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Does The Marshall–Lerner Condition Hold In India? Evidence From Cointegration And Vecm Analysis

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Abstract: The effectiveness of exchange rate depreciation as a tool for improving a country's trade balance has long been debated in international economics, particularly through the lens of the Marshall–Lerner (ML) condition and the J-curve hypothesis. Against this backdrop, the present study empirically investigates the impact of exchange rate movements on India's trade balance with the objective of testing the validity of the ML condition in India by analysing the dynamic relationship between the exchange rate movements and trade balance. The time series spanned from 1990 to 2024, sourced from World Development Indicators. The key variables employed include exports, imports, the NEER, India's gross domestic product (GDP), and world GDP, which together capture the price and income effects influencing trade flows. To ensure methodological rigor, the study first examines the time-series properties of the variables using unit root tests. Co-integration and the vector error correction mechanism (VECM) were used to estimate the short- and long-run parameters. The empirical findings reveal that exchange rate depreciation enhances export performance while reducing import demand in the long run. This finding provides empirical support for the validity of the ML condition in India. In contrast, the short-run results indicate weak or adverse effects of exchange rate depreciation on the trade balance, lending support to the J-curve hypothesis.

Overall, the findings suggest that while exchange rate depreciation may not lead to immediate improvements in India's trade balance, it becomes effective in the long run as trade volumes gradually adjust. The study highlights the importance of complementing exchange rate policy with structural reforms, export diversification, and macroeconomic stability to achieve sustainable external balance.

***Index Terms* -** Marshall-Lerner Condition, Exchange Rate, Vector Error Correction Model, Elasticities.

I. Introduction

Exchange rate movements play a pivotal role in shaping a country's external sector performance, particularly for emerging economies that are increasingly integrated into global trade and financial markets. Among the theoretical frameworks that link exchange rate changes to external adjustment, the ML condition holds a prominent position. It posits that a depreciation of a country's currency will improve its trade balance if the sum of the absolute values of the price elasticities of demand for exports and imports exceeds unity. This condition highlights the critical role of demand responsiveness in determining whether exchange rate depreciation can serve as an effective tool for correcting trade imbalances.

The theoretical implications of the ML condition can be summarized as follows:

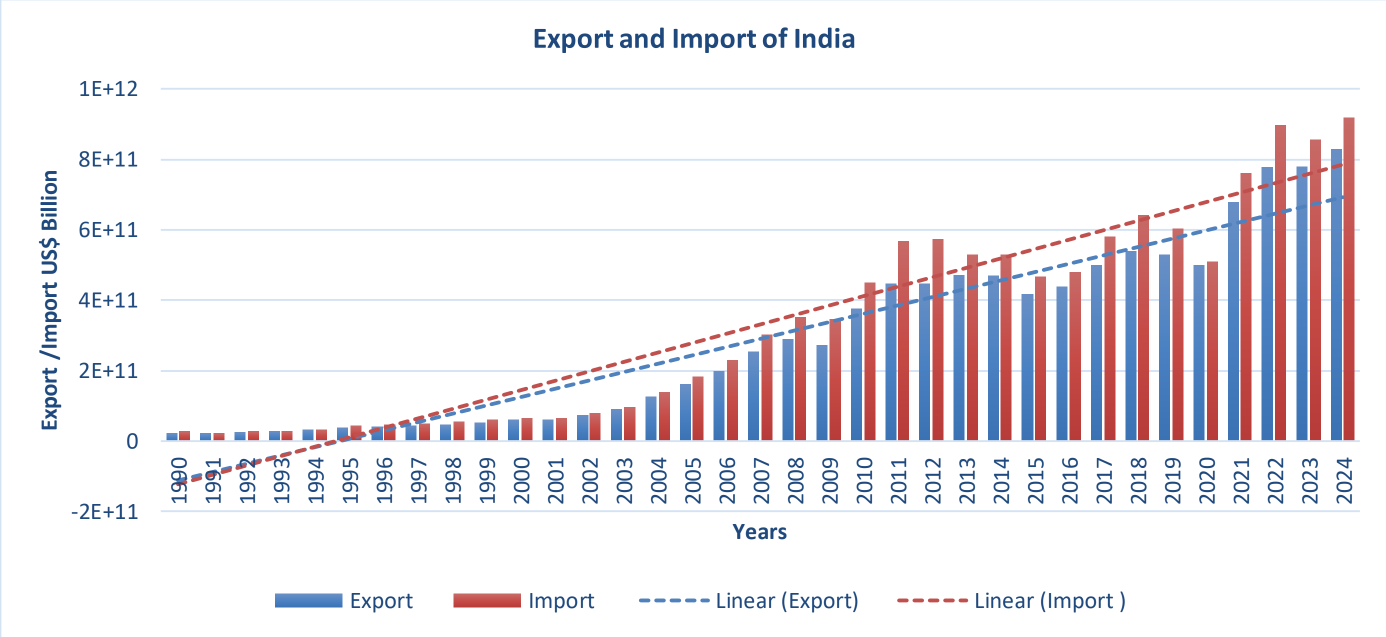
Condition	**Outcome on Trade Balance**
(Absolute value of Export Elasticity) + (Absolute value of Import Elasticity) > 1	Improves
(Absolute value of Export Elasticity) + (Absolute value of Import Elasticity) = 1	No change
(Absolute value of Export Elasticity) + (Absolute value of Import Elasticity) < 1	Worsens

While the ML condition provides a long-run criterion for improving the trade balance, short-run dynamics may follow a different trajectory, commonly explained by the J-curve phenomenon, which suggests that a depreciation may initially worsen the trade balance before improving it over time. The J-curve effect arises because import prices respond immediately to currency depreciation, whereas the volumes of exports and imports adjust with a lag due to contractual rigidities, production constraints, and consumption habits (Abille & Mecik, 2023) (Augustine & Kumar, 2020). As a result, the trade balance may deteriorate in the short run before improving in the long run as quantity adjustments dominate price effects. However, empirical evidence on the existence of the J-curve remains mixed and often country-specific, particularly in emerging economies such as India, where structural factors and trade composition may influence adjustment dynamics (Mwito, Mkenda, & Luvanda, 2021). This framework is particularly relevant for policymakers, as it provides clear guidance for exchange rate management and international trade strategies. The policy significance is especially pronounced in emerging economies such as India, where exchange rate adjustments are often viewed as a mechanism to enhance export competitiveness and restrain import growth (Parray, Wani, & Yasmin, 2022). However, the effectiveness of currency depreciation critically depends on whether export and import demands are sufficiently elastic. If trade flows are relatively inelastic, depreciation may fail to improve the trade balance and could even worsen external imbalances, particularly in the short run,

Empirical studies examining the validity of the ML condition for India have produced mixed and sometimes conflicting results. While some studies find evidence supporting the condition, others suggest that it holds only for specific trading partners or under particular model specifications (Kathuria & Kumar, 2021); (Parray, Wani, & Yasmin, 2022). These divergent findings point to the sensitivity of empirical outcomes to methodological choices, estimation techniques, and data periods. Consequently, a comprehensive evaluation of the ML condition in the Indian context necessitates a careful review of the empirical literature that accounts for differences in econometric frameworks and structural characteristics of trade (Bahmani, Harvey, & Hegerty, 2013). The ambiguity in empirical evidence is further compounded by India's persistent trade deficits, which have frequently coincided with a long-term depreciation of the Indian rupee against the US dollar since the 1970s. This stylized fact appears to contradict the theoretical prediction that currency depreciation should improve the trade balance (Raza, Larik, & Tariq, 2013). Such an apparent inconsistency suggests that the relationship between exchange rates and trade outcomes in India may be influenced by structural factors, including import dependence on essential commodities, limited price competitiveness of exports, invoicing practices, and adjustment lags in trade flows.

Against this backdrop, the present study aims to reassess the validity of the ML condition for India by synthesizing insights from the existing empirical literature and conducting an empirical analysis. The paper first revisits the theoretical support of the ML condition and then critically evaluates prior empirical studies on India, focusing on the robustness of their findings and the methodologies employed. Subsequently, the study undertakes an updated empirical investigation to examine the responsiveness of India's exports and imports to exchange rate movements, with particular emphasis on estimating import and export price elasticities in both the short run and the long run. By acknowledging the multifaceted nature of exchange rate–trade dynamics, this paper contributes to the ongoing debate on exchange rate policy effectiveness in developing economies and provides policy-relevant insights into whether currency depreciation can serve as a viable instrument for improving India's trade balance (Sohrabji, 2024). Moreover, the share of exports and imports in total GDP has been continuously increasing since 1990, when liberalization policies were started. It can be observed in the following graph:

Fig. 1 Export and Import of India from 1990 to 2024



Data Source: World Development Indicators

The figure illustrates the long-term trends in India's exports and imports from 1990 to 2024. Both exports and imports exhibit a strong upward trajectory, reflecting the expansion of India's external trade following economic liberalization and deeper integration into the global economy. Exports increased from about USD 22.6 billion in 1990 to nearly USD 827.4 billion in 2024, while imports rose more rapidly from USD 27.1 billion to approximately USD 918.3 billion over the same period. Imports consistently exceed exports throughout most of the period, indicating a persistent trade deficit.

The dotted linear trend lines indicate that imports have grown at a faster pace than exports, as evidenced by the steeper slope of the import trend line. While exports show steady growth, the relatively sharper rise in imports, particularly after the mid-2000s and post-2010 period, suggests increasing dependence on foreign goods, including capital, intermediate, and energy imports. Periods of visible divergence between exports and imports, especially in recent years, point to widening trade imbalances despite strong export performance. Overall, the figure provides preliminary evidence that exchange rate movements alone may not immediately correct trade imbalances, underscoring the importance of examining both long-run adjustment mechanisms, such as those captured by the ML condition, and short-run dynamics associated with the J-curve effect.

II. Empirical Literature Review

Author (Year)	Sample	Period	Data Frequency	Methodology	Result
(Mahmud, Ullah, & Yucel, 2004)	Six developed Countries	Australia (1966q1-1998q4) Germany, Japan (1960q1-1995q4) Norway (1966q1- 1998q4) United Kingdom, United States (1957q1- 1997q2)	Quarterly	non-parametric kernel estimation technique by Local Linear Least Squares (LLLS)	The ML condition is not satisfied for any country except for Norway.
(Ling , Mun, & Mei, 2008)	Malaysia	1955-2006	Annual	VECM	The ML condition is satisfied in Malaysia.
(Mohammad & Hussain, 2010)	Pakistan	1970-2008	Annual	Augmented Dickey-Fuller	The ML condition is satisfied in Pakistan.
(Mun, Heang , Mun, & Shan, 2014)	Malaysia	1981-2010	Annual	Classical Regression model, Johansen-Juselius test	Does not hold ML condition
(Caporale , Gil-Alana, & Mudida, June 2015)	KENYA	1996q1-2011q4	Quarterly	Fractional integration and cointegration methods	The ML condition is satisfied in Kenya.
(CAMBAZOĞLU & GÜNEŞ , 2016)	Turkey with Germany	January 2010- December 2014	Quarterly	Auto Regressive Distributed Lags (ARDL)	Holds the ML condition
(Gelana, 2019)	Ethiopia	1995q1-2017q4	Quarterly	VECM co-integration method	Does not hold ML condition
(Amaral & Breitenbach, 2021)	Fragile Five Economics (Brazil, India, Indonesia, South Africa, and Turkey)	1996Q1-2019Q4 Exception: India (1997Q1 2019Q4) Turkey (1998Q1 2019Q4)	Quarterly	ARDL Bound test	There is little evidence from the study that supports the validity of the ML Condition

III. Research Methodology

The study employs annual data covering the period 1990–2024. The period of 1990 is selected due to the economic reforms that led to the opening of the Indian Economy. The time-series data for each variable are obtained from the World Development Indicators. All variables are tested for stationarity using the Phillips–Perron (PP) test. When the variables are found to be integrated of the same order, Johansen's maximum eigenvalue test is employed to examine the presence of cointegration. The optimal lag length of the model is selected using information-based criteria, particularly the Akaike Information Criterion (AIC). After estimating cointegration, a VECM is employed to estimate the trade elasticities of India's imports and exports.

3.1 Model Building

$$IM = f\,(Y_i\,, NEER)$$
$$EX = f\,(Y_w\,, NEER)$$

IM and EX represent the import of India from the rest of the world and the export of India to the rest of the world, respectively. Y_i and Y_w represent the nominal GDP of India and the rest of the world's nominal GDP, respectively. Whereas NEER is the nominal Exchange rate of India with the rest of the world, i.e., the US dollar. The official exchange rate is the nominal exchange rate and is usually expressed as the number of units of domestic currency per one US dollar. The log-linear representation of the import demand equation and export demand equation is as follows:

$$LIM_t = \alpha_0 + \alpha_1 LY_{i,t} + \alpha_2 LNEER_{i,t} + \varepsilon_{i,t} \quad (1)$$
$$LEX_t = \beta_0 + \beta_1 LY_{w,t} + \beta_2 LNEER_{i,t} + \varepsilon_{i,t} \quad (2)$$

Generally, a depreciation of the domestic currency reduces the price of exports in foreign-currency terms, which encourages exports, while it increases the domestic-currency cost of imports, which tends to discourage import demand. The ML condition deals with the import and export price elasticity of demand, i.e., domestic price elasticity of demand for imports and foreign price elasticity of demand for exports. In the above linear form of logarithm, equations (1) and (2) represent the import and the export elasticity of demand. It is expected that a depreciation of the domestic currency will lead to a reduction in imports and an expansion of exports. The income elasticities of import and export demand, denoted by $\alpha_1$and $\beta_1$are expected to be positive, implying that an increase in the income of India raises its import demand, while an increase in world income stimulates the export demand of India. Therefore, α_2 and $\beta_2$have also positive expected signs. To simplify the ML condition, the study assumes that export and import supply elasticities are perfectly elastic (Brooks, 1999). Thus, the sum of import price elasticity and export price elasticity must be greater than one. In the above model, the coefficient $LNEER_{i,t}$ is expected to be greater than one. Mathematically, this is expressed as

$$|\alpha_1|+|\beta_1| > 1$$

When this condition holds, a depreciation of the domestic currency leads to an improvement in the trade balance.

IV. Empirical Results

The empirical analysis in this study aims to examine the long-run validity of the ML condition for India. Cointegration analysis is an appropriate econometric approach for this purpose, as it enables the identification of long-term relationships among the relevant variables. Accordingly, the Johansen cointegration technique is employed to investigate the existence of long-run equilibrium relationships, while the VECM is used to estimate the price elasticities of exports and imports. Since the applicability of the VECM depends on the order of integration of the variables, the PP unit root test is first conducted to examine the stationarity properties of the series.

4.1 Unit Root Test

Table 1: Philips-Perron (PP) test

PP test		
Variables	At Level 1(0)	At First Difference 1(I)
LN(IM)		0.01
LN(EX)		0.01
LN(NEER)		0.01
LN(Y_i)		0.01
LN(Y_w)		0.01

Source: Author's Calculations

The Phillips-Perron (PP) test was employed to assess the stationarity of the time series, and the outcomes are presented in Table 1. All the variables in both models are non- stationary at the level, but stationary at the first difference. So the condition has been fulfilled, hence the Johansen co-integration method was applied to examine the existence of long-run equilibrium relationships with each other. We proceed to estimate a VECM with a lag length of 1 for each of the above two models of variables.

4.2 Johansen Co-integration test:

Based on the stationary results reported in Table 1, all variables are integrated of order one, $I(1)$, indicating that the Johansen cointegration technique is appropriate. This method employs the Trace and Maximum Eigenvalue statistics to determine the number of cointegrating vectors. The results of these tests are presented in the given Tables for two different models.

4.2.1. Export Model

Table 2: Johansen co-integration test (Trace statistics Test)

Hypothesized no. of CE(S)	**Eigenvalue statistics**	**Trace Statistic**	**0.05 (Critical Value)**	**Decision**
$r = 0^*$	0.4953	36.97	34.91	Reject
$r \leq 1$	0.2509	14.4	19.96	Do not reject
$r \leq 2$	0.1372	4.87	9.24	Do not reject

Source: Author's Calculations

*Indicates the rejection of the null hypothesis (no co-integration) at 5 percent

In Table 2, the trace statistic is greater than the critical value at the 5 percent level of significance, and thus we can reject the null hypothesis of no cointegration ($r = 0$). However, at ($r \leq 1$) and ($r \leq 2$), the trace statistic is less than the critical values at the 5 percent level of significance; hence, the null hypothesis cannot be rejected, indicating the presence of a single cointegrating relationship among the variables in the export model.

Table 3: Johansen co-integration test (maximum Eigen statistic)

Hypothesized no. of CE(S)	**Eigenvalue statistics**	**Max-Eigen Statistic**	**0.05 (Critical Value)**	**Decision**
$r = 0^*$	0.4953	22.57	22	Reject
$r \leq 1$	0.2509	9.54	15.67	Do not reject
$r \leq 2$	0.1372	4.87	9.24	Do not reject

Source: Author's Calculations

*Indicates the rejection of the null hypothesis (no co-integration) at 5 percent

Table 3 presents the results of the maximum eigenvalue test, which also rejects the null hypothesis of no cointegration at the 5 percent level, while failing to reject higher order hypothesis. The robustness of both trace and maximum eigenvalue statistics confirms the existence of one long-run cointegrating relationship among the variables included in the export model.

4.2.2. Import model

Table 4: Johansen co-integration test (Trace statistics Test)

Hypothesized no. of CE(S)	Eigenvalue statistics	Trace Statistic	0.05 (Critical Value)	Decision
r = 0*	0.6618	62.68	34.91	Reject
r ≤ 1*	0.5078	26.91	19.96	Reject
r ≤ 2	0.1011	3.52	9.24	Do not reject

Source: Author's Calculations

*Indicates the rejection of the null hypothesis (no co-integration) at 5 percent

Table 4 presents the results of the Johansen cointegration test based on the trace statistic. The null hypothesis of no cointegration (r = 0) is rejected at the 5 percent level, as the trace statistic exceeds the corresponding critical value. The null hypothesis of at most one cointegrating vector (r ≤ 1) is also rejected, while the hypothesis of at most two cointegrating relationships (r ≤ 2) cannot be rejected. This indicates the presence of two cointegrating relationships among the variables in the import model.

Table 5: Johansen co-integration test (maximum Eigen statistic)

Hypothesized no. of CE(S)	Eigenvalue statistics	Max-Eigen Statistic	0.05 (Critical Value)	Decision
r = 0*	0.6618	35.77	22	Reject
r ≤ 1*	0.5078	23.39	15.67	Reject
r ≤ 2	0.1011	3.52	9.24	Do not reject

Source: Author's Calculations

*Indicates the rejection of the null hypothesis (no co-integration) at 5 percent

Table 5 reports the maximum eigenvalue test results, which support the trace test findings. The null hypotheses for (r = 0) and (r ≤ 1) are rejected at the 5 percent level, whereas the null hypothesis for (r ≤ 2) cannot be rejected. The consistency of both test statistics confirms the existence of two long-run cointegrating relationships in the import model.

4.3. Vector Error Correction Model (VECM)

After the evidence of the co-integration relationship among the variables, the next step is to estimate the VECM. The VECM is specified with one less lag length (p-1). Where p is the optimal lag length determined with vector autoregressive (VAR). In this study, the optimal lag length was 2, and therefore, VECM was estimated with one lag. The following table depicts the price elasticities of export demand and import demand in India.

Table 6. Vector Error Correction Model

Export Model		**Import model**	
Variables	**Co-integration Equation**	**Variables**	**Co-integration Equation**
LN(EX) (−1)	1	LN(IM) (−1)	1
LN (Y_w)(−1)	0	LN(Y_i) (−1)	0
LN(NEER) (−1)	11.530038	LN(EER) (−1)	5.179898
LN(Y_w)	1	LN(Y_i)	1

Error Correction Model

Co-integrating Equation	Export Equation	Import Equation
Equation 1 (ECT)	0.0465	−0.1445

Source: Author's Calculations

Table 6 presents the results of the VECM estimation for both export and import models, evaluating whether the ML condition holds in India. The cointegration equations indicate the existence of a stable long-run relationship among the variables. In the export equation, the real effective exchange rate enters positively in the long run, suggesting that currency depreciation improves export performance. In the import equation, the exchange rate also plays a significant role, indicating that exchange rate movements influence import demand.

The error correction term in the import model is negative and statistically significant, suggesting that imports adjust efficiently towards long-run equilibrium following exchange rate shocks. Although the export adjustment is weaker in the short run, the long-run responsiveness of exports and imports to exchange rate changes suggests that the combined price elasticities of trade flows satisfy the ML condition in the long run. Therefore, the results support the validity of the ML condition for India.

V. CONCLUSION

The study empirically examines the impact of the exchange rate on India's trade balance performance, using annual data from 1990 to 2024. The trade elasticities of imports and exports are estimated separately for India to assess whether it satisfies the ML condition. The analysis incorporated key macroeconomic variables like imports, exports, the NEER, India's GDP, and world GDP to evaluate its impact on India's trade performance. The study first conducted stationarity and Johansen cointegration tests as preliminary steps for further analysis, revealing that all variables are stationary at the first difference. The cointegration results confirm the existence of at least one long-run equilibrium relationship among the variables. This finding suggests that despite short-run fluctuations, India's trade flows and exchange rate movements are tied together by a stable long-run relationship. The VECM results provide strong empirical evidence in support of the ML condition in India. This implies that a depreciation of the Indian currency leads to an improvement in the trade balance in the long run. Moreover, the error correction term is found to be negative and statistically significant, confirming that short-run disequilibria in the trade balance are corrected over time towards the long-run equilibrium. The limited short-run responsiveness of exports and imports reflects adjustment lags arising from contractual rigidities, import dependence, and delayed quantity responses. This pattern is consistent with the J-curve hypothesis, whereby the trade balance initially deteriorates following depreciation before improving as long-run adjustments take effect.

From a policy perspective, the results imply that exchange rate depreciation can improve India's trade balance in the long run, though short-run effects remain weak due to adjustment lags consistent with the J-curve. Therefore, the exchange rate policy should be complemented by export diversification, productivity enhancement, and price stability to achieve sustained external balance. Future research may extend this analysis by incorporating sectoral trade data, nonlinear adjustment mechanisms, or structural breaks to further enrich the understanding of exchange rate trade dynamics in India.

REFERENCES

1. CAMBAZOĞLU, B., & GÜNEŞ , S. (2016). MARSHALL-LERNER CONDITION ANALYSIS: TURKEY CASE. *Economics, Management, and Financial Markets*, 272-283 .
2. Abille, A. B., & Mecik, O. (2023). The exchange rate, income, tradeopenness and the trade balance: longitudinal panel analysis forselected SSA countries. *International Trade, Politics and Development* , 138-153.
3. Amaral, A., & Breitenbach, M. (2021). The Marshall- Lerner Condition in the Fragile Five Economies: Evidence from the ARDL Bounds Test Approach. *Business and Economics Research Journal, 12, No. 4*, 731-750.
4. Augustine , B., & Kumar, L. (2020). Original Sin, Currency Depreciation and External Debt Burden: Evidence from India. *International Journal of Economics and Financial Issues*, 10(3), 58-68.
5. Bahmani, M., Harvey, H., & Hegerty, S. (2013). Empirical tests of the Marshall-Lerner condition: a literature review . *Journal of Economic Studies, Vol. 40 Iss 3* , 411-443.
6. Brooks, T. J. (1999). Currency depreciation and the trade balance: an elasticity approach and test of the Marshall-Lerner condition for bilateral trade between the US and the G-7. *Doctoral dissertation, The University of Wisconsin-Milwaukee.*
7. Caporale , G. M., Gil-Alana, L. A., & Mudida, R. (June 2015). TESTING THE MARSHALL–LERNER CONDITION IN KENYA. *South Afriacn Journal of Economics* , 253-269.
8. Gelana, D. (2019). THE EFFECT OF REAL EXCHANGE RATE ON THE TRADE BALANCE OF ETHIOPIA: DOES MARSHALL LERNER CONDITION HOLDS? EVIDENCE FROM (VECM) ANALYSIS.
9. Kathuria, K., & Kumar, N. (2021). Are exports and imports of India's trading partners cointegrated? Evidence from Fourier bootstrap ARDL procedure. *Empirical Economics*, 1171-1191.
10. Ling , N. Y., Mun, H. W., & Mei, T. G. (2008). Real Exchange Rate and Trade Balance Relationship: An Empirical Study on Malaysia. *International Journal of Business and Managment 3(8)*, 130-137.

11. Mahmud, S., Ullah, A., & Yucel, E. (2004). Testing Marshall-Lerner condition: a non-parametric approach. *Applied Economics Letters*, 231-236.
12. Mohammad , S., & Hussain, A. (2010). The Role of Exchange Rate on Balance of Trade: Empirical from Pakistan. *European Journal of Social Sciences*, 14(1), 150-156.
13. Mun, H. W., Heang , L. T., Mun, C. K., & Shan, G. (2014). Validity of Marshal Lerner Hypothesis: An Empirical Study on Malaysia-United States Trade Balance . *Asian Research Journal of Business Management*, ISSN 2321-9246.
14. Mwito, M. M., Mkenda, B. K., & Luvanda, E. (2021). The asymmetric J-curve phenomenon: Kenya versus her trading partners. *Central Bank Review (CBR)*, 25-34.
15. Parray, W. A., Wani, S., & Yasmin, E. (2022). DETERMINANTS OF THE TRADE BALANCE IN INDIA. EVIDENCE FROM A POST-LIBERALISATION PERIOD. *Studia Universitatis Vasile Goldiș Arad, Seria Științe Economice, 32(4)*, 16-37.
16. Raza, D., Larik, D., & Tariq, M. (2013). Effects of Currency Depreciation on Trade Balances of Developing Economies: A Comprehensive Study on South Asian Countries . *IOSR Journal Of Humanities And Social Science vol 14*, pp 101-106.
17. Sohrabji, N. (2024). Asymmetric Exchange Rate Effects on Trade Flows in India. *Economics*, *12(5)*, 114.