Does J-Curve Phenomenon Exist in Case of Laos? An ARDL Approach

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Abstract

This study aims to test the existence of J-curve phenomenon in Laos economy using quarterly data over the period of 1993-2010. The ARDL bounds testing approach to cointegration is used to examine short run as well as long run impact of real depreciation of Lao kip on Lao trade balance. The empirical results suggest that there is J-curve effect in case of Laos. The impact of real depreciation of the Lao kip on Lao trade balance is insignificant in long run. In short-run, real depreciation has inverse impact on Lao's trade balance. The long-run trade balance is determined by domestic income.

Keywords: J-curve, ARDL approach, Laos

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1. Introduction

The relationship between exchange rate and trade balance is one of the well-established theoretical relationships in economics. It is argued that the real depreciation or devaluation of home currency makes the exports cheaper and imports more expensive and hence leads to an improved trade balance. On the basis of this proposition, countries all over the world often exercise such a trade policy in an attempt to make the trade balance better. However, according to the Marshall Learner (ML) condition, the success of such a devaluation policy entirely depends on whether the magnitude of the absolute value of the sum of export and import demand elasticities is greater than unity. Again, it is evident from the existing literature that the real depreciation or devaluation of home currency causes no immediate impact on the trade balance rather it worsens the trade balance in the short run before improving it in the long run. Magee, (1973) named it the J-curve phenomenon, as in this case the time path of the trade balance resembles letter *J*. It is argued that in the first few months after a real devaluation or depreciation, the trade balance of home country can deteriorate rapidly as exports and imports orders are placed several months in advance and the short run response of the trade balance is controlled by the contracts.

A good number of J-curve centric empirical studies have been conducted during the last three decades employing two distinct approaches; aggregate trade balance approach and bilateral trade balance approach. Of these two types of approaches the aggregate trade balance approach deals with trade flow between one country and the rest of the world while the later considers trade flow between one country and its trading partners. It is evident from the studies based on the aggregate approach that they suffer from the problem of aggregation bias. In such a reality researchers advances with the bilateral process and in this case Rose and

Yellen, (1989) which looked for the evidence for the existence of J-curve between the US and her six major trading partners is the pioneer.

In the area of International economics, J-curve phenomenon has widely used to explain the relationship between exchange rate and trade balance. However, the validity of the J-curve phenomenon is not consistent in the developing economics where exchange rate is more controlled by the central bank by the implementation of fixed or managed floating exchange rate. Therefore, managing exchange rate is one of the most important issues for developing countries. According to the conventional approach, currency devaluation improves the trade balance in long-run (Shahbaz et al. 2011, 2012a). However, trade balance is worsened in short run initially and then improves which is called that trade balance is followed the J-curve phenomenon (Matesanz and Fugarolas, 2009).

The earlier findings of the literature on J-curve are not consistent in the context of the developing economics. Large numbers of empirical research has been found on developed and advanced economics[1] where the central bank has the autonomy for the implementation of monetary policy. While, the existence of the J-curve confirmed, by several researchers in different countries, for example; Gupta-Kappor and Ramakrishnan, (1999) for Japan; Bahnmani-Oskooee and Harvey, (2006) for Malaysia with major trading partners. Wijeweera and Dollery, (2013) for Australia; Shahbaz et al. (2011, 2012a) for Pakistan; Bahmani-Oskooee and Harvey, (2012) for Singapore; Bahmani-Oskooee and Kutan, (2009) for Bulgaria, Croatia and Russia; Bahmani-Oskooee and Harvey (2009) for Malaysia; Naranyan, (2004) for New Zealand; Bhmani-Oskooee and Wang, (2006) for China and Wilson, (2001) for Singapore, Malaysia and Korea reported no evidence on J-curve

[1]See literature survey on J-curve in Bahmani-Oskooee and Ratha, (2004b) and,Bahmani-Oskooee and Hegerty, (2009).

phenomenon. The finding of the empirical exercises is sensitive for data construction and methodology used and economic structure of countries (Halicioglu, 2008; Bahmani-Oskooee and Ratha, 2004a). In Asia, there are also some studies of J-curve phenomenon in Asian developing countries (Arora et al. 2003 for India; Onafowora, 2003 for Thailand, Malaysia and Indonesia; Shahbaz et al. (2011, 2012a) for Pakistan; Bahmani-Oskooee and Wang, 2006 for China; Narayan, (2006) for China and Bahmani-Oskooee and Harvey, (2009) for Malaysia. However, there are no studies on J-curve in transitional economy in Asian which including Laos[2]. Earlier study on Kyopilavong and Toyoda, (2007) used macroeconomic model to examine exchange rate policy on Lao economy. Another study, Chansomphou and Ichihashi, (2010) applied cointegration approach and reported a significant negative impact of misalignment on export-GDP ratio in the long run. Laos has been faced large chronic trade deficit account for 6.95% of GDP in 2011 (BOL, 2011). On one hand, macroeconomic stability in term of stabilizing exchange rate and controlling inflation is one of the most priorities for monetary authority[3] (Kyophilavong, 2009, 2010). On other hand, export-led growth policy is one of important policy[4] (GoL, 2004, 2011). Therefore, appropriate management of exchange rate is crucial factors for Laos in term of balancing macroeconomic stability and promotion of trade. Lao government has conducted the managed-floating exchange rate policy since 1989. The official rate was adjusted proportionally to be in line with the parallel market rate (Kyophilavong, 2010).

The main objective of present study is to test the existence of J-curve hypothesis in case of Laos. This study contributes in existing literature by three ways. Firstly, it is a pioneering

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[2]Thanh and Kalirajan, (2006) and Thanh and Kalirajan, (2005) suggested that devaluation can be implemented to encourage exports and to improve current account balance and BOP in Vietnam.

[3]Lao has induced managed-floating exchange rate system in 1986. Monetary authority has management exchange rate in order to stabilize macro-economy. The more detailed discussion on exchange rate regime and exchange rate management see Kyophilavong, (2010).

[4] In order in to so, Lao government liberalized trade by joining ASEAN Free Trade Area in 1998 and has joint the World Trade Organization (WTO) in February 2013.

effort investigating the impact of real depreciation on trade balance in case of Laos. Secondly, we apply unit root test to examine the integrating order accommodating the structural break stemming in the series. Thirdly, the ARDL bounds testing approach to cointegration developed by Pesaran et al. (2001) in the presence of structural breaks is applied and it is more suitable for testing J-curve hypothesis (Bahmani-Oskooee and Hegerty, 2009).

The remainder of this paper is organized as follows. Section-2 is theoretical framework and empirical model. Section-3 is empirical results. Section-4 is conclusion.

2. Theoretical framework and empirical model

Theory suggests that exchange rate movements play important role on trade balance (Edwards, 1989; Aghevli et al. 1991). In order to make devaluation to be successful, it is important to fulfill the Marshall-Lerner (LM) condition: the sum of the absolute value of imports and exports demand price elasticities should be greater than unitary. On other hand, devaluation will not improve trade balance if trade deficit is larger and exports' elasticities are smaller. Despite the benefits of devaluation, it has the cost. Firstly, devaluation will lead to increase domestic currency prices of imported goods as well as domestic price level. Secondly, devaluation will reduce value of financial assets and aggregate demand via wealth effect. Thirdly, devaluation will increase cost of external debts and service in foreign currencies (Cooper, 1971; Edwards, 1989; Aghevli et al. 1991). Therefore, in many countries, governments are reluctant to devalue their currency to improve their trade balance. The theoretical framework following by Rose and Yellen, (1989); Rose, (1990) and empirical methodology is following by Bahmani-Oskooee et al. (2006), Bahmani-Oskooee and Wang, (2006) and Shahbaz et al. (2012a). The empirical equation is modeled as following:

$$TB_t = \alpha_1 + \alpha_2 YD + \alpha_3 YW + \alpha_4 RE + \mu_t \qquad (1)$$

Following the existing literature, TB_t is trade balance is defined as the ratio of exports to imports; YD_t is the domestic income (real GDP); YW_t is the world income-using Industrial Production Index (IPI) of US as a proxy; and RE_t is real exchange rate which defined as $NE_t * PW_t / PL_t$ (NE_t is nominal exchange rate (kip/US dollar); PW_t is world price which defined as US price; and PL_t is domestic prices defined as Lao CPI. All series have been converted into natural logarithms[5]. This empirical study uses quarterly data over the period of 1993Q1-2010Q4. It is the longest period of data availability in Laos. The data on all variables is collected from International Financial Statistics (CD-ROM, 2012). Due to limitation of data, we use the *Interpolation Method* to convert the annual data of the YD_t and TB_t to its quarterly value[6].

The estimation of domestic income (α_2) coefficients expected to be positive because increasing of income lead to a rise of imports from other countries. However, if increase in Lao income leads to rise in the production of import substitute goods, Laos might import less as income increases, yielding a negative estimation for α_2. Therefore, α_2 could be negative and positive depend on whether demand side factors dominate supply side or vice versa (Halicioglu, 2008; Shahbaz et al. 2011). Similarly, the estimation of foreign income (α_3) coefficient could be positive and negative. It is expected that α_4 is positive if real appreciation increases exports and lowers imports, which also satisfies the ML condition. It is

[5] The log-linear specification provides efficient results as compared to simple specification (Layson, 1983; Shahbaz, 2010).
[6] We used the interpolation method in EVIEWS 7 for converting the annual data of the real GDP into quarterly data. This method was used by (Darrat and Al-Mutawaa, 1996; Weliwita and Ekanayake, 1998; Chaisrisawatsuket al.2004; Samreth, 2008) for developing countries.

important to note that according to J-curve hypothesis, α_4 is negative in short-run. Therefore, it is important to incorporate short-run dynamics into long-run.

We apply the ARDL bounds testing approach developed by Pesaran et al. (2001). This approach has a number of advantages comparing to Johansen cointegration techniques (Johansen and Juselius, 1990). Firstly, it requires smaller sample size comparing to Johansen cointegration technique (Ghatak and Siddiki, 2001). Secondly, Johansen's technique requires that the variables should be integrated of the same order. The ARDL approach does not require variables be integrated of the same order. It can be applied whether the variables are purely I(0)or I(1), or mutually cointegrated. Thirdly, the ARDL approach provides unbiased long-run estimates with valid *t* statistics if some of the model regressors are endogenous (Narayan, 2005; Odhiambo, 2008). Fourthly, this approach provides a method of assessing short run and long run effects of one variable on the other simultaneously and it also separates short run and long run effects (Bentzen and Engsted, 2001).

The ARDL bounds testing approach can distinguish between dependent and explanatory variables. In order to implement the bounds testing procedure, equation-1 transformed to unconditional error correction model (UECM) as following:

$$\Delta TB_t = b_0 + \sum_{i=1}^{p} c_i \Delta TB_{t-i} + \sum_{i=1}^{p} d_i \Delta YD_{t-i} + \sum_{i=1}^{p} e_i \Delta YW_{t-i} + \sum_{i=1}^{p} f_i \Delta RE_{t-i} + \pi_1 TB_{t-1} + \pi_2 YD_{t-1} + \pi_3 YW_{t-1} + \pi_4 RE_{t-1} + \pi_5 DB + u_t \quad (2)$$

Where Δ denotes the first different operator, a_0 is the drift component, T is time trend, DB is dummy variables, p is the maximum lag length[7] and u_t is the usual white noise residuals. The procedure of the ARDL bounds testing approach has two steps. The first step is dealt with F-test for the joint significance of lagged level variables. The null hypothesis of the non-existence of a long-run relationship is denoted by ($F_{TB}(TB / YD, YW, RE)$ is (H_o: $\pi_1 = \pi_2 = \pi_3 = \pi_4 = 0$)against ($H_a$: $\pi_1 \neq \pi_2 \neq \pi_3 \neq \pi_4 \neq 0$). Pesaran et al. (2001) generated lower and upper critical bounds for F-test, lower bound critical values assume all variables are I(0) while upper bound critical values assume all variable are I(1). If the calculated F-statistic exceeds upper critical bound, the null hypothesis of no cointegration among variables may be rejected. If the calculated F-statistic falls below lower bound then null hypothesis of no long-run relationship is accepted[8]. The second step is the estimation of the long-run coefficients that are involved with determining the ARDL model with optimal lags. The selection criteria for the optimal lags such as the Schwarz Bayesian Criterion (SBC) and the Akaike Information Criterion (AIC) are mostly used to determine the order of the ARDL model. The next step is the estimation of the short-run parameters using the error correction model (ECM). To ensure the convergence of the dynamics to long-run equilibrium, the sign of the lagged error correction term (ECM_{t-1}) coefficient must be negative and statistically significant. Further, the diagnostic tests comprise of testing for the serial correlation, function form, normality, and heteroscedasticity (Pesaran and Pesaran, 2009). In addition, the stability tests of Brown et al. (1975), also known as the cumulative sum(CUSUM) and cumulative sum of squares ($CUSUM_{SQ}$) tests based on the recursive regression residuals, are used to that end.

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[7]Pesaran et al. (2001) cautions that it is important to balance choosing lag length.
[8]If the calculated F statistics falls between the lower and upper bounds, it is inclusive. The alternative efficient way of establishing cointegration is testing significant negative lagged error-correction term (Kremers et al. 1992; Bahmani-Oskooee, 2001; Iwata et al. 2012; Shahbaz et al. 2012b).

3. The Empirical Results

Before conducting the bounds test for cointegration, we applied unit root test to ensure that our variables are not integrated at I(2) because F-test would be spurious if variables are stationary at 2nd difference (Ouattara, 2004). The critical bounds are based on the assumption that variables are I(0) or I(1) (Pesaran et al. 2001; Narayan, 2005). We applied Zivot-Andrews, (1992) unit root test accommodating single unknown structural break stemming in the series. The results of Zivot-Andrews unit root test (reported in Table-1) show that TB_t, RE_t and YW_t are stationary at their level form with intercept and trend while YD_t integrated at I(1). This implies that our variables have mixed order of integration i.e. TB_t, RE_t and YW_t are I(0) and YD_t is I(1). The break in 1997Q4 refers the Asian financial crisis which first occurred in Thailand and it has contagion effects on Laos and the rest of Asian countries.

Table-1: Zivot-Andrews Unit Root Test

Variable	At Level		At 1st Difference	
	T-statistic	Time Break	T-statistic	Time Break
TB_t	-5.236 (2)**	1997Q4	-7.443(0)*	2008Q1
YD_t	-3.463(4)	2004Q2	-5.327(4)*	1998Q1
YW_t	-5.706(4)*	2006Q2	-6.663 (4)*	1998Q1
RE_t	-6.297(4)*	1997Q4	-7.531(0)*	1988Q4
Note: * and *** represent significant at 1 and 10 per cent level of significance. Lag order is shown in parenthesis.				

Therefore, we select the optimal lag length based on Schwartz Bayesian Criterion[9] (SBC). The result indicates that 4 is the optimal lag order[10]. In order to account for the fact that we have a relatively small sample size, we have produced new critical values (CVs) of the *F-test*, computed by stochastic simulations using 20000 replications. Table-2 reports the computed F-statistic for testing the existence of long-run relationship between the variables.

Table-2: Results of ARDL Cointegration Test

Dependent Variable	TB_t	
F-statistics (Structural Break)	4.251** (1997Q4)	
Critical values	5 per cent level	10 per cent level
Lower bounds	3.423	2.833
Upper bounds	4.581	3.885
$Adj-R^2$	0.750	
F-statistics	12.495*	
Note: * and ** show the significance at 5% and 10% level respectively.		

When TB_t is the dependent variable, the calculated F-statistic ($F_{TB} TB / YD, YW, RE$) = 4.25 is greater than upper critical bound at 10 percent level of significance. It suggests that there is cointegration between trade balance and its determinants in case of Laos. The estimation of

[9]Narayan, (2004) and Pesaran and Shin, (1999) argued that the SBC-based ARDL model performs better than the AIC-based model.
[10] We set the maximum lag order up to 6 to ensure sufficient degree of freedom for econometric analysis because our sample size is quite small. In order to save spaces, the results are not presented but are available upon request.

short-run and long-run coefficients of the ARDL model is shown in Table-3. Our results indicate the positive and significant impact of real income on trade balance. Keeping other things constant, a 1 percent increase in real income will improve trade balance by 0.433 percent. Both real exchange rate and world income have a positive but insignificant impact on trade balance in case of Laos. Dummy variable for Asian financial crisis is positive and significant impact on trade balance. It implied that Asian financial crisis improved trade balance because devaluation stimulated export and decreased imports.

In short run, empirical evidence shows that lagged one year of real exchange rate has a negative and statistically significant impact on trade balance in current period. This implies that devaluation of domestic currency will deteriorate trade balance in short-run. However, lagged 3 quarter of real exchange rate will have positive and statistically significant impact on trade balance. Lagged domestic income has positive and significant impact on trade balance. This entails that increase in domestic income will improve trade balance. The short-run findings indicate that J-curve phenomenon is true in case of Laos. This finding is consistent with the studies in developing countries by Shahbaz et al. (2011, 2012a) and, Bahmani-Oskooee and Cheema, (2009) for Pakistan; Bahmani-Oskooee and Ratha, (2010) for India; Celik, (2010) for Turkey; Wang, (2006) for China; Singh, (2004) for India; Wilson, (2001) for Singapore, Malaysia and Korea.

The results indicate that the estimate of lagged error correction term (ECM_{t-1}) is found to be statically significant with negative sign at 5 percent level of significance. This shows the speed of adjustment from short-run towards long-run. We find that deviations in short run towards long run are corrected by 11.83 percent in each quarter. This low speed of adjustment in trade balance might due to low competitiveness in export sector of Laos. The diagnostic test shave also been applied for adequacy of the specification of the model. The diagnostic tests suggest that long-run and short-run estimates are free from serial correlation, misspecification of short run model, non-normality of error term, and heteroskedasticity. The stability of the ARDL parameters is examined applying CUSUM and CUSUMsq tests developed by Brown et al. (1975). The Figure-1 shows the plot of the CUSUM and CUSUMsq statistics stay within the critical bounds indicating the stability of trade balance equation.

In order to capture the how the series respond when there is a shock in one of the variable beyond the selected time period, we employed the generalized impulse response analysis using vector autoregressive (VAR). This generalized impulse response analysis was developed by Pesaran and Shin, (1998). Several scholars argued that with VAR framework, generalized impulse response analysis produces better results compared to other traditional approach (Engle and Granger, 1987; Ibrahim, 2005). The main advantage of this approach compare to orthogonalized impulse response analysis is: firstly, it is not sensitive with ordering of the variables because ordering of the variables is uniquely determined by VAR systems. Secondly, generalized impulse response analysis estimates the simultaneous shock affects. Table-5 shows the results of variance decomposition approach which explains how much of the predicted error variance of a variable is described by the innovations generated from each independent variable in a system. It indicated that trade balance is explained by real exchange rate of 10.77%, domestic income of 7.52%%, world income of 2.62% and rest of 79.07% is explained by innovative shocks stem in trade balance. The variance decomposition confirmed the result from short and long run equation that trade balance was explained by world income, domestic income and real exchange rate. The contribution of trade balance, domestic income and world income to explain real effect exchange rate is

10.59%, 11.07% and 15.74% respectively. The rest of 62.58% of real exchange rate is explained by its own innovations. The contribution of trade balance and world income is negligible to explain domestic income that is 3.40% and 3.02% respectively. Real exchange rate shows its significant contribution to domestic income. The contribution of Laos' trade balance, domestic income and real exchange rate is to explain world income is ignorable.

Figure-1 shows the results of impulse response function which indicate how long and to what extent dependent variable reacts to shock in forcing variables. Trade balance shows negative and positive due to one standard deviation shock in real exchange rate and it was decreasing and dies out after 9^{th} time horizon. This confirms the existence of J-curve phenomenon in case of Laos. The response of trade balance is positive and negative due to shocks stemming in domestic income. This response dies out after the 8^{th} time horizon. Trade balance responds negatively with world income and it is decreasing and dies out at 7^{th} time horizon. Hence, impulse response function supports that there are positive and negative impact of real exchange rate on trade balance in short run. So, we find the presence of J-curve effect in case of Laos.

4. Conclusion and Policy Implications

This paper employs the ARDL bounds testing approach to examine the J-curve effect. The empirical results found that J-curve exists in case of Laos. Moreover, real depreciation has positive but insignificant impact on trade balance in long-run. Real exchange rate change has negative and positive impact on trade balance in short run. In addition, domestic income plays important role to improve trade balance in short run as well as in long run. Thus, the implementation of exchange rate policy managed-floating exchange rate policy might not improve trade balance in long-run but promotion economic growth will improve trade balance. Therefore, Lao policy maker should consider the implementation of flexible exchange rate policy in order to improve trade balance (Levy-Yeyati and Sturzenegger, 2003).

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Appendix-A

Table-3: Long-Run and Short-Run Analysis

Dependent Variable = TB_t		
Long-Run Results		
Variable	Coefficient	T-Statistic
Constant	-12.247*	-3.611
YD_t	0.433**	2.264
YW_t	0.691	0.886
RE_t	0.380	1.287
DB_t	1.041***	2.067
Short-Run Results(2,1,0,3)		
Variable	Coefficient	T-Statistic
Constant	-6.897	-4.274
ΔTB_{t-1}	-0.075	-0.653
ΔTB_{t-2}	-0.241*	-2.821
ΔYD_t	-14.322	-1.251
ΔYD_{t-1}	40.256*	4.074
ΔYW_t	0.389	0.875
ΔRE_t	-0.750***	-2.059
ΔRE_{t-1}	-0.362	-1.135
ΔRE_{t-2}	0.385	1.270
ΔRE_{t-3}	1.409*	4.262

DB	0.586*	2.867
ECM_{t-1}	-0.1183**	-2.0185
Note: *, ** and *** denote the significant at 1, 5 and 10 per cent level respectively.		

Table-4: Diagnostic Tests

	F-version		LM-version	
	Statistics	P- Value	Statistics	P- Value
A: Serial Correlation	F(4, 50)=0.451	0.771	$\chi2$ (4)=2.371	0.668
B: Functional Form	F(1, 53)= 0.0063	0.937	$\chi2$ (1)=0.0081	0.928
C: Normality	N/A		$\chi2$ (2)=1.989	0.370
D: Heteroscedasticity	0.0205	0.886	$\chi2$ (1)=0.021	0.884

Table-5: Variance Decomposition Approach

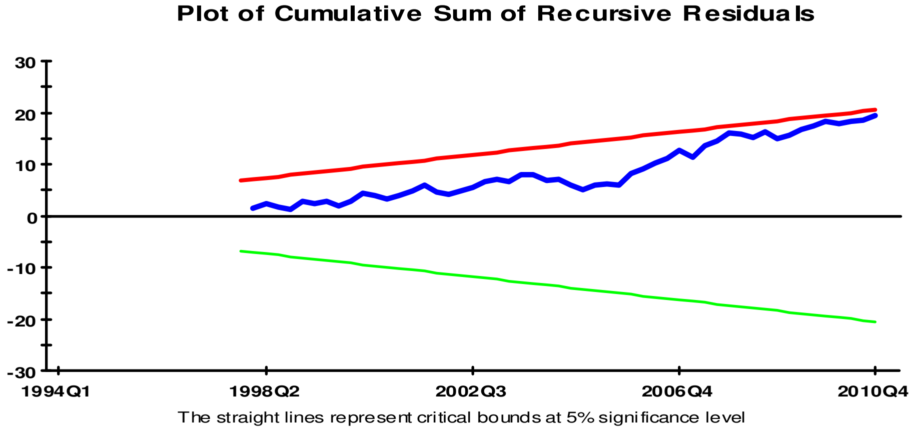
Variance Decomposition of TB_t:				
Period	TB_t	RE_t	YD_t	YW_t
1	100.0000	0.0000	0.0000	0.0000
2	90.9473	7.0574	0.4410	1.5541
3	85.3660	6.71108	6.2971	1.6257
4	81.0276	10.5217	6.7721	1.6784
5	80.1524	10.5891	7.1662	2.0921
6	79.4253	10.5756	7.4950	2.5038

7	79.3271	10.6057	7.5043	2.5627
8	79.1695	10.7327	7.5183	2.5793
9	79.1438	10.7589	7.5182	2.5789
10	79.1318	10.7634	7.5259	2.5787
11	79.1238	10.7659	7.5251	2.5851
12	79.1119	10.7662	7.5263	2.5955
13	79.0948	10.7675	7.5282	2.6092
14	79.0808	10.7701	7.5291	2.6198
15	79.0722	10.7709	7.5295	2.6272
Variance Decomposition of RE_t				
Period	TB_t	RE_t	YD_t	YW_t
1	2.4860	97.5140	0.0000	0.0000
2	1.6115	98.3635	0.0009	0.0239
3	5.5652	88.6682	5.7200	0.0464
4	8.4502	81.3059	9.8395	0.4042
5	8.5533	79.2886	10.4859	1.6721
6	9.0268	76.6772	10.8376	3.4583
7	9.6740	73.6747	10.9551	5.6961
8	9.8114	71.3887	10.9488	7.8509
9	9.8747	69.3954	10.9877	9.7420
10	10.0424	67.6223	10.9940	11.3411

11	10.1699	66.2238	10.9436	12.6625
12	10.2691	65.1002	10.9272	13.7033
13	10.3853	64.1251	10.9618	14.5275
14	10.4979	63.2936	11.0136	15.1946
15	10.5927	62.5895	11.0700	15.7476
Variance Decomposition of YD_t				
Period	TB_t	RE_t	YD_t	YW_t
1	4.4968	0.2237	95.2793	0.0000
2	3.7925	0.5723	94.3580	1.2771
3	4.2174	1.3729	93.2670	1.1425
4	3.4231	3.5518	91.8707	1.1541
5	2.8054	7.7731	88.5078	0.9136
6	2.2944	10.7612	86.2095	0.7347
7	2.1471	12.5890	84.6643	0.5995
8	2.1715	14.7679	82.4869	0.5735
9	2.2057	17.1674	79.9339	0.6928
10	2.3335	19.2460	77.5095	0.9108
11	2.5154	21.0839	75.1697	1.2308
12	2.7098	22.8191	72.8493	1.6216
13	2.9247	24.4388	70.5709	2.0654
14	3.1607	25.9336	68.3673	2.5382

15	3.4007	27.3125	66.2601	3.0265
Variance Decomposition of YW_t				
Period	TB_t	RE_t	YD_t	YW_t
1	4.1251	1.4729	0.9082	93.4936
2	5.1781	1.8118	0.8250	92.1848
3	5.4195	1.2971	0.8888	92.3945
4	4.9175	1.3061	0.9496	92.8266
5	4.4808	2.9446	1.2587	91.3157
6	4.5550	4.9704	1.2063	89.2681
7	4.9941	6.4944	1.3378	87.1734
8	5.4897	8.0433	1.5348	84.9321
9	5.8390	9.5331	1.6886	82.9390
10	6.2070	10.7812	1.8683	81.1433
11	6.4931	11.8217	2.0289	79.6560
12	6.6986	12.6937	2.1650	78.4426
13	6.8571	13.4147	2.2677	77.4603
14	6.9920	14.0396	2.3451	76.6231
15	7.1016	14.6004	2.4051	75.8927

Figure-1. Plot of the CUSUM and CUSUMsq



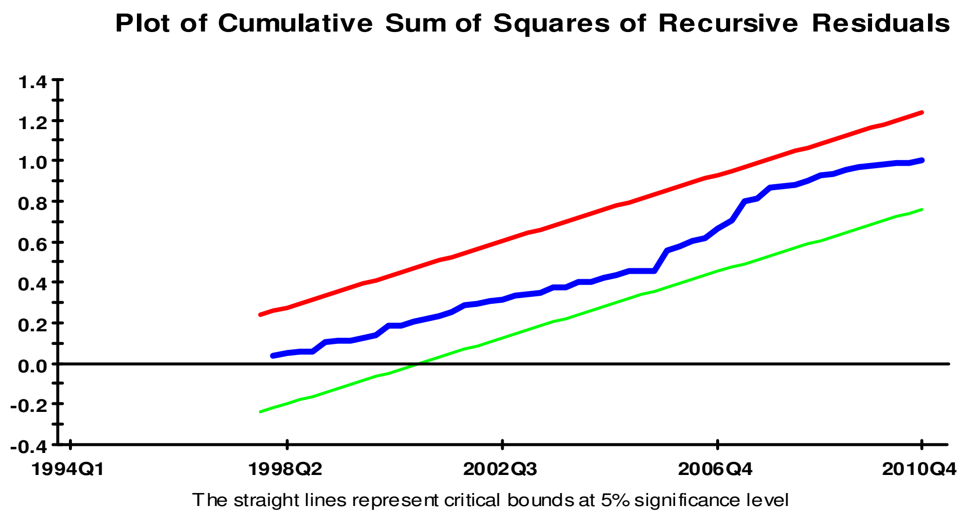


Figure-2. Impulse Response Function