Trade Balance and Exchange Rate Nexus: Evidence from India

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Abstract

The present paper attempts to study the impact of exchange rate fluctuations on India's trade balance from 2000 to 2020. The main objective of this paper is to test the validity of the J-Curve and examine the impact of other related variables on trade balance as well. An estimation strategy based on bounds tests and an error correction model in a symmetrical framework was employed to do so. The results do not show any evidence of'J-Curve' phenomenon in India. In addition, the results reveal that domestic GDP negatively impacts the trade balance, while foreign income and exchange rate have a positive impact on the balance of trade in the long run.

Keywords: Exchange rate, Balance of Trade, J-curve, ARDL

Introduction:

The fluctuations in exchanges rate have long been identified as apprehension for an economy's macroeconomic stability. However, with the onset of the generalized floating period, the area of attention has shifted significantly. Exchange rate fluctuations affect both exports and imports of a country, therefore affecting its trade balance. According to international trade theories, a currency devaluation or depreciation in a country would make imports expensive and exports cheaper and, thus improve the trade balance. However, improvement in the country's trade balance does not take place immediately after devaluation or depreciation. Because prior contracts or purchases for export and import quantities stay unaltered during the period of depreciation, while as price adjustments have an immediate effect. As a result, a decline in the value of export profits results in an increase in the value of import payments, worsening the trade balance in the short term. However, when modifications to quantity and pricing are made over time, an improvement is shown. This brief worsening in a country's trade balance followed by an improvement resulting from currency depreciation/ devaluation is commonly referred to as the "J-curve" effect in the economic literature.

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Exchange rate theoretically impacts the balance of trade that may be examined with regard to the condition of Marshall-Lerner (M-L) and the "J-curve" effect. As stated by Marshall and Abba Learner, the former says that if the summation of demand elasticity for imports and exports is greater than one currency, depreciation/ devaluation will improve the trade balance. On the one hand, if the amount is exactly equal to one, the trade balance will remain unchanged in the case of depreciation (devaluation). On the other hand, if the demand elasticities of imports and exports are less than one, meaning that the Marshall Learner condition does not hold, depreciation (devaluation) will worsen the trade balance. However, scholars (Arize, 1990; Warner and Kreinin., 1983) have consistently demonstrated that the Marshall-Learner requirement is easily fulfilled; hence, depreciation or devaluation improves an economy's trade balance in the long run. Additionally, the "J-curve" effect posits that, due to the intrinsic character of individuals, there will be an initial deterioration of the balance of trade in the short run following currency devaluation (depreciation), but will show improvement in the long-run.

In this context, this study examines the movements of the exchange rate on the balance of trade in India from 2000 to 2020. The Auto-regressive distributed lag model (ARDL) will be used. The existing paper will not confine the potential of a symmetric relationship to exchange rates and trade balances only but will also investigate the influence of other factors such as domestic and foreign income growth symmetrically.

Literature Review

Professionals in international finance agree that actual exchange rate fluctuations affect the trade balance over the long run (Bahmani-oskooee, Parray et al., (1992, 2001); Himarios (1989); Rawlins and Praveen, (2000); Hasan and Khan, (1994); Bahmanii-oskooe and Ratha, (2004); Waliullah et al., (2010); Bhat and Bhat (2020) and Shahbaz et al. (2011). In particular, evidence implies that currency devaluation/depreciation improves the trade balance in the long run, Baharumshah (2001,2002), Bahmani-oskooee (2001), Lal and Lowinger (2003), Tochitskaya (2005) and Onafowora (2003).

Linda and Daniel (2019) examine the trade balance in post-liberalization Ghana using symmetric and asymmetric models to analyze data from 1984 to 2015. Both specifications demonstrate the absenteeism of the "J-curve" effect and the M-L condition. However, after applying the asymmetric model, Sajad and Javed (2020) presented no evidence of "J-curve" in the Indian case. Moses et al. (2020) investigated the symmetric and asymmetric effect of real exchange

rate on Kenya's balance of trade by using quarterly data from 2006(Q1) to 2018 (Q4) with its 30 major trading partners. The results showed that the "J-curve" effect was evident in 13 cases.

Doojav (2018) used a VECM model to investigate the impact of the currency exchange rate on Mongolia's trade surplus or deficit. The results were consistent with the Marshal-Lerner condition, suggesting that a depreciation or devaluation of the Mongolian tugrik could lead to a net gain in trade surplus in the long run. The research indicates that a flexible exchange rate can effectively manage exchange rate risk and current account deficits. Additionally, Asteriou et al. (2016) used monthly data from 1995-2012 to examine the impact of exchange rate fluctuations on international trade for Indonesia, Mexico, Nigeria, and Turkey, employing the GARCH and ARDL techniques for short-run and long-run analysis, respectively. Except for Turkey, the findings indicated no long-term relationship between the studied nations' exchange rate volatility and foreign trade. On the other hand, in the short run, a robust causal correlation between volatility and international trade for Indonesia and Mexico was found, while for Nigeria, just a one-way causal relationship, from export demand to volatility was witnessed.

Data and Econometric Methodology

The Autoregressive distributed lag model (ARDL) framework proposed by Shin et al., (2001) has been implemented in this investigation. It was decided to use this method due to a number of factors. No matter what order variables are integrated in, the method always yields the consistent findings, but not orders greater than one, either I(0) or I(1) or a mix of both. Although some regressors may be endogenous, it generates unbiased estimates and stable t-statistics across time. The estimating method ARDL works quite well in investigations with small samples, like the one used here. This method also permits the determination of optimal lags between dependent and explanatory variables, which in turn permits the establishment of optimal lags between the rates at which dependent and explanatory variables are balanced by means of individual adjustments to the various variables. The general ARDL model is represented as follows:

$$\Delta E = \alpha_0 + \delta_1 t + \delta_2 E_{t-1} + \delta_3 M_{t-1} + \sum_{t=1}^{n} \beta_i \Delta E_{t-1} + \sum_{t=1}^{n} \theta_i \Delta M_{t-1} + \mu_t \qquad (5)$$

In this equation, E is the explanatory variable, M is a vector of independent variables, t is time, and μ_t is the disturbance term. F-test statistics is used to check the long-run association between the variables. The absence of cointegration among the variables is represented by the null hypothesis $H_0: \delta_1 = \delta_2 = \delta_3 = 0$ against$H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq 0$. In this case, we use a critical value bounds test, which relies on the specific sequence in which the variables are integrated. If

the F-statistic value is greater than the critical values we say that cointegration does not exist. If it is below the critical values, we say that long run cointegration exits among the variables. If the value is in between the critical values then no conclusion can be drawn. After that we estimate the parameters that describe the long run association between the variables. The error correction model (ECM) is the next step in the estimating process since it estimates the short-run and long-run connections between parameters inside the ARDL framework.

Data Description

This analysis used the annual time series data collected from 2000 to 2020. The data on the exchange rate was extracted from the international monetary fund (IMF) and all other variables were extracted from the World Development Indicators (WDI). The ratio of exports to imports was used as a proxy for trade balance (Bhat and Bhat 2020, Bahmani-Oskooee, 1991, 2001; Akoto & Sakyi, 2019).

Results and Discussions:

Stationarity tests:

Both the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests were employed to ensure that the variables in this analysis were stationary. It is evident from Table 1 that all variables are stationary at 1(0) and 1(1), which justifies the use of the ARDL approach in this study.

Table 1: Unit Root Test, ADF and PP Test

	ADF Test		PP Test	
Variables	**T-Statistics**	**P-Value**	**T-Statistics**	**P-Value**
LTB	-1.48	0.391	-1.49	0.438
D.LTB	-6.98	0.000	-6.47	0.000
LGDP	-3.01	0.005	-3.67	0.000
D.GDP	-11.01	0.001	-11.00	0.005
LE	-2.98	0.028	-3.21	0.023
D.LE	-9.11	0.001	-8.11	0.025
LFI	-1.10	0.610	-1.19	0.689
D.LFI	-2.94	0.000	-3.82	0.037

Source: Authors own calculations based on secondary data extracted from (IMF) and (WDI).

Note: D denoted the first difference.

Cointegration test

The ARDL model is based on Akaike Info Criterion (AIC). The F-statistics exceeds the critical values for 10, 5, 2.5, and 1 percent significance levels as shown in table 2. Thus, there is long run relationship among the model variables.

Table 2: Result of Cointegration Relationship

Model	F-statistic	I(0)	I(1)	Decision
LTB (LE, LGDP, LFI)	9.32			
Critical Values				
10%		3.13	4.15	Cointegration Exists
5%		3.56	4.48	
2.5%		3.96	5.16	
1%		4.39	5.69	

Source: Authors Calculations based on secondary data extracted from (IMF) and (WDI).

Discussion of Results

Having established the presence of Cointegration, as depicted in table 2, there exists a long-run relationship among the variables since Phillips-Perron-t and Augmented Dickey-Fuller t are statistically significant either at level or at first difference.

ARDL results from table 3, shows the short-run and long-run effects of E, GDP, and FI on the country's trade balance. To begin with the impact of exchange rate changes on the trade balance in the short-run, it is found that that the exchange rate exerts a negative but insignificant effect on TB. The negative sign shows a deterioration of the trade balance followed by an increase in the exchange rate. The impact of domestic GDP is statistically significant, implying that an increase in domestic GDP will improve the trade balance in the short run i.e., increase in GDP will encourage exports more than imports. However, the impact of foreign income is insignificant. A significant error correction term (-0.446) with a negative sign indicates a stable long-run relationship, suggesting that disequilibrium is corrected by 44.6% per year.

The results further reveal that in the long run, the exchange rate's impact is positive and significant. The positive sign on the exchange rate variables indicates that currency depreciation improves the trade balance and appreciation deteriorates it in the long run. This is consistent with the findings of (Aziz, 2008; Sund Chu, 2010 and Bhat and Bhat 2020). The outcome of this study does not provide an indication of the 'J-curve' phenomena in India. The impact of domestic GDP

is negative and statistically significant. This implies that as the economy grows, the demand for imported goods increases, as predicted by the theory. The easing of import restrictions has resulted in the emergence of a new generation of domestic customers. Import demand responds far more positively to GDP growth than export demand does to exchange rate depreciation. Thus, the net effect on the trade balance is negative. This conclusion is consistent with the Keynesian idea that as income rises, imported products' consumption grows, affecting the trade balance. Finally, the impact of foreign income is positive and significant. A 1% increase in FI will improve the trade balance by 0.175%. The positive reaction of the trade balance to a growth in international GDP is consistent with Keynesian theory, in which an increase in later stimulates exports to the rest of the world, assuming that import demand remains the same. The results of present study show that exchange rate depreciation and an increase in foreign income enhance the trade balance in the long run.

Table 3: Results of ARDL

Variable	Coefficient	Standard Error	P-Value
Long-run results			
LE	0.801	0.032	0.000
LGDP	-0.258	0.036	0.001
LFI	0.164	0.039	0.003
Short-run results			
D.LE	-1.124	0.795	0.153
D.LGDP	0.479	0.183	0.013
D.FI	-0.387	0.489	0.512
Constant	1.432	0.426	0.000
ECM	-0.454	0.119	0.001

Source: Authors own calculations based on secondary data extracted from (IMF) and (WDI).

Table 4: Diagnostic Tests

Tests	ARDL
Serial Correlation LM Test	2.32 (0.09)
Heteroskedasticity Test	2.23 (0.16)
Normality	0.29 (0.79)
Ramsey RESET Test	1.23 (0.41)

Source: Authors own calculations based on secondary data extracted from (IMF) and (WDI).

In this study, diagnostic tests like serial correlation using the Breusch Godfrey serial correlation LM test, heteroskedasticity via Breusch-Pagan-Godfrey test, normality of residuals by Jerque-Bera test have been performed to check the precision of the estimated model, and the results are reported in table 5. It is evident from the table that the model is free from all the issues mentioned above.

Conclusion

A plethora of studies have been conducted to enlighten the association between exchange rate and trade balance. This study discusses the symmetrical influence of exchange rate movements on the trade balance in India from 2000 to 2020. The results of our estimated model demonstrate clear long run cointegration. Using ARDL, exchange rate is statistically insignificant but is having an appropriate sign in the short-run. However, currency depreciation improves whiles as appreciation deteriorates the balance of trade in the long-run. The outcome of this reflects no evidence of the J-Curve phenomena in India. Similarly, the impact of domestic GDP is negative and statistically significant in short run but is positive in the long run, implying that an increase in domestic GDP will improve the trade balance in the long-run. Finally, the short-run impact of foreign income is negative and statistically insignificant. However, an increase in foreign GDP will improve the trade balance in the long run.

The findings of this paper suggest some crucial policy implications. It is imperative that countries should prioritize export promotion and implement policies that will increase exports. It is also important to increase exports and reduce reliance on foreign markets by substituting

imported goods with domestically produced ones, a strategy that can be accomplished through expanding domestic production capacity and boosting productivity. Finally, excessive exchange rate fluctuations should be limited to prevent exchange rate misalignments and an unfavourable position in the balance of trade account.

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