The Impact of Real Effective Exchange Rate on the Non-oil Export: The Case of Azerbaijan

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The Impact of Real Exchange Rate on Non-Oil Exports: The case of Azerbaijan

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Abstract

The paper investigates the impact of the real exchange rate on non-oil exports in Azerbaijan by applying Vector Error Correction Model.

The estimation results suggest that real exchange rate has negative impact on non-oil export performance while non-oil GDP affects positively in the long- and short-run. Error correction term indicates that short-run fluctuation can be adjusted into long-run equilibrium relationship.

Based on findings of the study can be concluded that appreciating real exchange rate is one of major factors that impede non-oil export growth.

Since promotion of non-oil export is one of the urgent issues of the strategic economic policy of Azerbaijan Republic then findings of this study may be useful for policymakers.

JEL Codes: C32, F31, F41, O24, P28

Keywords: *Azerbaijani economy, Non-oil export, Real effective exchange rate, Non-oil GDP, Dutch Disease, Vector Error Correction Model.*

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Content

1. Introduction

Export earnings assume vital importance not only for developing, but also for developed countries. Developed countries mainly export capital and final goods, while the main part of export of developing countries consists of mining-industry goods especially natural resources. According to export-led growth hypothesis increased export can perform the role of "engine of economic growth" because it can increase employment, create profit, trigger greater productivity and lead to rise in accumulation of reserves allowing a country to balance their finances (Emilio (2001), Goldstein and Pevehouse (2008), Gibson and Michael (1992), McCombie and Thirlwall (1994)). In this context there are some challenges for countries with natural resource abundance such as oil in comparison with other countries. The main point is that in parallel with windfall of oil revenues these countries have to pay more attention to the development of the non-oil sector as well as its export performance (Sorsa, 1999)). Because in the most of the cases oil driven economic development leads to some undesirable consequences such as Dutch Disease in the oil rich countries.

In this regard Dutch Disease concept provides certain link between the real exchange rate and non-oil export. According to this concept the appreciation of a country's real exchange rate caused by the sharp rise in export of a booming resource sector draws capital and labour away from a country's manufacturing and agricultural sectors, which can lead to a decline in exports of agricultural and manufactured goods and inflate the price of non-tradable goods (Corden (1982) and Corden and Nearly (1984)). If we divide overall export of oil rich countries into oil and non-oil exports appreciation of real exchange rate which is specific for these countries negatively affects non-oil exports while export revenues of oil sector mainly depends on oil price in the world markets.

Above stated problem is also specific for Azerbaijan, one of the oil rich countries. According to official statistics the volume of non-oil export has decreased by 26.5 percent between 2004 and 2008 while appreciation of the real effective exchange rate has approximately doubled in the same period[3]. On the other hand, the share of non-oil export in the total export has decreased from 52.5 percent in

[3] Statistical bulletin of Central Bank of Azerbaijan, 2008

2004 to 4.7 percent in 2008. These facts indicate the worsening of non-oil export performance and urgency for its promotion.

The main objective of this study is to analyze the impact of changes in the real exchange rate on the export performance of the non-oil sector and to suggest policy proposals which may be useful for policymakers in non-oil export promotion issues.

This study finds that appreciating exchange rate is one of the major factors that impede non-oil export growth while increase in value added of non-oil sector leads to raise in non-oil export earnings in Azerbaijan.

The study can contribute to existing empirical literature by investigating the influence of the exchange rate on non-oil exports in Azerbaijan. The rest of the paper is organized as following. *Literature review* section consists of reviewed relevant literatures, while *Data collection, Non-oil Export Equation and Employing methodology* section describes non-oil export equation, required data and underlying methodology. *Estimation issues and interpretation of results* section covers the estimations' outputs and interpretations of them. *Concluding remarks* section summarizes main findings of the study. Reviewed literatures are listed in the *Reference* section and estimation outputs mainly are placed in *Appendix*.

2. Literature Review

There is huge number of studies that investigate the impact of exchange rate on export. But according to our research objective we try mainly to focus on studies that investigate this relationship in case of oil dependent economies like Azerbaijan.

Bernardina (2004) investigates impacts of the real exchange rate, real non-oil GDP, and the world income on Russian non-oil export by using an Error Correction Model over the period 1994-2001. Author finds that there is a robust and negative long run co-integration relationship between the real exchange rate and Russian non-oil exports. Furthermore, the world income has positive effect on Russian non-oil export while real non-oil GDP causes a decline in non-oil export.

By using Static OLS and Fix Effect based on Two Stage LS Masoud and Rastegari (2008) estimate effects of certain factors as well as real exchange rate on non-oil export over the period 1995-2005. Study concludes that Iran's non-oil exports positively related to increase in population, per capita income and consumer price index while negatively depends on appreciation of real exchange rate.

Another study related to Iranian non-oil export comes from Sabuhi and Piri (2008). They explore the effects of exchange rate, export volume, domestic saffron production on price of saffron, Iran's major non-oil export good in the short- and long-run. Employing Autoregressive Distributed Lag (ARDL) model shows that appreciating exchange rate has statistically significant negative impact on export price of saffron while there is no significant relationship between export price and domestic production of Saffron in the long-run.

Sorsa (1999) analyzes Algerian non-oil export promotion issues in presence of oil sector dominancy over the period 1981-1997 and reveals that appreciation of real exchange rate is the major factor that impedes non-oil export growth and its diversification.

The effects of real exchange rate, its movements and volatility on the growth of non-oil export in Nigeria are studied by Ogun (1998) over the period 1960-1990. The results show that real exchange rate and also both its misalignment and volatility affect non-oil export growth adversely.

Oyejide (1986) examines effects of trade and exchange rate policies on Nigeria's agricultural export using Ordinary Least Squares (OLS) over the period 1960-1982 and concludes that appreciation of real exchange rate adversely influences to non-oil export especially during the oil boom.

Another study that investigates relationship between exchange rate and non-oil export goods in Nigeria comes from Yusuf and Edom (2007). By applying Johansen co-integration approach over the period 1970-2003 they reveal that depreciation of official exchange rate promotes export of round wood and sawn wood in Nigeria.

Adubi and Okunmadewa (1999) investigate impact of exchange rate and price indexes and also their volatilities on the agricultural export of Nigeria in the period 1986 to 1993. Results of ARIMA and OLS estimations indicate that appreciation of exchange rate and its volatility have negative impacts on agricultural export earnings.

By applying OLS on the time series of relevant variables including exchange rate over the annual period of 1970-2005 Abolagba et al. (2010) find that appreciation of real exchange rate has statistically significant and negative impact on export of cocoa and rubber in Nigeria.

Ros (1993) analyzes Mexico's non-oil trade and industrialization experience during 1960-1990 and concludes that appreciation of real exchange rate due to oil revenues is harmful for non-oil export performance.

The influences of trade and exchange rate policies on agricultural export which is the main part of non-oil export of Cameroon is studied by Amin (1996) over the period 1971-1992. Study concludes that current exchange rate policy especially appreciation of national currency impedes agricultural export.

Mohamad et al. (2009) conduct panel data estimation to account for the role of the real exchange rate and other economic fundamentals such as macroeconomic stability, terms of trade, capital goods investment, external demand and human capital on the export performance of Indonesia, Malaysia, Singapore and Thailand. They find that appreciation of real exchange rate and also its misalignment and volatility have strong negative impact on export performance.

By employing Pooled Mean Group over the period of 1970 to 2003 Benbouziane and Benamar (2007) investigate the impact of exchange rate regime on the real sector in some Middle East and North Africa Countries including Algeria, Bahrain, Iran, Kuwait, Libya, Saudi Arabia, and Sudan which are oil rich. Study finds that as a whole, exchange rate overvaluation reduces competitiveness of manufactured goods in these countries.

Egert Balazs and Morales-Zumaquero (2005) estimates export functions both in nominal and real terms in the case of transition countries of Central and Eastern Europe including Russia over the period 1990-2005 by employing panel regression and ARDL modeling. They use domestic and foreign income, foreign direct investment, relative prices, the nominal exchange rate for nominal exports, the real exchange rate for real exports, and a volatility measure of the nominal and the real exchange rates respectively as explanatory variables and conclude that in general appreciation of exchange rate (nominal or real terms) and also its volatility are harmful for export earnings.

3. Data collection, Non-oil Export Equation and Employing methodology

3.1. Data collection

Non-oil export in real terms (*X*). Since the export price index is unavailable for the entire estimation period, real non-oil exports are calculated as the ratio of nominal non-oil exports to weighted average of the consumer price indices of the main trading partners. The weights correspond to the share of the total trade turnover with the respective country.

The trade turnover based average of the consumer price index of main trade partners (CPI^F) is calculated based on prices and weights of country's main 13 trading partners as below:

$$CPI^F = \sum_{i=1}^{13} CPI_i^F \cdot W_i \qquad (1)$$

Where,

CPI_i^F – is a CPI i th main trading partner;

W_i – is a weight of i th main trading partner in our overall trade turnover.

Real effective exchange rate (*RER*). As a real exchange rate study uses real effective exchange rate.

Non-oil GDP net of non-oil net export in real terms (*Z*)**.** In order to avoid endogeneity we use non-oil GDP net of non-oil net exports as a control variable. This variable will be called "real non-oil GDP" hereafter. Since the deflator of non-oil GDP is not available we use CPI as a proxy for it. We calculate real values of Z as below:

$$Z = \frac{Nominal\,Non\;oil\;GDP - Nominal\,Non\;oil\,Net\;Export}{CPI} \qquad (2)$$

Time series data of all required variables are obtained from the official web page of Central Bank of Azerbaijan.

3.2. Non-oil Export Equation

Based on the conventional equations of supply of exports and by following the approach employed by Jongwanich (2007) our non-oil export equation is as below:

$$X = a_0 + a_1\left(\frac{p^x}{\bar{p}^d}\right) + a_2 Z \qquad (3)$$

Where,

p^x – is an export price expressed in foreign currency;

$\bar{p}^d = \frac{p^d}{e}$; p^d – is a price of exportable in the domestic market expressed in local currency and

e – stands for nominal exchange rate (local currency per a unit of foreign currency).

If we replace $\bar{p}^d$ with $\frac{p^d}{e}$ then equation (3) becomes as below:

$$X = a_0 + a_1\left(\frac{ep^x}{p^d}\right) + a_2 Z \qquad (4)$$

It is obvious that $\frac{ep^x}{p^d} = RER$ as indicated Tihomir (2004). Note that an increase in RER means a depreciation of the domestic currency in this definition.

Thus, our final export supply function seems as below:

$$X = a_0 + a_1 RER + a_2 Z \qquad (5)$$

3.3. Employing methodology

We estimate the impacts of the real effective exchange rate and real non-oil GDP on non-oil exports in real terms in the long- and short-run. In other words we construct Error Correction Model between variables in interest. In order to estimate co-integration relationship one can use Engle-Granger or Johansen approaches. But it is also emphasized by econometricians that application of Engle-Granger approach is not appropriate in the presence of more than two variables. The point is that Engle-Granger approach intends only one co-integrating equation between variables. But when we have more than two variables, say that three variables then it is possible existence of two co-integrating equation. Since we have three variables it is preferable to apply Johansen's co-integration method.

Thus, in order to test for co-integration we use the Johansen (1988) and Johansen and Juselius (1990) full information maximum likelihood of a Vector Error Correction Model. The model is given as follows:

$$\Delta y_t = \Pi y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta y_{t-i} + \mu + \varepsilon_t \tag{6}$$

Where, y_t is a (*n x 1*) vector of the *n* variables of interest, i.e. non-oil export in real terms, real effective exchange rate, real non-oil GDP, μ is a (*n x* 1) vector of constants, Γ represents a (*n x (k*-1*)*) matrix of short-run coefficients, ε_t denotes a (*n x 1*) vector of white noise residuals, and Π is a (*n x n*) coefficient matrix. If the matrix Π has reduced rank (*0 < r < n*), it can be split into a (*n x r*) matrix of loading coefficients α , and a (*n x r*) matrix of co-integrating vectors β . The former indicates the importance of the co-integration relationships in the individual equations of the system and of the speed of adjustment to disequilibrium, while the latter represents the long-term equilibrium relationship, so that $\Pi = \alpha\beta'$. *k* is number of lags, *t* denotes time and Δ is a difference operator.

Before estimating co-integrated vector-error correction model, the stochastic properties of the time series are assessed by performing unit-root tests. We are going to employ Augmented Dickey-Fuller

(1981) and Phillips-Perron (1988) for this purpose. Note that, the Augmented Dickey-Fuller and Phillips-Perron tests maintain the null hypothesis of non-stationarity of the time series.

4. Estimation issues and interpretation of results

4.1. Estimation procedures

All variables in estimation procedures are in their logarithm expression and denoted with small caps respectively[4]. Estimations cover the quarterly period of 2002Q3-2009Q3.

As stated in the methodological section we first conduct *Unit-Root Test*s by means of Augmented Dickey-Fuller and Phillips-Perron Tests. The tests results indicate that all variables (x, rer, z) are non-stationary in levels and stationary in first difference (See: Appendix, Table 2).

After ensuring that all variables are integrated of order one as a next step we moved to Johansen co-integration test procedures. We construct a VAR model of three endogenous variables, i.e. x, rer, z and include here constant and a dummy variable for the first quarter of 2005[5]. Then we seek the appropriate lag-length based on the VAR Lag Length Selection Criteria. Most of these criteria indicate that 4 lags are relevant (See: Appendix, Table 3) [6]. Thus, we estimate VAR with 4 lags and this specification has not any problem in terms of autocorrelation, normality and heteroskedasticity of the residuals as shown from Appendix, Table 4-6. Then we employed co-integration test. Both trace and Trace and Max-Eigenvalue tests indicate that there is one co-integrating equation between variables in four versions as indicated at the Appendix, Table 7. In order to choose appropriate one we estimate co-integration equations in all of these four specifications. The third specification is more relevant in terms of model selection criteria (See: Appendix, Table 8). Thus, co-integrating relationship between the non-oil export in real terms, real effective exchange rate and real non-oil

[4] Note that all estimation procedures are performed in E-views 7.0 econometrical package.
[5] Dummy variable is included into VAR in order to capture sharp decrease of non-oil export in the first quarter of 2005 which mainly caused by deterioration of non-oil tradable and increasing in oil sector and starting appreciation of exchange rate.
[6] Although most of the lag selection criteria suggest 4 lags, we also estimate VAR in all lag length from 6 lags to 1 lag and conduct Johansen co-integration analysis. We reveal that the results are more robust and meaningful when we estimate VAR in 4 lags.

GDP is as below (see: Appendix, Table 8 for detailed information):

$$x = 1.68 + 1.63rer + 1.46z \quad (7)$$

As given at the Table 8, column 4 in Appendix since the value and sign of error correction coefficient (-0.31) is as expected (i.e. it is in interval of (-1; 0) and statistically significant) we can conclude that there is stable co-integration between non-oil export in real terms, real effective exchange rate and real non-oil GDP. At the same time equation (7) is satisfied in term of autocorrelation, normality and heteroskedasticity of residuals (see: Appendix, Table 8, column 4).

After estimating long-run relationship we are going to examine how growth rates of real non-oil GDP and real effective exchange rate affect non-oil export in real terms in the short-run. For this purpose we estimate error correction model by excluding insignificant variables from the model we get more parsimonious specification as below:

Table 1: Short-run model

Dependent Variable: D(X) Independent Variables	Coefficient	Std. Error	t-Statistic	Prob.
ECM_JOH(-1)	**-0.214564**	0.080819	-2.654874	**0.0148**
D(X(-1))	-0.353289	0.111630	-3.164828	0.0047
D(Z(-1))	-0.519433	0.215122	-2.414597	0.0250
D(Z(-4))	0.486856	0.200447	2.428850	0.0242
D(RER(-1))	4.184019	1.227734	3.407920	0.0026
D(RER(-3))	3.894444	1.633674	2.383857	0.0266
D_05Q1	-1.105419	0.272597	-4.055146	0.0006
C	0.050378	0.047895	1.051845	0.3048

Estimated short-run model is satisfactory in terms of coefficient test; residual test and coefficients stability tests as shown from Table 9-15 and Figure 1in the Appendix.

4.2. Interpretation of results

Long-run relationship

Based on the long-run estimation results we conclude that there is statistically significant co-integration between non-oil export in real terms, the real effective exchange rate, and real non-oil GDP. According to equation (7), **one percent** appreciation (depreciation) of real effective exchange rate leads to **1.63 percent** decrease (increase) in non-oil export in real terms. This finding is in line with theory. This text-book relationship is crucial in the case of Azerbaijan due to increasing appreciation of exchange rate. Note that real effective exchange rate has appreciated about two times during the 2004-2008. According to long-run model to keep other factors in constant this appreciation has caused reduction of non-oil export in real terms approximately by 3.26 (1.63*2) times during the 2004-2008. This is quite high appreciation and it mainly sources from huge inflow of oil revenues into country. If we take into account that the real effective exchange rate has appreciating trend since 2004 then we can conclude that it is one of the major factors that impede non-oil export growth. Therefore, policymakers should take this fact into consideration in the non-oil export promotion issues, one of the urgent tasks of strategic economic policy of Azerbaijan Republic.

According to equation (7) keeping other factors in constant, **one percent** increase in real non-oil GDP causes **1.46 percent** raise in non-oil export in real terms. This finding is also consistent with our expectations. It is obvious that volume of export can expand as increase aggregate supply.

Short-run relationship

According to the short run model real effective exchange rate and real non-oil GDP have statistically significant impact on non-oil export in real term. Ceterius paribus a **one percent** increasing in real non-oil GDP growth with 4 lags results **0.49** percent raising in non-oil export growth in the short-run. Short-run impacts of real effective exchange rate on non-oil export are **4.18** with 1 lag and **3.89** with 3 lags respectively.

Error correction coefficient indicates that short-run fluctuation between variables in interest adjusts to long-run equilibrium relationship. Exactly saying 21 percent of disequilibrium is corrected to the long-run level within a quarter.

It is worth to note that we should be careful when we interpret our estimation results because of small number of observation.

5. Concluding remarks

We attempted shed light to relationship between real exchange rate and non-oil export, one of the important issues for Azerbaijani economy. Based on estimation outputs we can conclude that real effective exchange rate and real non-oil GDP has statistically significant impact on non-oil export both in the long- and short-run. In other words appreciation of real effective exchange rate has negative effect on non-oil export in real terms while real non-oil GDP has positive impacts. It also revealed that short-run fluctuation can be adjusted towards long-run equilibrium relationship. Long-run elasticities of non-oil export in real terms regarding with real effective exchange rate and real non-oil GDP are **1.63** and **1.46** respectively. Short-run impacts of real effective exchange rate on non-oil export are **4.18** with 1 lag and **3.89** with 3 lags respectively. Error correction term indicates that **21 percent** of disequilibrium is corrected toward the long-run level within a quarter.

Findings of this study are consistent with economic theory and also reality of Azerbaijani economy. According to theory in general appreciation of national currency negatively affects export earnings of country. This theoretical hypothesis is crucial in the case of Azerbaijan due to by one hand increasing appreciation of exchange rate which mainly sourced from huge inflow of oil revenues and by the other hand declining share of non-oil export caused by domination of oil sector in overall economy in recent years.

Based on results of the study can be concluded that (a) appreciating exchange rate is one of major factors that impede non-oil export growth; (b) increase in value added of non-oil sector leads to increase in non-oil export earnings.

Since promotion of non-oil export is one of the urgent issues of the strategic economic policy of Azerbaijan Republic then findings of this study may be useful for policymakers.

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7. Appendix

Table 2: Results of Unit Root Tests

Variables	Test Method	In the level			In the first difference		
		Constant	Trend	Actual value	Constant	Trend	Actual value
x	*ADF*	No	No	0.144550	No	No	-5.609120***
	PP	No	No	0.340709	No	No	-19.07625***
z	*ADF*	Yes	Yes	-2.958867	Yes	No	-7.302980***
	PP	Yes	Yes	-4.475187	No	No	-5.320252***
rer	*ADF*	Yes	Yes	-1.786916	No	No	-3.576087***
	PP	Yes	Yes	-2.012322	No	No	-3.576087***

Note that *, ** and *** asterisks above actual values indicate statistical significance of actual value at the 10%, 5% and 1% significance levels respectively. Six lags are used as maximum and optimal lag is selected by Schwarz criterion automatically in ADF test.

Table 3: Lag Order Selection

Endogenous variables: X RER Z Exogenous variables: C D_05Q1

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-0.632030	NA	0.000323	0.473716	0.759189	0.560988
1	64.20216	106.5133	6.04e-06	-3.514440	-2.800759	-3.296260
2	71.59215	10.55713	7.04e-06	-3.399439	-2.257550	-3.050352
3	88.94377	21.06982	4.22e-06	-3.995984	-2.425885	-3.515989
4	113.0624	**24.11858***	**1.69e-06***	-5.075883	**-3.077576***	**-4.464980***
5	122.8502	7.690447	2.12e-06	-5.132157	-2.705642	-4.390347
6	131.9543	5.202322	3.50e-06	-5.139590*	-2.284866	-4.266872

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error
AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion

Table 4: VAR Residual Normality Tests

Jarque-Bera	Prob.
1.966409	0.9228

Table 5: VAR Residual Heteroskedasticity Tests

Joint test:		
Chi-sq	df	Prob.
155.4630	150	0.3632

Table 6: VAR Residual Serial Correlation LM Tests

Lags	LM-Stat	Prob
1	10.30502	0.3264
2	7.220995	0.6141
3	13.79078	0.1300
4	14.02453	0.1215
5	3.668747	0.9318
6	4.474145	0.8775
7	8.513759	0.4833
8	1.481909	0.9973
9	10.01687	0.3491
10	3.727200	0.9284
11	4.025927	0.9097
12	16.85991	0.0510

Table 7: Co-integration Tests

Series: x rer z; Exogenous series: D_05Q1; Lags interval: 1 to 4
Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	1	1	1	1	0
Max-Eig	1	1	1	1	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Table 8: Co-integration Equations Specifications and Residuals Tests

	Co-integration Equations Specifications			
	No intercept or trend in CE or VAR	Intercept (no trend) in CE–no intercept in VAR	Intercept (no trend) in CE and VAR	Intercept and trend in CE–no trend in VAR
x	1.00000	1.00000	1.00000	1.00000
rer t-statistics:	1.393211 [-3.24841]	1.491799 [2.33425]	1.631752 [2.36360]	-0.262.464 [- 0.12553]
z t-statistics:	1.656770 [-6.38877]	1.388.286 [5.16244]	1.461850 [5.03225]	-0.503.368 [-0.24603]
C t-statistics:		2.357456 [0.69515]	1.678.826	6.093795
@trend t-statistics:				0.111904 [0.89282]
ECM coefficient t-statistics:	-0.314243 [-3.93039]	-0.35355 [-3.86026]	-0.307095 [-3.24051]	-0.315569 [-2.93514]
Statistical Properties				
R-squared	0.929911	0.928631	**0.931315**	0.925588
Sum squared residuals	0.364519	0.37118	**0.357218**	0.387006
Log Likelihood	22.30961	22.04708	**22.60301**	21.44165
Akaike AIC	-0.573077	-0.554971	-0.524346	-0.444252
Schwarz SC	-0.086997	0.105103	**0.182876**	0.26297
Residuals Tests				
LM Test	OK	OK	OK	OK
Jarque-Bera	2.090579	1.873939	1.624069	1.916626
Prob.	0.9112	0.9309	0.9508	0.9272
White Heterosk. Test (Chi-sq)	169.1228	169.1684	166.8467	165.6696
Prob.	0.3347	0.3338	0.3807	0.4054

Table 9: Short-run estimation output

Dependent Variable: D(X) Method: Least Squares

Independent Variables	Coefficient	Std. Error	t-Statistic	Prob.
ECM_JOH(-1)	-0.214564	0.080819	-2.654874	0.0148
D(X(-1))	-0.353289	0.111630	-3.164828	0.0047
D(Z_(-1))	-0.519433	0.215122	-2.414597	0.0250
D(Z_(-4))	0.486856	0.200447	2.428850	0.0242
D(RER(-1))	4.184019	1.227734	3.407920	0.0026
D(RER(-3))	3.894444	1.633674	2.383857	0.0266
D_05Q1	-1.105419	0.272597	-4.055146	0.0006
C	0.050378	0.047895	1.051845	0.3048

R-squared	0.808480	Mean dependent var	0.012414
Adjusted R-squared	0.744640	S.D. dependent var	0.430980
S.E. of regression	0.217788	Akaike info criterion	0.018360
Sum squared resid	0.996063	Schwarz criterion	0.395545
Log likelihood	7.733775	Hannan-Quinn criter.	0.136490
F-statistic	12.66413	Durbin-Watson stat	2.331871
Prob(F-statistic)	0.000003		

Table 10: Residuals Autocorrelation Test of Short-run Model

<table>
<tr><th>Autocorrelation</th><th>Partial Correlation</th><th></th><th>AC</th><th>PAC</th><th>Q-Stat</th><th>Prob</th></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>1</td><td>-0.197</td><td>-0.197</td><td>1.2461</td><td>0.264</td></tr>
<tr><td>. *| . |</td><td>.**| . |</td><td>2</td><td>-0.195</td><td>-0.244</td><td>2.5157</td><td>0.284</td></tr>
<tr><td>. *| . |</td><td>.**| . |</td><td>3</td><td>-0.139</td><td>-0.259</td><td>3.1803</td><td>0.365</td></tr>
<tr><td>. |* . |</td><td>. | . |</td><td>4</td><td>0.119</td><td>-0.041</td><td>3.6887</td><td>0.450</td></tr>
<tr><td>. | . |</td><td>. *| . |</td><td>5</td><td>-0.038</td><td>-0.125</td><td>3.7427</td><td>0.587</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>6</td><td>0.053</td><td>-0.001</td><td>3.8533</td><td>0.697</td></tr>
<tr><td>. *| . |</td><td>. *| . |</td><td>7</td><td>-0.077</td><td>-0.087</td><td>4.0974</td><td>0.768</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>8</td><td>0.072</td><td>0.027</td><td>4.3163</td><td>0.828</td></tr>
<tr><td>. *| . |</td><td>.**| . |</td><td>9</td><td>-0.185</td><td>-0.210</td><td>5.8591</td><td>0.754</td></tr>
<tr><td>. | . |</td><td>. *| . |</td><td>10</td><td>-0.041</td><td>-0.199</td><td>5.9369</td><td>0.821</td></tr>
<tr><td>. |**. |</td><td>. |* . |</td><td>11</td><td>0.265</td><td>0.153</td><td>9.4390</td><td>0.581</td></tr>
<tr><td>. | . |</td><td>. | . |</td><td>12</td><td>0.039</td><td>0.029</td><td>9.5202</td><td>0.658</td></tr>
</table>

Table 11: Residuals Normality Test of Short-run Model

Jarque-Bera	Prob.
1.8944	0. 3878

Table 12: Residuals Serial Correlation Test of Short-run Model

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.714244	Prob. F(2,19)	0.2068
Obs*R-squared	4.433029	Prob. Chi-Square(2)	0.1090

Table 13: Residuals ARCH Heteroskedasticity Test of Short-run Model

F-statistic	0.436031	Prob. F(1,26)	0.5149
Obs*R-squared	0.461827	Prob. Chi-Square(1)	0.4968

Table 14: Residuals White Heteroskedasticity Test of Short-run Model

F-statistic	1.437604	Prob. F(7,21)	0.2430
Obs*R-squared	9.394824	Prob. Chi-Square(7)	0.2255
Scaled explained SS	2.843943	Prob. Chi-Square(7)	0.8991

Table 15: Ramsey Reset Test of Short-run Model

F-statistic	0.585630	Prob. F(1,20)	0.4531
Log likelihood ratio	0.836968	Prob. Chi-Square(1)	0.3603

Figure 1: Parameters Stability Tests of Short-run Model