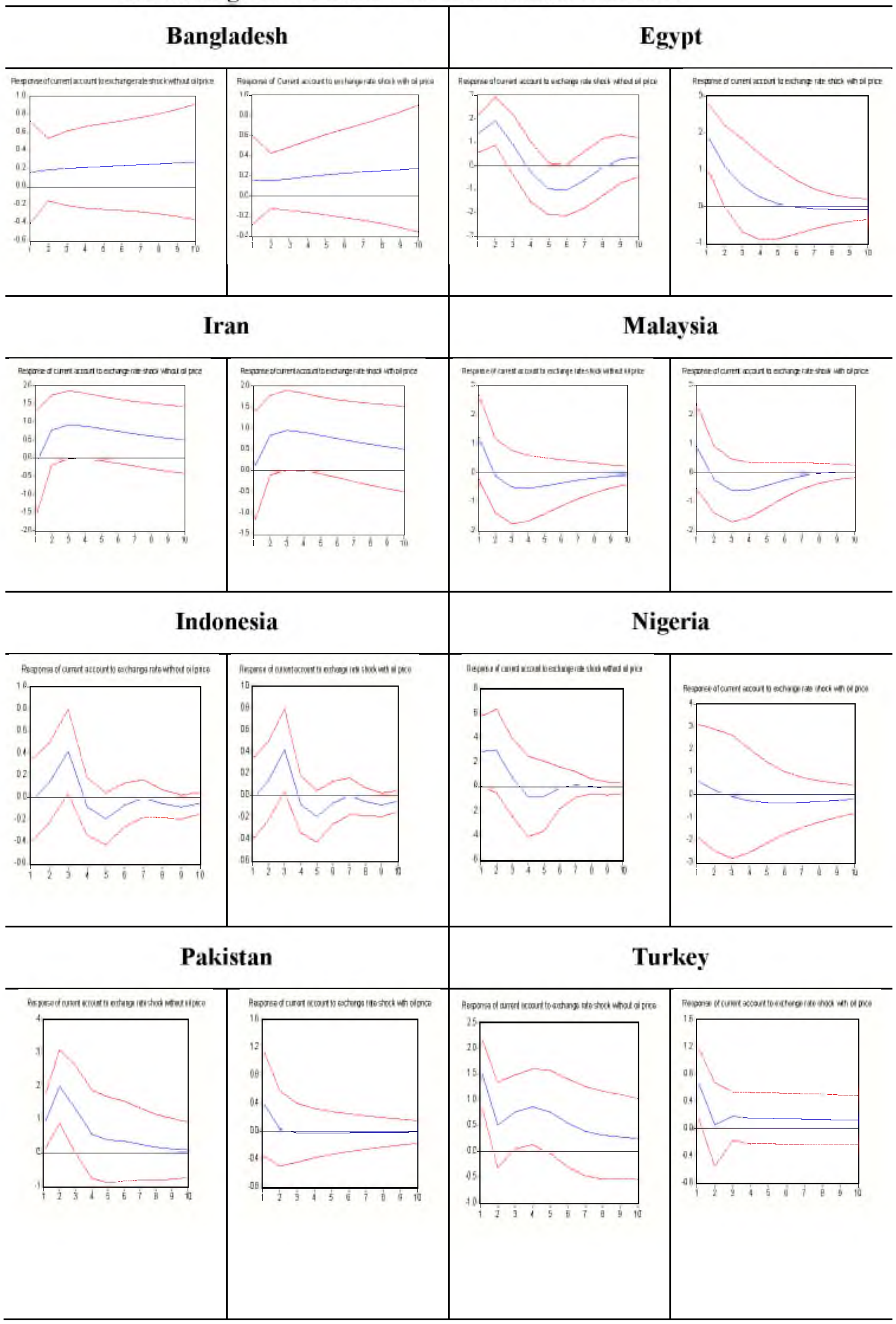
The relationship between exchange rate and current account for both models (with and without oil prices) is also forecasted with the help of impulse response functions. These impulses are derived on the basis of above specified identification scheme, in which Cholesky one-standard deviation shocks are given to exchange rate and response of current account balance is estimated over a period of ten years, 2012-2021, following the initial occurrence of the shocks. The impulses for all countries are plotted in Figure 1.

Among oil importing countries an obvious difference can be observed in response of current account to one standard deviation positive shock to exchange 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 4.3.

Along with derivation of impulse response function, variance decomposition analysis is also conducted to analyse the contribution of each shock to the variance of n-period ahead forecast error of the variables. Table 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 remains almost same. This is also the case of Nigeria among oil exporting countries. However, for Egypt and Iran exchange rate is contributing more to the standard error of current account balance as compared to oil prices.

[8]The cost of oil price subsidy in Malaysia increases with the increase in oil price which is not compensated by increased export revenues. Subsidised 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.

Fig. 4.1. Impulse Response Function of Current Account Balance in Response to Exchange Rate Shock With and Without Oil Prices



Source: Authors' own generated.

Table 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

Continued—

Table 4—(*Continued*)

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.

4.4. Impact of Oil Prices on Exchange Rate and Current Account

The above exercise calls for further investigation of the issue by analysing the response of exchange rate and current account to oil price hike. Results are reported in Table 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.[9] 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 highly elastic demand of energy with respect to energy 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 specialised 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 prices prevails for both current account and exchange rate. This means that country's oil exports to world have not risen much asto 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.

[9]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

Impact of Oil Prices on Current Account Balance and Exchange Rate

	Short-run		Long-run	
Bangladesh				
	Ca	Rexr	Ca	Rexr
Oil	1.684***	–0.01	6.48***	0.97***
	(8.25)	(–0.04)	(6.49)	(4.76)
Egypt				
	Ca	Rexr	Ca	Rexr
Oil	–1.67***	–0.06	–0.81	–0.02
	(–9.01)	(–0.33)	(–0.46)	(–0.12)
Iran				
	Ca	Rexr	Ca	Rexr
Oil	–8.07***	0.44***	–0.69**	–0.12
	(–39.84)	(2.34)	(–1.96)	(–0.64)
Indonesia				
	Ca	Rexr	Ca	Rexr
Oil	1.75***	0.27	–2.32***	–0.39
	8.91	1.44	–4.5	–2.09
Malaysia				
	Ca	Rexr	Ca	Rexr
Oil	–2.12***	0.14	3.84***	–0.16
	(–11.31)	(0.46)	(3.64)	(–0.84)
Nigeria				
	Ca	Rexr	Ca	Rexr
Oil	–22.87***	–0.153	–1.293***	–0.79
	(–121.00)	(–0.824)	(–0.871)	–4.256
Pakistan				
	Ca	Rexr	Ca	Rexr
Oil	4.96***	0.07	–5.30	–0.28
	(26.66)	(0.38)	(–1.56)	(–1.50)
Turkey				
	Ca	Rexr	Ca	Rexr
Oil	2.98***	0.197	–3.267***	–0.36***
	(15.79)	(1.06)	(–8.69)	(–1.977)

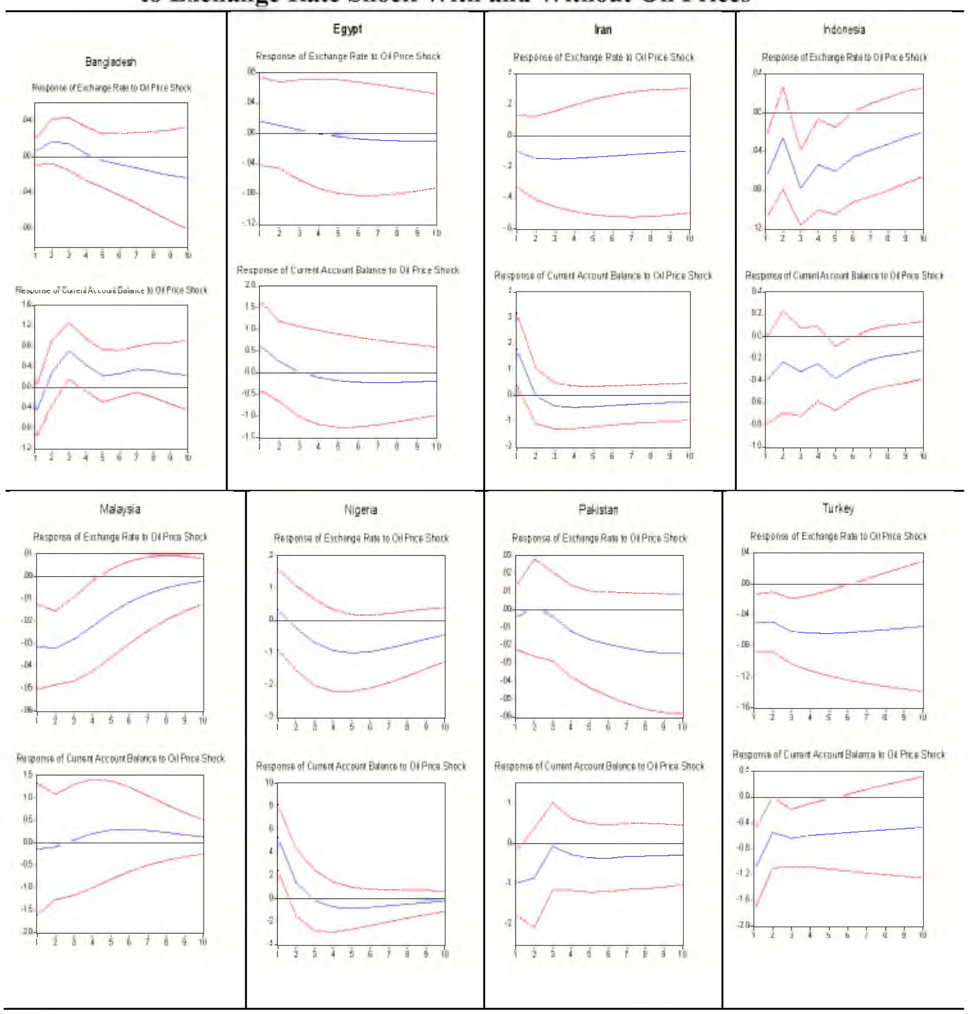
***Denote significance at 1 percent level.

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) providing 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 stimulate 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 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.

4.4.1. *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.

Fig. 4.2. Impulse Response Function of Current Account Balance in Response to Exchange Rate Shock With and Without Oil Prices



Source: Authors' own generated.

5. CONCLUSION AND RECOMMENDATIONS

The objective of this study is to explore the dynamic relationship between current account and exchange rate and to analyse the effect of oil price innovation on their relationship for D-8 countries. For achieving this objective Vector Autoregression (VAR) approach is employed. Impulse responses are also used to analyse 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 2011 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 continues to exist in Bangladesh and Turkey. 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 exports 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.

The research can be extended in number of ways. For instance, study on exploring the transmission mechanism of oil prices to exchange rate and analysing the relationship between exchange rate and current account by incorporating exchange rate regimes and institutional and structural changes taking place during the sample period can be undertaken.

APPENDIX A

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

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

Replacing AU_t by BV_t to get,

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

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

Solving the Equation 4 for X_t we get

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

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

$$\begin{bmatrix} 1 & \gamma_{12} \\ \gamma_{21} & 1 \end{bmatrix} \begin{bmatrix} u_t^{rexr} \\ u_t^{ca} \end{bmatrix}$$

Summarised form of equation 5 can be written as:

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

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

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

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Comments

The paper titled "The Effects of Oil Price Innovations on the Dynamic Relationship between Current Account and Exchange Rate: Evidence from D-8 Countries" is an excellent and systematic effort to explore the relationship in the shocks in oil prices and their impact on the current account and exchange rates in the D-8 countries. The case study of D-8 countries is carefully selected so as to represent both the oil exporting and oil importing countries and the relative dynamics thereof.

However the following are some of my comments which the authors may like to consider before the final submission of their papers:

(i) The title says *oil price innovations….*in my opinion since the authors have presented an empirical paper and it's not a pure econometrics/statistics paper hence the term innovation which in economics represents more of a controlled intervention sense, may be changed to *shocks.*

(ii) The sample period is taken upto 1981-2010, since the paper will be published in 2014, so if its not of a big hassle the authors may like to increase the no of years to be taken as the sample period.

(iii) Since the authors are exploring the impact of shocks in one of the components in the current account, a natural question arises would the analysis change if it was some other component say for developing countries the import of technology products, or the export of the agro-based products. Or is it the oil specifically, then in this case authors need to present a proper transmission mechanism of how the shock in oil prices will lead to an impact. I am saying this because in there results the results have some outliers on both the oil importing and oil exporting countries. So may be we need to generalise some results as to saying those imports which have a larger share in the imports/exports would follow this pattern.

(iv) Since we are exploring the dynamics through the adjustments in the exchange rates, there are a number of other institutional and structural changes which have taken place over the sample period. Such as (1) exchange rate regimes (authors have pointed it out in the literature but not used it) (2) remittance from the oil exporting countries to the oil importing countries being the origin country (3) BOP controls such as capital account convertibility (4) active monetary policy etc.

(v) Finally the difference in results across countries such as Bangladesh being an outlier needs more clarification in terms of either a theoretical justification or an administrative one.

The paper makes an interesting case and presents the results in accordance with the theoretical understanding. Over all the paper is a good contribution to the existing knowledge on the subject.

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