Testing the J-Curve Hypothesis: A Case of Nepal[#]

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Abstract

This paper attempts to explore the J-curve phenomenon in the case of Nepalese foreign trade sector in order to examine whether devaluation[2] of Nepalese currency can be taken as a policy tool for improving Nepalese trade imbalance with the rest of the world economies. Johansen's cointegration test, vector autoregression (VAR) model, impulse response function as well as autoregressive distributed lag (ARDL) bounds testing cointegration approach has been employed in order to see the relationships between the nominal effective exchange rate index (NEER) and trade balance (TB) as well as the real effective exchange rate index (REER) and trade balance (TB) of Nepal. The study found no evidence of "J-curve" in the case of Nepalese trade. On the contrary to the "J-curve" phenomenon as explained by the classical text books, the findings of the study suggest that depreciation of Nepalese exchange rate rather produces a flatter "L-curve" phenomenon indicating that there is no room for improving Nepalese trade imbalance through a currency devaluation process.

Key Words: Trade Balance, Exchange Rate, Devaluation, J-Curve.

JEL Classification: C22, F14, O24.

[#] The earlier version of this paper is available at www.nrb.org.np under NRB Working Paper series, NRB-WP-27, 2015.

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[2] In this article, devaluation and depreciation as well as revaluation and appreciation have been treated as synonymous to each other.

Acknowledgement: *The author would like to thank the participants of 2nd International Conference on Economics and Finance (26-28 February 2015) organized by Nepal Rastra Bank in Kathmandu for their valuable comments/suggestions.*

I. INTRODUCTION

Nepal is a land-locked small and open economy. It has been engaging in foreign trade since time immemorial. India has been the largest trading partner of Nepal followed by China since the ancient period. Nepalese trade was basically confined to India and China (Tibet) during that period. However, despite a long history of involvement in foreign trade, the situation has not been improved yet. While, around two-third of Nepalese total trade has been concentrated to India, the share of trade with China accounts around 10 percent (Table-3, Annex) still in these days.

The huge concentration of Nepalese trade with India can be attributed to its proximity, sharing of long and open border, historical attachment, and freedom for cross-border movement of the people as well as linguistic, socio-cultural and religious similarities. However, despite sharing a long border, Nepalese trade with China has not been flourished as expected mainly due to the presence of inaccessible high Himalayas and rough/difficult terrain on the northern border. While, most of the Nepalese exports to China takes place through *Tatopani* Customs point, the majority of imports from China takes place through the sea route via India.

Notwithstanding a long history of involvement in trade activities, the nature and composition of Nepalese exports could not have got significant shift from agro-forestry based low value added primary commodities to capital based modern manufacturing products. Even if there are a few manufactured exportable items, they are incapable of providing the benefits that could have come from both the backward as well as forward linkages to the Nepalese economy (Chaulagai, 2014). Furthermore, most of the Nepalese exports are import dependent in the sense that the manufacturing of the exportable items depend heavily on the imported raw material[3], the price of which increases commensurate to either the devaluation/depreciation of Nepalese currency or increase in inflation in the countries of origin or mix of both.

The direction of Nepalese foreign trade has been reproduced in Table -1 (Annex). The table shows that Nepal has been facing persistent and widening trade deficit with both India and other countries. The export performance is more or less stagnant largely due to low export base, lion's share of low-value-added agro-forestry based exportable items, low domestic production activities due to various bottlenecks and lack of entrepreneurship in the country. However, on the contrary, the import has been increasing exponentially each year. The colossal increase in imports can be attributed to huge import base, (which is largely comprised of the daily consumer goods to high-value-added manufactured as well as capital and luxurious goods), increased domestic demand, basically, due to surge in remittance inflows and thereby change in the living style of the people, margin seeking attitude of the business men as well as a high dependence on imported raw materials for the production of the exportable items.

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[3] It is roughly calculated that around two-third of Nepalese exportable commodities use imported raw materials to different extents.

The data published by Nepal Rastra Bank, the central bank of Nepal, shows that the aggregate ratio of exports to imports of Nepal has been declining each year mainly due to the increase in the monetary value of imports compared to increase in the monetary value of exports (Chart-1). Similar situation can be seen in the case of India and other countries. The aggregate exports to imports ratio which was accounted to 49.0 percent in 1974/75, declined to 16.1 percent in 2011/12 and furthers slid down to 12.7 percent in 2013/14. The share of total trade with India has been increasing each year especially after 1996/97 and reached to 66.6 percent in 2013/14 from 65.1 percent in 2011/12 (Table-2, Annex). This shows that India has been the largest trading partner of Nepal and majority of Nepalese trade has been concentrated to India. Such a huge concentration of trade to a single economy may invite problems of different kinds in the country. Therefore, a need of diversification of trade, both commodity-wise and country-wise, has been felt strongly in order to gain from trade. However, despite long history of involvement in trade, such a diversification has not been achieved in the true sense yet.

Table-4 (Annex) shows some important facts about Nepalese foreign trade. It shows that the total imports which was only 2.0 fold higher than total exports in 1974/75, reached to 6.2 fold higher in 2011/12 and 7.8 times higher in 2013/14. Furthermore, the total annual exports which was able to finance 5.9 months of imports in 1974/75, decreased to 1.9 months in 2011/12 and further slid down to 1.5 months in 2013/14. Similarly, the total exports, which was able to finance 49.0 percent of imports in 1974/75, became able to finance only 12.7 percent of imports in 2013/14. The astonishing fact is that the earnings from total Nepalese exports even falls short to finance the import of petroleum products alone. While, such shortfall was by Rs. 19.68 billion in 2011/12, it increased to Rs. 42. 87 billion in 2013/14.

Chart-2 (Annex) shows the movement of NEER, REER and TB of Nepal since 1975 to 2013. It is obvious that the TB does not follow the NEER and it has been increasing rapidly irrespective of the depreciation of NEER throughout. On the similar ground, TB also did not have followed the REER up to 1990. The TB has been increasing incessantly irrespective of the depreciation of REER up to 2007 (compared to the level of 1990) and speedily appreciation thereafter.

II. LITERATURE REVIEW

The basic elasticity approach to balance of payments states that devaluation of home currency leads to an increase in exports, decrease in imports and thereby improvement in the balance of payments situation of the devaluing country. However, on the contrary, the popular J-curve hypothesis states that devaluation of the home currency leads to deterioration of the balance of payments of the devaluing country initially due to the increase in the value of imports compared to the increase in the value of exports; the balance of payments improves only in the long-run due to the operation of lag effects[4] coming from devaluation.

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[4] There may be a various types of lags. Some of them may be recognition lags, decision lags, delivery lags, replacement lags, and production lags and so on.

Many researchers have studied the J-curve phenomenon since a long back. The evidence that come out in the view from the literature are rather mixed. While, Ng, Har and Tan (2008) and Umoru and Eboreime (2013) found no evidence of J-curve phenomenon, Gupta-Kapoor and Ramakrishnan (1999), Bahmani-Oskooee and Kantipong (2001) and Petrović and Gligorić (2010) found little evidence of such phenomenon. Still, Ahmad and Jing (2004), Baek, Mullik and Koo (2006) and Hsing (2008) found a mixed result.

Gupta-Kapoor and Ramakrishnan (1999) have empirically tested the J-curve phenomenon using quarterly data for Japan between 1975:1 and 1996:4. The effect of an appreciation of yen on the ratio of imports to exports (M/X) was analyzed using an error correction model. The impulse response function indicated that the J-curve phenomenon was found to be true for Japan during the flexible exchange rate regime.

Bahmani-Oskooee and Kantipong (2001) investigated the J-Curve phenomenon between Thailand and her large trading partners that included Germany, Japan, Singapore, U.K and the U.S. Using quarterly data over 1973I-1997IV period and cointegration analysis they found the evidence of the J-Curve at least in the cases of U.S. and Japan.

Utilizing cointegration and causality tests the paper by Ahmad and Yang (2004) has tried to ascertain the long-run relatedness, and the short-run dynamics, between the real exchange rate, national income, and the trade balance using time series data on China's bilateral trade with the G-7 countries. The paper found some evidence that a real depreciation eventually improved the trade balance with some countries. But there was no indication of a negative short-run response which characterizes the J-curve.

Using autoregressive distributed lag (ARDL) model the study by Baek, Mullik and Koo (2006) examined the J-curve phenomenon for the U.S. agricultural trade and compared the effect on agricultural trade relative to the U.S. non-agricultural trade. For this purpose, bilateral trade data between the U.S. and her three major trading partners — Japan, Canada and Mexico had been used. The study found little evidence of the J-curve for the U.S. agricultural trade with Japan, Canada and Mexico. For the non-agricultural trade, on the other hand, the behavior of the U.S. trade with industrialized economies such as Japan and Canada followed the J-curve, but not with developing economies such as Mexico.

The study by Hsing (2008) found the evidence of a J-curve for Chile, Ecuador, and Uruguay. However, there was lack of support for a J-curve for Argentina, Brazil, Colombia, and Peru.

The paper by Ng, Har and Tan (2008) attempts to identify the relationship between the real exchange rate and trade balance in Malaysia from year 1955 to 2006 by using Unit Root Tests, Cointegration techniques, Engle-Granger test, Vector Error Correction Model (VECM), and impulse response analyses. The study found a long run relationship between trade balance and exchange rate. However, it failed to indicate any J-curve effect in Malaysia case.

The paper by Petrović and Gligorić (2010) showed that exchange rate depreciation in Serbia improved the trade balance in the long run despite it established a J-curve effect in the short run. Johansen's cointegration approach, autoregressive distributed lag approach, error correction models as well as impulse response functions were used to arrive at the conclusion.

Umoru and Eboreime (2013) have used the Bounds testing approach on time series data of over 40 years to explore the J-curve phenomenon on the Nigerian oil sector. However, this study reached at the conclusion that the standard J-curve hypothesis could not be validated for the Nigerian oil sector as the trade balance contemporaneously gained the improvement in the short-run.

III. METHODOLOGY

This paper uses Nepalese trade balance (TB) as the dependent variable and the index of Nepalese nominal effective exchange rate (NEER) as well as the index of Nepalese real effective exchange rate (REER) as independent variables. This paper does not include any other variable as the independent variable for the purpose of observing the pure effect coming out from the variables under consideration on Nepalese trade balance and to exclude any possible interference that would come out as a result of including more independent variables. This paper uses unit root testing, Johansen's cointegration analysis, vector autoregression (VAR) model, impulse response function as well as ARDL bounds testing approach to test the presence of J-curve phenomenon in the case of Nepalese foreign trade.

Unit Root Test

Let us assume a simple random walk model (RWM) as:

$$Y_t = \rho Y_{t-1} + u_t \qquad -1 \leq \rho \leq \quad \text{..........} \ (1)$$

Where u_t is a white noise error term.

If ρ equals 1, we face what is known as the unit root problem, that is, a situation of nonstationarity. If, however, $|\rho| \leq 1$, then the time series Y_t is said to be stationary. In practice, then, it is important to find out if a time series possesses a unit root.

By subtracting Y_{t-1} from both sides of equation 1 we obtain:

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + u_t = (\rho - 1)Y_{t-1} + u_t \quad \text{..........} \ (2)$$

Which can be alternatively written as:

$$\Delta Yt = \delta Y_{t-1} + u_t \quad \text{..........} \ (3)$$

Where $\delta = (\rho - 1)$ and Δ is the first-difference operator.

If $\delta = 0$, then $\rho = 1$, that is we have a unit root. It may be noted that if $\delta = 0$, then

$$\Delta Y_t = (Y_t - Y_{t-1}) = u_t \quad \text{..........} \ (4)$$

Since u_t is a white noise error term, it is stationary, which means that thefirst differences of a random walk time series are stationary.

The unit root is tested using Augmented Dicky-Fuller (ADF) test. The ADF test here consistsof estimating the following regression:

$$\Delta Y_t = \beta_1 + \beta_{2t} + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t \qquad \text{.......... (5)}$$

Where ε_t is a pure white noise error term and where $\Delta Y_{t-1} = (Y_{t-1} - Y_{t-2})$, $\Delta Y_{t-2} = (Y_{t-2} - Y_{t-3})$, etc. The number of lagged difference terms to include is often determined empirically, the idea being to include enough terms so that the error term in 5 is serially uncorrelated. In ADF we still test whether $\delta = 0$ and the ADF test follows the same asymptotic distribution as the DF statistic, so the same critical values can be used.

If the computed absolute value of the tau statistic ($|\tau|$) exceeds the DF or MacKinnon critical tau values, we reject the hypothesis that $\delta = 0$, in which case the time series is stationary. On the other hand, if the computed $|\tau|$ does not exceed the critical tau value, we do not reject the null hypothesis, in which case the time series is nonstationary. Make sure that you use the appropriate critical τ values Gujarati (2003).

Cointegration Analysis

Suppose a regression model like 6, where personal consumption expenditure (PCE) and personal disposable income (PDI) are individually I(1), that is they contain a unit root.

$$PCE_t = \beta_1 + \beta_2 PDI_t + u_t \qquad \text{.......... (6)}$$

Let us write this equation as:

$$u_t = PCE_t - \beta_1 - \beta_2 PDI_t \qquad \text{.......... (7)}$$

Suppose we now subject u_t to unit root analysis and find that it is stationary; that is I(0), then we can say that the two variables PCE and PDI are cointegrated.

Two variables will be cointegrated if they have a long-term, or equilibrium, relationship between them. A regression presented by equation 6 is known as a cointegrating regression and the slope parameter β_2 is known as the cointegrating parameter (Gujarati, 2003).

The VAR Model

The general form of the VAR model takes of the form (Gujrati 2003)-

$$M_{1t} = \alpha + \sum_{j=1}^{k} \beta_j M_{t-j} + \sum_{j=1}^{k} \gamma_j R_{t-j} + u_{1t} \qquad \text{.......... (8)}$$

$$R_t = \alpha' + \sum_{j=1}^{k} \theta_j M_{t-j} + \sum_{j=1}^{k} \gamma_j R_{t-j} + u_{2t} \qquad \text{.......... (9)}$$

Where, M_1 stands for money and R stands for interest rate and the u's are the stochastic error terms, called impulses or innovations or shocks.

Lag Selection and VAR Model

The VAR lag order selection criterion has been used to determine the length of lag to be chosen for the model. The lag length has been chosen using Akaike Information Criterion (AIC). The lag order selection criteria advised to take two lags in the case of TB and NEER and three lags in the case of TB and REER for the building the model. On the basis of the lag selection criterion, the following VAR models have been generated.

VAR model of TB with REER-

$$log(TB) = \alpha_0 + \alpha_1 log(TB)_{t-1} + \alpha_2 log(TB)_{t-2} + \alpha_3 log(TB)_{t-3} + \alpha_4 log(REER)_{t-1} + \alpha_5 log(REER)_{t-2} + \alpha_6 log(REER)_{t-3} \quad \text{.......... (10a)}$$

And the VAR model of TB with NEER-

$$log(TB) = \alpha_0 + \alpha_1 log(TB)_{t-1} + \alpha_2 log(TB)_{t-2} + \alpha_3 log(NEER)_{t-1} + \alpha_4 log(NEER)_{t-2} \quad \text{.......... (10b)}$$

Where, TB stands for Nepalese trade balance and,

$$TB = M - X \quad \text{.......... (11)}$$

Where, M stands for Nepalese total import and X stands Nepalese total export.

The ARDL Model

The general form of ARDL(p,q) model takes of the following form (Pesaran and Shin, 1997)-

$$y_t = \alpha_0 + \alpha_1 t + \sum_{i=1}^{p} \phi_i Y_{t-i} + \beta' X_t + \sum_{i=0}^{q-1} \beta_i^{*'} \Delta X_{t-i} + u_t \quad \text{.......... (12)}$$

$$\Delta X_t = P_1 \Delta X_{t-1} + P_1 \Delta X_{t-2} + \ldots\ldots\ldots. + P_s \Delta X_{t-s} + \varepsilon_t \quad \text{.......... (13)}$$

Where X_t is the *k*-dimensional I(1) variables that are not cointegrated among themselves, u_t and ε_t are serially uncorrelated disturbances with zero means and constant variance-covariances, and P_i are $k \times k$ coefficient matrices such that the vector autoregressive process in ΔX_t is stable.

Using the lags as advised by the lag selection criterion, the basic ARDL model with TB and REER, and TB and NEER takes of the form-

$$\Delta log(TB) = \beta_0 + \beta_1 \Delta log(TB)_{t-1} + \beta_2 \Delta log(TB)_{t-2} + \beta_3 \Delta log(TB)_{t-3} + \beta_4 \Delta log(REER)_{t-1} + \beta_5 \Delta log(REER)_{t-2} + \beta_6 \Delta log(REER)_{t-3} + \beta_7 log(TB)_{t-1} + \beta_8 log(REER)_{t-1} \quad \text{.......... (14a)}$$

And,

$$\Delta log(TB) = \beta_0 + \beta_1 \Delta log(TB)_{t-1} + \beta_2 \Delta log(TB)_{t-2} + \beta_3 \Delta log(NEER)_{t-1} + \beta_4 \Delta log(NEER)_{t-2} + \beta_5 log(TB)_{t-1} + \beta_6 log(NEER)_{t-1} \quad \text{.......... (14b)}$$

Where, TB stands for Nepalese trade balance (deficit). The REER and NEER indices have been calculated using the following formula-

$$REER= Ti*(CPIn/CPIi)*Ei +Tw*(CPIn/CPIw)*Ew \quad \text{.......... (15a)}$$

$$NEER= Ti*Ei +Tw*Ew \quad \text{.......... (15b)}$$

Where,

Ti = Nepalese trade share with India,
Tw = Nepalese trade share with countries other than India.
CPIn = Nepalese consumer price index
CPIi = Indian consumer price index
Ei = Amount of IC per unit of NC
CPIw = World consumer price index
Ew = Amount of USD per unit of NC

The Data

The time series data for Nepalese trade balance, share of trade and exchange rates have been derived from different publications like Quarterly Economic Bulletin (QEB) and Current Macroeconomic Situation published by the Nepal Rastra Bank. The data for Indian consumer price index (CPIi) and the world consumer price index (CPIw) have been derived from the International Financial Statistics (IFS) CD Rom, 2014. The REER and NEER indices have been calculated by using the formula represented by equations 15a and 15b respectively. In this case any increase in the REER or NEER index implies the real or nominal appreciation of the Nepalese Currency (NC) and vice-versa. The data series constitutes 39 observations ranging from 1975 to 2013.

IV. ANALYSIS OF THE RESULTS

Unit root testing

The ADF unit root testing procedure shows that all the time series variables suffer from the unit root problem at level. However, they have been found to be stationary at first difference, implying that they were integrated of the order one, i.e., I(1) (Table-5, Annex).

Cointegration Analysis

Johansen Cointegration approach has been employed to test the cointegration between the variables. The result of the Johansen cointegration test has been reproduced in Table-6 (Annex). The table demonstrates that both the trace and max-Eigen statistic show no cointegration between TB and REER as well as TB and NEER at 0.05 level. This indicates that there is no long-run relationship between TB and REER as well as TB and NEER.

VAR Analysis

The result from the VAR analysis shows that all the coefficients excluding the first lag of the TB are insignificant. In the case of REER and NEER, all the lags are found to be statistically insignificant individually (Equation 16a and 16b) as well as jointly (as shown by the result of the Wald test, Table-7, Annex). This confirms that the lags of REER as well as NEER cannot influence TB individually as well as jointly in the short-run confirming that there is no short-run causality running from REER/NEER to TB.

$$log(TB) = 1.09log(TB)_{t-1}* - 0.02log(TB)_{t-2} - 0.07log(TB)_{t-3} - 0.33log(REER)_{t-1} - 0.06log(REER)_{t-2} + 0.62log(REER)_{t-3} - 0.87 \quad .... (16a)$$

$$log(TB) = 1.09log(TB)_{t-1}* - 0.11log(TB)_{t-2} + 0.03log(NEER)_{t-1} - 0.06log(NEER)_{t-2} - 0.53 \quad .... (16b)$$

* denotes significant at 5 % level (All the rest of the coefficients are found to be insignificant).

As the residuals of the VAR model are normally distributed and they are also free from the problem of serial correlation as well as Heteroskedasticity (Table-8, Annex), the results are acceptable. The result from the CUSUM test further shows that the model is stable (Chart-3a & 3b, Annex). The impulse response function (Cholesky dof adjusted method) shows that when a positive shock of one standard deviation is given to REER/NEER, the TB responses negatively and it lasts at least for up to 10 periods/years ahead (Chart-4a & 4b, Annex). That is, TB response negatively to any positive shock on REER as well as NEER. It means that when REER/NEER goes up or appreciates, TB will go down continuously. Or, putting it in another way around, when REER/NEER decreases or depreciates, TB increases continuously in the future. This gives rise to a flatter "L" shaped curve in response to the devaluation of the exchange rate in contrary to the textbook type "J- curve" phenomenon.

ARDL Analysis

$$\Delta log(TB) = -0.467 + 0.135\Delta log(TB)_{t-1} + 0.007\Delta log(TB)_{t-2} + 0.301\Delta log(TB)_{t-3} - 0.505\Delta log(REER)_{t-1} + 0.124\Delta log(REER)_{t-2} - 0.768\Delta log(REER)_{t-3} + 0.005log(TB)_{t-1} + 0.107log(REER)_{t-1} \quad .... (17a)$$

$$\Delta log(TB) = 0.68 + 0.063\Delta log(TB)_{t-1} + 0.04\Delta log(TB)_{t-2} + 0.03\Delta log(NEER)_{t-1} - 0.21\Delta log(NEER)_{t-2} - 0.03log(TB)_{t-1} - 0.04log(NEER)_{t-1} \quad .... (17b)$$

Note: none of the coefficients are found to be significant.

The result from the ARDL model demonstrates that none of the short-run as well as long-run coefficients are individually significant (Equation 17a & 17b). Similarly, the Wald test (Table-9, Annex) shows that all the lags of the REER as well as NEER also cannot influence the TB jointly. Furthermore, as the computed Wald F-statistic, for first lags of TB and REER as well as TB and NEER, are below the lower critical bound of 4.94 (Table-10, Annex), the bounds test indicates that there is no steady-state long-run relationship between TB and NEER.

As the residuals of the ARDL model are normally distributed and they are also free from the problem of serial correlation as well as Heteroskedasticity (Table-11, Annex), the result is acceptable. The result from the CUSUM test (Chart-5a & 5b, Annex) further shows that the models are stable. Therefore, the results came out from the ARDL models is also acceptable.

V. CONCLUSION

The cointegration analysis and the result of the ARDL bounds test show that there is no cointegration or the long-run relationship between REER and TB as well as NEER and TB. Similarly, the result of the VAR Wald test suggests that there is no short-run causality running from REER/NEER to TB. The graphical representation of the NEER and TB also demonstrates that the nominal depreciation of exchange cannot be any effective tool to improve Nepalese trade imbalance. Furthermore, the result from the impulse response function demonstrates that there is no presence of "J-curve" phenomenon in response to the devaluation of the exchange rate in the case of Nepal. On the contrary, it shows that devaluation of the exchange rate rather gives rise to a flatter "L-curve" phenomenon: a sharp divergence from the conventionally accepted view in the arena of the International Economics.

Thus, the result confirms that devaluation of nominal exchange rate never improves Nepalese trade deficit, rather exacerbates it persistently by boosting the monetary payments for import further up. Putting it alternatively, Nepalese trade imbalance rather improves with the appreciation of the Nepalese nominal exchange rate, *ceteris paribus*. Though this seems to be inconsistent, it is not implausible in the sense that appreciation of the nominal exchange rate makes the import much cheaper requiring lesser amount of payments to be made to the foreigners. Though it seems to be contradictory theoretically, it is possible practically in the situation where Nepal needs to import most of the commodities to fulfill its domestic demand and the volume of Nepalese import accounts more than eight times higher than its exports.

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Annexes

Table-1
Direction of Nepalese Foreign Trade

Rs in Million

FY	Exports, f.o.b.			Imports, c.i.f.			Trade Balance		
	Total	India	Other	Total	India	Other	Total	India	Other
1974/75	889.6	746.7	142.9	1,814.6	1,475.7	338.9	-925.0	-729.0	-196.0
1975/76	1,185.8	893.7	292.1	1,981.7	1,227.1	754.6	-795.9	-333.4	-462.5
1976/77	1,164.7	779.6	385.1	2,008.0	1,343.5	664.5	-843.3	-563.9	-279.4
1977/78	1,046.2	498.1	548.1	2,469.6	1,534.1	935.5	-1,423.4	-1,036.0	-387.4
1978/79	1,296.8	650.1	646.7	2,884.7	1,581.7	1,303.0	-1,587.9	-931.6	-656.3
1979/80	1,150.5	520.9	629.6	3,480.1	1,786.4	1,693.7	-2,329.6	-1,265.5	-1,064.1
1980/81	1,608.7	992.4	616.3	4,428.2	2,179.0	2,249.2	-2,819.5	-1,186.6	-1,632.9
1981/82	1,491.5	994.4	497.1	4,930.3	2,280.9	2,649.4	-3,438.8	-1,286.5	-2,152.3
1982/83	1,132.0	843.3	288.7	6,314.0	2,499.6	3,814.4	-5,182.0	-1,656.3	-3,525.7
1983/84	1,703.9	1,160.7	543.2	6,514.3	3,058.0	3,456.3	-4,810.4	-1,897.3	-2,913.1
1984/85	2,740.6	1,601.7	1,138.9	7,742.1	3,895.8	3,846.3	-5,001.5	-2,294.1	-2,707.4
1985/86	3,078.0	1,241.1	1,836.9	9,341.2	3,970.9	5,370.3	-6,263.2	-2,729.8	-3,533.4
1986/87	2,991.4	1,302.6	1,688.8	10,905.2	4,262.0	6,643.2	-7,913.8	-2,959.4	-4,954.4
1987/88	4,114.5	1,567.6	2,546.9	13,869.6	4,595.7	9,273.9	-9,755.1	-3,028.1	-6,727.0
1988/89	4,195.3	1,034.9	3,160.4	16,263.7	4,238.7	12,025.0	-12,068.4	-3,203.8	-8,864.6
1989/90	5,156.2	602.5	4,553.7	18,324.9	4,674.5	13,650.4	-13,168.7	-4,072.0	-9,096.7
1990/91	7,387.5	1,552.2	5,835.3	23,226.5	7,323.1	15,903.4	-15,839.0	-5,770.9	-10,068.1
1991/92	13,706.5	1,450.0	12,256.5	31,940.0	11,245.5	20,694.5	-18,233.5	-9,795.5	-8,438.0
1992/93	17,266.5	1,621.7	15,644.8	39,205.6	12,542.1	26,663.5	-21,939.1	-10,920.4	-11,018.7
1993/94	19,293.4	2,408.9	16,884.5	51,570.8	17,035.4	34,535.4	-32,277.4	-14,626.5	-17,650.9
1994/95	17,639.2	3,124.3	14,514.9	63,679.5	19,615.9	44,063.6	-46,040.3	-16,491.6	-29,548.7
1995/96	19,881.1	3,682.6	16,198.5	74,454.5	24,398.6	50,055.9	-54,573.4	-20,716.0	-33,857.4
1996/97	22,636.5	5,226.2	17,410.3	93,553.4	24,853.3	68,700.1	-70,916.9	-19,627.1	-51,289.8
1997/98	27,513.5	8,794.4	18,719.1	89,002.0	27,331.0	61,671.0	-61,488.5	-18,536.6	-42,951.9
1998/99	35,676.3	12,530.7	23,145.6	87,525.3	32,119.7	55,405.6	-51,849.0	-19,589.0	-32,260.0
1999/00	49,822.7	21,220.7	28,602.0	108,504.9	39,660.1	68,844.8	-58,682.2	-18,439.4	-40,242.8
2000/01	55,654.1	26,030.2	29,623.9	115,687.2	54,700.9	60,981.3	-60,028.1	-28,670.7	-31,357.4
2001/02	46,944.8	27,956.2	18,988.6	107,389.0	56,622.1	50,766.9	-60,444.2	-28,665.9	-31,778.3
2002/03	49,930.6	26,430.0	23,500.6	124,352.1	70,924.2	53,427.9	-74,421.5	-44,494.2	-29,927.3
2003/04	53,910.7	30,777.1	23,133.6	136,277.1	78,739.5	57,537.6	-82,366.4	-47,962.4	-34,404.0
2004/05	58,705.7	38,916.9	19,788.8	149,473.6	88,675.5	60,798.1	-90,767.9	-49,758.6	-41,009.3
2005/06	60,234.1	40,714.7	19,519.4	173,780.3	107,143.1	66,637.2	-113,546.2	-66,428.4	-47,117.8
2006/07	59,383.1	41,728.8	17,654.3	194,694.6	115,872.3	78,822.3	-135,311.5	-74,143.5	-61,168.0
2007/08	59,266.5	38,555.7	20,710.8	221,937.7	142,376.5	79,561.2	-162,671.2	-103,820.8	-58,850.4
2008/09	67,697.5	41,005.9	26,691.6	284,469.6	162,437.6	122,032.0	-216,772.1	-121,431.7	-95,340.4
2009/10	60,824.0	39,993.7	20,830.3	374,335.2	217,114.3	157,220.9	-313,511.2	-177,120.6	-136,390.6
2010/11	64,338.5	43,360.4	20,978.1	396,175.5	261,925.2	134,250.3	-331,837.0	-218,564.8	-113,272.2
2011/12	74,261.0	49,616.3	24,644.7	461,667.7	299,389.6	162,278.1	-387,406.7	-249,773.3	-137,633.4
2012/13	76917.1	50999.8	25917.3	556740.3	367031.3	189709.0	-479823.2	-316031.5	-163791.7
2013/14	90292.3	59417.3	30875.0	708761.8	472730.6	236031.2	-618469.5	-413313.3	-205156.2

Source: NRB (2014) Quarterly Economic Bulletin, 48(4), Nepal Rastra Bank.

Table 2
Some Important Ratios of Nepalese Trade

Some Important Ratios	1974/75	2011/12	2012/13	2013/14
1. Ratio of Exports to Import	49.0	16.1	13.8	12.7
India	50.6	16.6	13.9	12.6
Other Countries	42.2	15.2	13.7	13.1
2. Share in Total Exports				
India	83.9	66.8	66.3	65.8
Other Countries	16.1	33.2	33.7	34.2
3. Share in Total Imports				
India	81.3	64.8	65.9	66.7
Other Countries	18.7	35.2	34.1	33.3
4. Share in Trade Balance				
India	78.8	64.5	65.9	66.8
Other Countries	21.2	35.5	34.1	33.2
5. Share in Total Trade				
India	82.2	65.1	66.0	66.6
Other Countries	17.8	34.9	34.0	33.4
6. Share of Exports and Imports in Total Trade				
Exports	32.9	13.9	12.1	11.3
Imports	67.1	86.1	87.9	88.7

Source: NRB(2014) Current Macroeconomic Situation, Based on Annual Data 2013/14, Nepal Rastra Bank.

Table-3
Direction of Foreign Trade (First Five Months)

(Rs. in million)

PARTICULARS	2012/13	2013/14	2014/15	Percent Change	
				2013/14	2014/15
TOTAL EXPORTS	**32875.6**	**37366.5**	**36912.4**	**13.7**	**-1.2**
To India	20617.7	24212.8	22804.3	17.4	-5.8
To China	1123.0	1026.5	1421.5	-8.6	38.5
To Other Countries	11134.9	12127.2	12686.6	8.9	4.6
TOTAL IMPORTS	**225392.4**	**270354.1**	**318523.3**	**19.9**	**17.8**
From India	144487.6	178003.2	203994.7	23.2	14.6
From China	29230.2	30900.3	43034.2	5.7	39.3
From Other Countries	51674.6	61450.6	71494.4	18.9	16.3
TOTAL TRADE BALANCE	**-192516.8**	**-232987.6**	**-281610.9**	**21.0**	**20.9**
With India	-123869.9	-153790.4	-181190.4	24.2	17.8
With China	-28107.2	-29873.8	-41612.7	6.3	39.3
With Other Countries	-40539.7	-49323.4	-58807.8	21.7	19.2
TOTAL FOREIGN TRADE	**258268.0**	**307720.6**	**355435.7**	**19.1**	**15.5**
With India	165105.3	202216.0	226799.0	22.5	12.2
With China	30353.2	31926.8	44455.7	5.2	39.2
With Other Countries	62809.5	73577.8	84181.0	17.1	14.4

Source: NRB (2015), Current Macroeconomic Situation, Based on Five Month's Data of 2014/15, Nepal Rastra Bank.

Table-4
Some Important Facts about Nepalese Foreign Trade

Particulars	1974/75	2011/12	2012/13	2013/14
Import-Export Ratio	2.0	6.2	7.2	7.8
Import financed by total exports (months)	5.9	1.9	1.7	1.5
Import financed by total exports (%)	49.0	16.1	13.8	12.7
Total exports- Imports of petroleum products (Rs. in million)	-	-19676.7	-32483.4	-42872.1

Source: NRB (2014), Current Macroeconomic Situation, Based on Annual Data 2013/14, Nepal Rastra Bank.

Table 5
Results of the Unit Root Testing

Variable Name	T statistic	1%	5%	10%	Max. lag	Prob	Decision
Log(REER) at Level and Intercept	-1.072740	-3.621023	-2.943427	-2.610263	9	0.7162	Unit Root
Log(REER) at First Difference and Intercept	-5.586099	-3.621023	-2.943427	-2.610263	9	0.0000	No Unit Root
Log(NEER) at Level and Intercept	-1.168841	-3.615588	-2.941145	-2.609066	9	0.6778	Unit Root
Log(NEER) at First Difference and Intercept	-4.568992	-3.621023	-2.943427	-2.610263	9	0.0008	No Unit Root
Log(TB) at Level and Intercept	-1.280893	-3.621023	-2.943427	-2.610263	9	0.6281	Unit Root
Log(TB) at First Difference and Intercept	-6.264713	-3.621023	-2.943427	-2.610263	9	0.0000	No Unit Root

Table 6
Results of the Cointegration Analysis

Variables	Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic			Max-Eigen Statistic		
			Value	0.05 Critical Value	Prob.	Value	0.05 Critical Value	Prob.
Log(TB) and Log(NEER)	None	0.193743	7.675040	15.49471	0.5008	7.106626	14.26460	0.4766
	At most 1	0.017077	0.568414	3.841466	0.4509	0.568414	3.841466	0.4509
Log(TB) and Log(NEER)	None	0.154395	7.814953	15.49471	0.4854	6.037316	14.26460	0.6084
	At most 1	0.048180	1.777637	3.841466	0.1824	1.777637	3.841466	0.1824

Table 7
VAR Wald Test

Variables	Null Hypothesis	F Statistic	Chi-square	Decision
REER	C(4)=C(5)=C(6)=0	0.596874 (0.6222)	1.790623 (0.6170)	No Short-run Causality
NEER	C(3)=c(4)=0	0.022301 (0.9780)	0.044601 (0.9779)	No Short-run Causality

Table 8
Residual Diagnostic Test for VAR Model

For Log(TB)= f(Log(REER))			
Test Statistic	**Tests**		
	Breusch-Godfrey Serial Correlation (LM Test)	Breusch-Pagan-Godfrey Heteroskedasticity Test	Jarque-Bera Normality Test
F Statistic	0.401569 (0.6732)	0.151014 (0.9874)	
Obs*R-squared	1.039917 (0.5945)	1.090716 (0.9819)	0.796142 (0.671614)
For Log(TB)= f(Log(NEER))			
F Statistic	0.506768 (0.6075)	0.292459 (0.8807)	
Obs*R-squared	1.209177 (0.5463)	1.304919 (0.8605)	0.498333 (0.779450)

Note: Values in parentheses are the corresponding probability values.

Table 9
Wald Test for ARDL Short-Run Coefficients

Variable	Null Hypothesis	F-Statistic	Chi-Square
Log(REER)	C(5)=C(6)=C(7)=0	0.565855 (0.6424)	1.697566 (0.6375)
Log(NEER)	C(4)=(5)=0	0.095797 (0.9089)	0.191594 (0.9086)

Note: Figures in the parenthesis are probability values.

Table 10
Bound Wald F-Test

Variables	Null Hypothesis	Critical Values		Wald F Statistic	Decision
		I(0)	I(1)		
$Log(TB)_{t-1}$ and $log(REER)_{t-1}$	C(8)=C(9)=0	4.94	5.73	0.050619	No Cointegration
$Log(TB)_{t-1}$ and $Log(NEER)_{t-1}$	C(6)=C(7)=0	4.94	5.73	0.734469	No Cointegration
5% critical values cited from Pesaran, shin and Smith (2001), Table CI (iii), Case III, Unrestricted Intercept and no Trend					

Table 11
Residual Diagnostic Test for ARDL Model

For TB=f(REER)			
Test Statistic	**Tests**		
	Breusch-Godfrey Serial Correlation (LM Test)	Breusch-Pagan-Godfrey Heteroskedasticity Test	Jarque-Bera Normality Test
F Statistic	1.863676 (0.1769)	0.522197 (0.8288)	
Obs*R-squared	4.705004 (0.0951)	4.845159 (0.7740)	2.475728 (0.297344)
For TB= f(NEER)			
F Statistic	1.341122 (0.2784)	0.163824 (0.9844)	
Obs*R-squared	3.253150 (0.1966)	1.180206 (0.9779)	0.900020 (0.637622)

Note: Values in parentheses are the corresponding probability values.

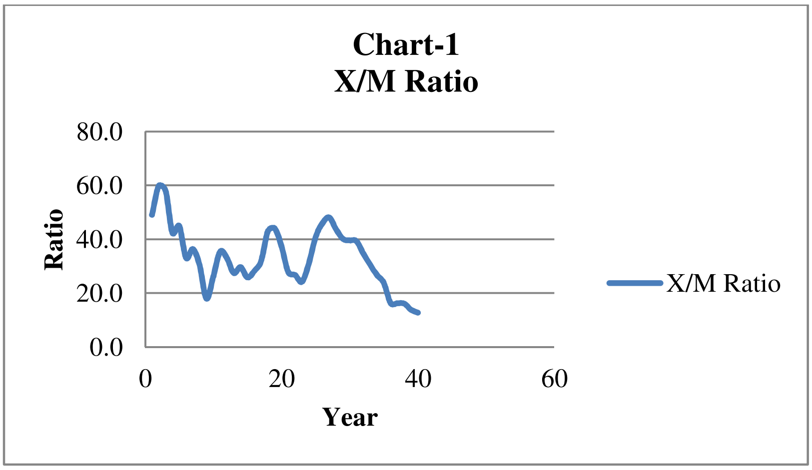
Chart-1
X/M Ratio
Ratio
80.0
60.0
40.0
20.0
0.0
0
20
40
60
Year
X/M Ratio

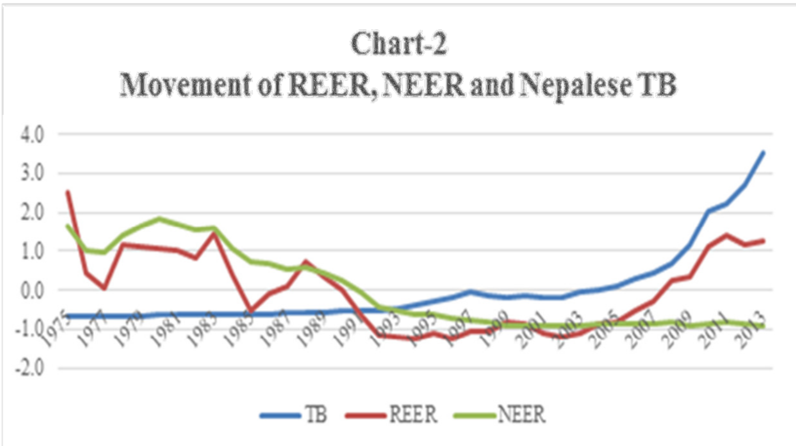
Chart-2
Movement of REER, NEER and Nepalese TB
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
TB
REER
NEER

Chart-3 (a)
CUSUM TEST for VAR Model [Log(TB)=f(Log(REER))]

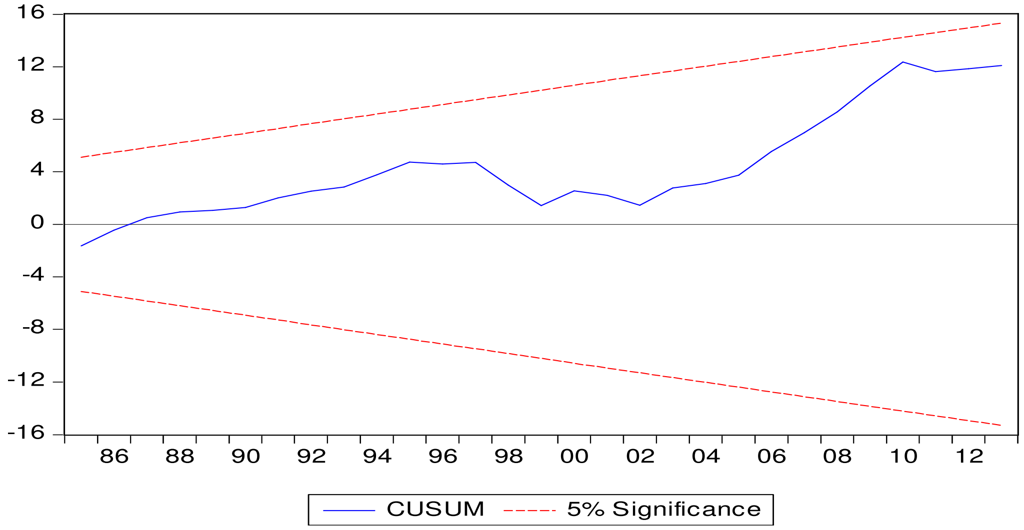

Chart-3 (b)
CUSUM TEST for VAR Model [Log(TB)=f(Log(NEER))]

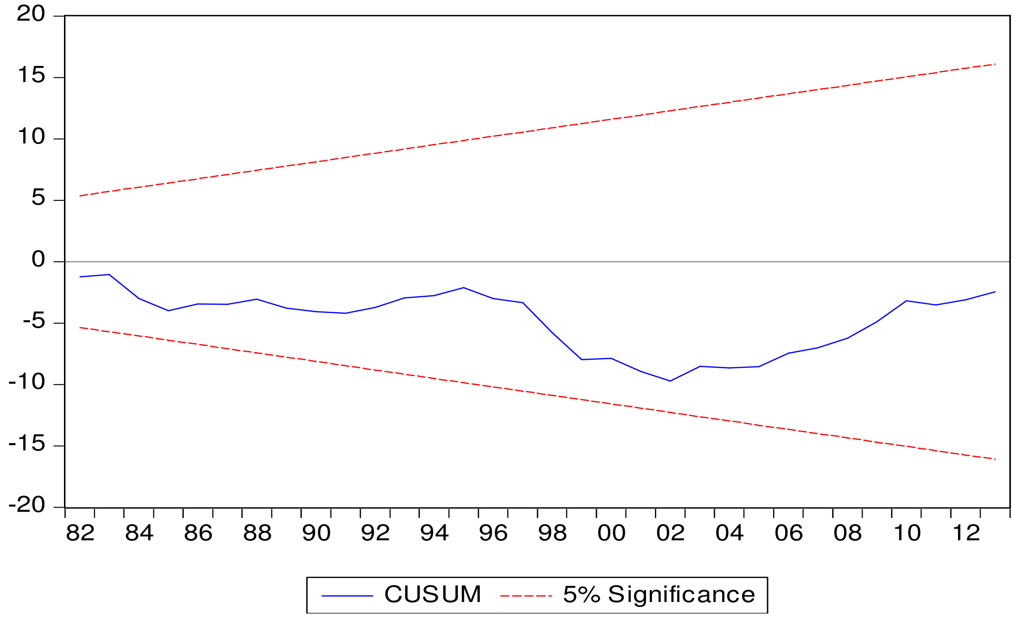

Chart-4 (a)

Response of LOG(TB) to Cholesky
One S.D. LOG(REER) Innovation

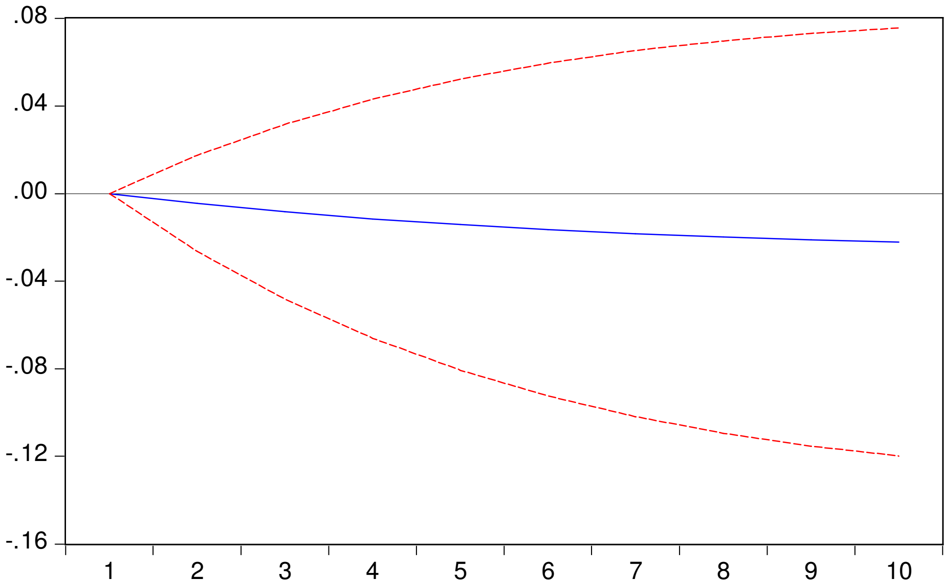

Chart – 4 (b)

Response of LOG(TB) to Cholesky
One S.D. LOG(NEER) Innovation

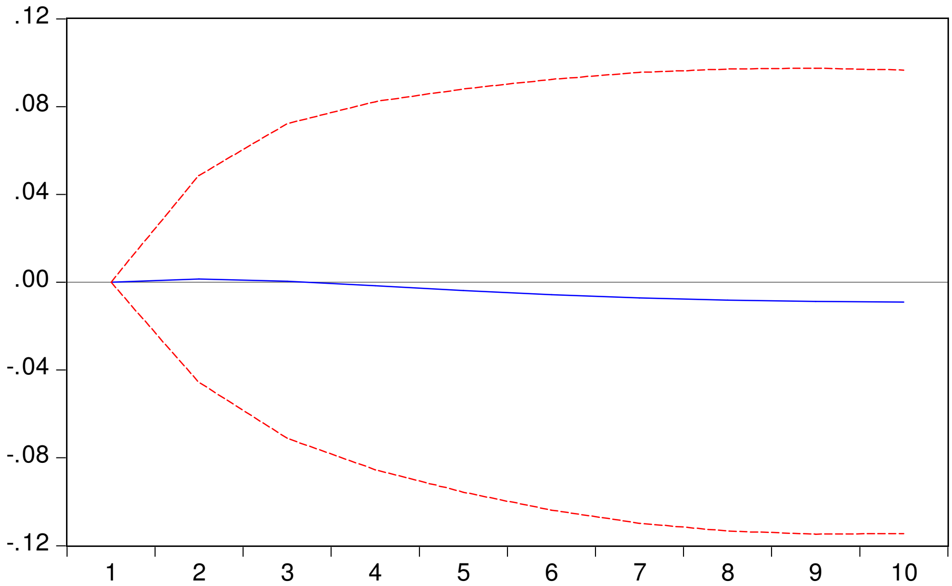

Chart-5 (a)
CUSUM Test for ARDL Model [TB=f(REER)]

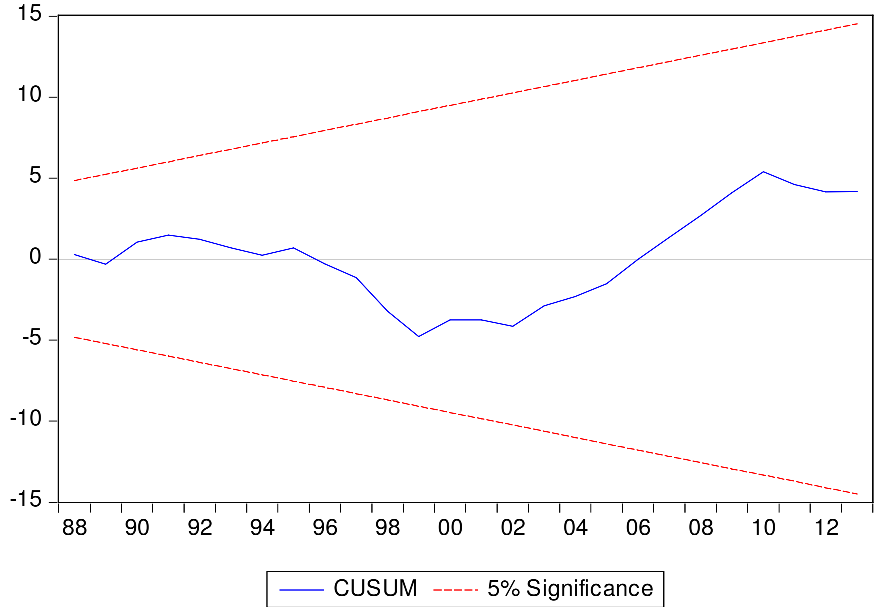

Chart-5 (b)
CUSUM Test for ARDL Model [TB=f(NEER)]