

## *Chapter VII*

# *Impact of Exchange Rate Fluctuations on Trade Balance in India*

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**CHAPTER VII**  
**IMPACT OF EXCHANGE RATE FLUCTUATIONS ON TRADE**  
**BALANCE IN INDIA**

**7.1 INTRODUCTION**

In an economic development of the country, trade is a key factor as it eventually focuses on the growth of the country and boost up the wellbeing of the people. Through an increase in the level of exports in the international trade there was a development in the global economic environment. In the international trade for every export and import of goods and services there is a transaction of inflow and outflow of foreign currency from one nation to other nation. Exchange rate is a vital component for every international trade transactions in the country. It greatly influences the prices of goods and services. The fluctuations in exchange rate will hinder the inflow of international trade due to the uncertainty movement and creates risk for the traders (Srinivasan and Kalaivani, 2012). Appreciation and Depreciation of the exchange rate inversely affect the trade. In India due to currency depreciation, it has shown a widen trade deficit in the country.

This chapter analyse the impact of fluctuations of select foreign currencies, such as, Indian rupee against USD, Euro, Yen and GBP on exports, imports and trade balance by taking monthly data for the period of 10 years from 2007-08 to 2016-17 to test the causality relationship exist between the variables.

**DESCRIPTIVE STATISTICS OF EXPORTS, IMPORTS AND TRADE BALANCE**

The descriptive statistics of monthly data of exports, imports and trade balance for the period 2007-08 to 2016-17 are given in table 7.1.

**Table 7.1****Descriptive statistics of Exports, Imports and Trade Balance**

<b>Variables</b>	<b>Exports</b>	<b>Imports</b>	<b>Trade balance</b>
Mean	1160.405	1747.395	-568.963
Median	1283.635	1965.540	-584.665
Maximum	1919.945	2617.800	936.450
Minimum	477.405	734.892	-1071.660
Std.Dev.	397.224	553.531	255.140
Skewness	-0.260	-0.370	1.532
Kurtosis	1.698	1.745	11.501
Jarque-Bera	9.832	10.611	408.394
Probability	0.007	0.004	0.000
Observations	120	120	120

Source: Computed

Table 7.1 shows the descriptive statistics of Exports, Imports and Trade balance for the study period from 2007-08 to 2016-17. The mean value of imports has been found to be higher at Rs.1747.395 bn followed by exports with the value of Rs.1160.405 bn and trade balance at Rs.-568.963. The imports have ranged from Rs.734.89 bn to Rs.2617.80 bn, whereas the S.D of imports stood higher at 553.53 which shows, there is an increase in the imports during the study period. Skewness refers to the measure of the extent asymmetric distribution of the value. It is found that the value are negatively skewed for exports and imports and trade balance is positively skewed indicated with a left long side tail on the distribution. The kurtosis values for exports and imports have shown that there is playkurtic with respect to normal distribution and while trade balance has resulted as leptokurtic. The JB test value stood at 9.83 with higher value and the p value states that the data is not normally distributed.

## 7.2 IMPACT OF EXCHANGE RATE OF INDIAN RUPEE AGAINST SELECT FOREIGN CURRENCIES ON EXPORTS, IMPORTS, TRADE BALANCE

To identify the impact of exchange rate fluctuations of Indian rupee against USD, GBP, EURO and YEN correlation analysis, granger causality test and regression analysis have been done

### CORRELATION ANALYSIS - RELATIONSHIP OF INDIAN RUPEE AGAINST SELECT FOREIGN CURRENCIES, EXPORTS, IMPORTS AND TRADE BALANCE

Correlation is a measure that has been applied to know the extent to which the variables are related. It is measured with correlation coefficient that ranges from -1 to +1 which is denoted by r. The p value indicates the significant and non-significant. The correlation analysis have been applied to analyse the relationship between Indian rupee against USD, GBP, EURO and YEN on exports, imports and trade balance for the period from 2007-08 to 2016 -17 and presented in table 7.2

**Table 7.2**

**Correlation analysis - between Indian rupee against select foreign currencies, exports, imports and trade balance**

	<b>Variables</b>	<b>USD</b>	<b>POUNDS</b>	<b>EURO</b>	<b>YEN</b>
2007-08	Exports	-.478	-.563	.845**	.807**
	Imports	-.336	-.298	.553	.468
	Trade balance	-.209	-.355	.416	.463
2008-09	Exports	-.809**	.839**	.600*	-.864**
	Imports	-.694*	.898**	.156	-.842**
	Trade balance	.484	-.726**	.092	.644*
2009-10	Exports	-.725**	-.582*	-.478	.067
	Imports	-.885**	-.488	-.331	.096
	Trade balance	.704*	.169	.015	-.091

	<b>Variables</b>	<b>USD</b>	<b>POUNDS</b>	<b>EURO</b>	<b>YEN</b>
2010-11	Exports	-.308	.461	.561**	.495
	Imports	-.482	.201	.524*	.233
	Trade balance	-.105	.448	.387	.483
2011-12	Exports	.683*	.662*	.421	.548
	Imports	.799**	.778**	.596*	.745**
	Trade balance	-.562	-.552	-.511	-.615*
2012-13	Exports	.182	-.409	.576	-.645*
	Imports	.031	.304	.455	-.171
	Trade balance	.084	.122	.017	.172
2013-14	Exports	.781**	.798**	.821**	.638*
	Imports	-.078	.032	.009	-.161
	Trade balance	.888**	.857**	.866**	.812**
2014-15	Exports	-.304	.498	.565**	.403
	Imports	-.336	.437	.448	.369
	Trade balance	.297	-.332	-.312	-.290
2015-16	Exports	.155	-.218	.304	.295
	Imports	-.591*	.448	-.513	-.794**
	Trade balance	.638*	-.523	.621*	.891**
2016-17	Exports	.267	-.188	-.376	-.204
	Imports	.639	-.784*	-.800**	-.059
	Trade balance	-.618	.824**	.754*	-.028

Source: Computed, \*\* Correlation is significant at the 0.01 level (2-tailed). \*Correlation is significant at the 0.05 level (2-tailed).

Table 7.2 depicts the relationship between exports, imports, trade balance and select foreign currencies, such as, US Dollar, Pound sterling, Euro and Yen are taken for the period 2007-08 to 2016-17. During the year 2007-08, Exports have a positive correlation with Yen (.807\*\*) and Euro (.845\*\*) at 1 per cent level of significance.

It is evident from the year 2008-09, the correlation has been found between Exports and USD (-.809\*\*) and also with Yen (-.864\*\*) indicates that there exist a significant negative relationship between the variables at 1 per cent level of significance. Exports have a positive correlation with Pounds (.839\*\*) at 1 per cent level of significance and also with Euro (.600\*) at 5 per cent level of significance. Imports have a positive correlation with Pounds (.898\*\*) at 1 per cent level of significance and negative correlation with USD (-.694\*) 5 per cent level of significance and Yen (-.842\*\*) at 1 per cent level of significance respectively. It is observed that there is a high positive correlation between trade balance and Yen with the value of .644\* at 5 per cent level of significance. However, there exist a negative correlation between trade balance and Pounds (-.726\*\*) at 1 per cent level of significance.

In the year 2009 -10 Exports have a high negative correlation with USD (-.725\*\*) at 1 per cent level of significance. The result also shows that there was a moderate negative correlation between exports and Pounds with the value of (-.582\*) and found to be a significant at 5 per cent level. Imports have a high negative correlation with USD (-.885\*\*) at 1 per cent level of significance. There exist a high positive correlation between trade balance and USD (.704\*) at 5 per cent level of significance.

In the year 2010-11, exports shows that there exist a moderate positive correlation to Euro (.561\*\*) at 1 per cent level of significance. It is also found that, Imports were correlated (.524\*) at 5 per cent level of significance.

In the year 2011-12, the moderate positive correlation exist between export and USD (.683\*), Pounds sterling resulted (.662\*) at 5 per cent level of significance. With respect to imports, it is positively correlated with all the select foreign currencies, such as, USD (.799\*), Pounds (.778\*) and Yen (.745\*) at 1 per cent level of significance and also with Euro (.596\*) at 5 per cent level of significance.

During the year 2012-13 the result of correlation analysis shows that exports are negatively correlated with Yen (-.645\*) at 5 per cent level significance.

The results of correlation analysis of the year 2013-14 have shown that exports have a high positive correlation with all the currencies, such as, USD (.781\*\*), Pounds(.798\*\*) and Euro (.821\*\*) at 1 per cent level of significance and with Yen (.638\*) at 5 per cent level of significance respectively. However, trade balance was found to be highly correlated with all the currencies, namely, USD (.888\*\*), Pounds (.857\*\*), Euro (.812\*\*) and Yen (.866\*\*) at 1 per cent level of significance.

During the year 2014 – 15, it is found that exports have a positive correlation with the currency, namely, Euro (-.565\*\*) at 1 per cent level of significance.

In the year 2015-16 imports have a negative correlation with the currency USD (-.591 \*) at 5 per cent level of significance and Yen (-.794\*\*) at 1 per cent level of significance respectively. It is observed that trade balance has a positive correlation on select foreign currencies, such as, USD (.638\*), Euro (.621\*) at 5 per cent level of significance and with Yen (.891\*\*) at 1 per cent level of significance.

In the year 2016-17, there exist a correlation between Imports and Pounds sterling (-.784 \*) at 5 per cent level of significance, Imports and Euro (-.800\*\*) at 1 per cent level of significance which indicates a negative correlation. However, relatively trade balance has a positive correlation with Pounds sterling (.824\*\*) at 1 per cent level of significance and with Euro (.754\*) at 5 per cent level of significance.

## **GRANGER CAUSALITY TEST**

Granger causality test has been proposed by Granger in 1969. It is a test which is applied to explain the 'casual relationships' between the variables. It explains how much one variable causes the other variable. It is a test for ascertaining whether one economic variable is useful in forecasting another economic variable. There are two ways of relationship in the test i.e., unidirectional and bidirectional relationship. For instance X Granger causes variable Y, the value of Y can be better predicted using variable X it is said to be unidirectional and if both X and Y Granger causes each other it is said to be bidirectional than it can be predicted using the variables X alone.

**GRANGER CAUSALITY TEST – CAUSAL EFFECT BETWEEN INDIAN RUPEE AGAINST SELECT FOREIGN CURRENCIES, EXPORTS, IMPORTS AND TRADE BALANCE**

Granger causality test has been applied between the select foreign currencies, namely, USD, Pounds sterling, Yen, Euro, export, import and trade balance to know the causality relationship between the variables. It is done to know how much the currencies causes exports, imports and trade balance in the way of unidirectional or bidirectional among the variables. The following null hypothesis have been framed

**H<sub>0</sub>:** Exchange rates do not have causality relationship between exports, imports and trade balance

The following table 7.3 presents the pair wise granger causality test for the exchange rate of Indian rupee against foreign currencies on exports, imports and trade balance.

**Table 7.3 Pair Wise Granger Causality Test**

<b>Null Hypothesis</b>	<b>Observation</b>	<b>F-Statistic</b>	<b>Probability</b>
INR/GBP does not Granger Cause INR/ USD	118	0.29932	0.7419
INR/USD does not Granger Cause INR/GBP		0.47239	0.6247
INR/YEN does not Granger Cause INR/USD	118	1.71240	0.1851
INR/USD does not Granger Cause INR/YEN		0.38231	0.6832
INR/EURO does not Granger Cause INR/USD	118	0.99342	0.3735
INR/USD does not Granger Cause INR/EURO		0.17473	0.8399
<b>EXPORTS does not Granger Cause INR/USD</b>	<b>118</b>	<b>3.24125</b>	<b>0.0428*</b>
INR/USD does not Granger Cause EXPORTS		2.12660	0.1240
<b>IMPORTS does not Granger Cause INR/USD</b>	<b>118</b>	<b>3.79649</b>	<b>0.0254*</b>

Null Hypothesis	Observation	F-Statistic	Probability
INR/USD does not Granger Cause IMPORTS		0.16730	0.8462
<b>Trade balance does not Granger Cause INR/USD</b>	<b>118</b>	<b>10.4019</b>	<b>7.E-05*</b>
INR/USD does not Granger Cause Trade balance		1.75802	0.1771
<b>INR/YEN does not Granger Cause INR/GBP</b>	<b>118</b>	<b>2.49657</b>	<b>0.0869*</b>
INR/GBP does not Granger Cause INR/YEN		0.23722	0.7892
INR/EURO does not Granger Cause INR/GBP	118	0.12327	0.8841
INR/GBP does not Granger Cause INR/EURO		0.18474	0.8316
EXPORTS does not Granger Cause INR/GBP	118	2.24295	0.1109
<b>INR/GBP does not Granger Cause EXPORTS</b>		<b>5.80194</b>	<b>0.0040*</b>
IMPORTS does not Granger Cause INR/GBP	118	1.84725	0.1624
<b>INR/GBP does not Granger Cause IMPORTS</b>		<b>4.20467</b>	<b>0.0173*</b>
<b>Trade balance does not Granger Cause INR/GBP</b>	<b>118</b>	<b>4.30450</b>	<b>0.0158*</b>
INR/GBP does not Granger Cause Trade balance		1.58310	0.2099
INR/EURO does not Granger Cause INR/YEN	118	0.76903	0.4659
INR/YEN does not Granger Cause INR/EURO		0.52816	0.5911
EXPORTS does not Granger Cause INR/YEN	118	0.26723	0.7660
INR/YEN does not Granger Cause EXPORTS		1.34954	0.2635
IMPORTS does not Granger Cause INR/YEN	118	1.37930	0.2560
INR/YEN does not Granger Cause IMPORTS		2.25719	0.1093

Null Hypothesis	Observation	F-Statistic	Probability
<b>Trade balance does not Granger Cause INR/YEN</b>	<b>118</b>	<b>3.57568</b>	<b>0.0312*</b>
<b>INR/YEN does not Granger Cause Trade balance</b>		<b>4.96675</b>	<b>0.0086*</b>
EXPORTS does not Granger Cause INR/EURO	118	0.78320	0.4594
<b>INR/EURO does not Granger Cause EXPORTS</b>		<b>5.38948</b>	<b>0.0058*</b>
<b>IMPORTS does not Granger Cause INR/EURO</b>	<b>118</b>	<b>2.65749</b>	<b>0.0745*</b>
INR/EURO does not Granger Cause IMPORTS		0.87047	0.4215
<b>Trade balance does not Granger Cause INR/EURO</b>	<b>118</b>	<b>3.19639</b>	<b>0.0446*</b>
<b>INR/EURO does not Granger Cause Trade balance</b>		<b>3.58640</b>	<b>0.0309*</b>
IMPORTS does not Granger Cause EXPORTS	118	1.11907	0.3302
<b>EXPORTS does not Granger Cause IMPORTS</b>		<b>5.94079</b>	<b>0.0035*</b>
Trade balance does not Granger Cause EXPORTS	118	2.16817	0.1191
<b>EXPORTS does not Granger Cause Trade balance</b>		<b>9.08504</b>	<b>0.0002*</b>
<b>Trade balance does not Granger Cause IMPORTS</b>	<b>118</b>	<b>2.88971</b>	<b>0.0597*</b>
<b>IMPORTS does not Granger Cause Trade balance</b>		<b>16.0275</b>	<b>7.E-07*</b>

Source: Computed, Significant at 0.05 level

Table 7.3 shows the results of Pair wise Granger causality tests for the currencies USD, Pounds Sterling, Euro, Yen, Exports, Imports and Trade balance respectively. Most of the variables have unidirectional Granger cause on the other variables. The result shows that Exports, Imports and Trade balance has unidirectional relationship between USD. It indicates that exports affect the exchange rate of USD, imports affects exchange rate of USD and Trade balance affect USD. Similarly, Yen has unidirectional causality on Pounds. It is inferred that the exchange rate of INR/YEN affects the INR/GBP. In case of GBP, the relationship obtained is unidirectional between exports, imports and Trade balance respectively. It indicates that the exports, imports and trade balance were affected by the currency GBP. The currency Yen and Trade balance have shown that these two variables have bi-directional relationship and indicated that the variables are affected by each other.

There exist a unidirectional relationship between exports and INR/Euro, Imports and INR/Euro depicts that exchange rate of INR/EURO are affected by exports and imports. The Trade balance and INR/EURO which shows that these two variables have bi-directional causality relationship indicates that both the variables are affected by each other.

Exports exhibits unidirectional causality with Imports, indicates that the exports affects the imports and also Exports exhibits unidirectionally causality with Trade balance, inferred that exports affect trade balance. The variable imports and trade balance shows bi-directional causality relationship implied that both the variables are affected by each other. It is inferred that the significant variables are statistically significant at 5 per cent level and there by rejected the null hypothesis.

## **REGRESSION ANALYSIS - BETWEEN INDIAN RUPEE AGAINST FOREIGN CURRENCIES AND EXPORTS, IMPORTS, TRADE BALANCE**

Regression analysis is a statistical technique which is applied to analyze the relationship between two or more variables. It has been done to find the impact of exchange rate fluctuations on the exports, imports and trade balance.

### **Regression Analysis - Exports and select Foreign Currencies**

It has been done to find the impact of exchange rate fluctuations on the exports. The following null hypothesis have been framed.

**H<sub>0</sub>:** Exchange rate of select foreign currencies do not affect exports

The table 7.4 presents the regression analysis for the exchange rate of Indian rupee against foreign currencies on exports.

**Table 7.4**  
**Regression analysis for Foreign currencies Vs Exports**  
**Dependent Variable: Exports**

	<b>Regression Coefficients (B)</b>	<b>Std. Error</b>	<b>Beta</b>	<b>t</b>	<b>Sig.</b>	<b>VIF</b>
(Constant)	-1682.307	166.278				
USD	14.496	3.636	.335	3.987	**	4.232
POUNDS	9.110	3.428	.239	2.658	**	4.843
YEN	16.174	2.929	.373	5.522	**	2.731
EURO	5.947	4.844	.114	1.228	Ns	5.205

Source: Computed

<b>R</b>	<b>R Square</b>	<b>F</b>	<b>Sig.</b>
.899	.808	121.042	**

Source: Computed

Table 7.4 shows the Regression analysis between the export as dependent variable and major currencies, namely, US dollar, Pound Sterling, Euro and Yen as an independent variables. It is inferred from the table that the currencies such as US dollar, Pounds Sterling and Euro have positive effect on the exports and found to be significant. Due to increase in domestic production of commodities and promotional activities the exports have been risen. It also resulted that ( $R^2=0.808$ ) which states that the variance in exports can be explained by the currencies US dollar, Pounds Sterling and Euro. The presence of multicollinearity is to be checked for the regression analysis. It is done between the currencies because all the currencies were correlated and to avoid spurious correlation among the currencies, multicollinearity is checked. It is also found that there is no presence of multicollinearity in the regression analysis. The null hypothesis is rejected.

## Regression Analysis - Imports and select Foreign Currencies

It has been done to find the impact of exchange rate fluctuations on the imports. The following null hypothesis have been framed.

**H<sub>0</sub>:** Exchange rate of select foreign currencies do not affect imports

The table 7.5 presents the regression analysis for the exchange rate of Indian rupee against foreign currencies on imports.

**Table 7.5**

### Regression Analysis for foreign currencies Vs Imports

#### Dependent Variable: Imports

	Regression Coefficients (B)	Std.Error	Beta	t	Sig.	VIF
(Constant)	-2229.391	259.981				
USD	7.434	5.685	.123	1.308	Ns	4.232
POUNDS	21.190	5.360	.399	3.954	**	4.843
YEN	34.231	4.579	.566	7.475	**	2.731
EURO	-1.277	7.574	-.018	-.169	Ns	5.205

Source: Computed.

R	R Square	F	Sig.
.871	.758	90.233	**

Source: Computed

Table 7.5 shows the Regression analysis between the import and major currencies namely US dollar, Pound Sterling, Euro and Yen as independent variables. It is inferred from the table that the currencies Pounds Sterling and Euro have positive effect on the imports and found to be significant. Due to rise in demand of automotive components, petroleum and fuel products there exists a positive impact between India's imports and the currencies. It resulted that ( $R^2=0.758$ ) which states that the variance in imports can be explained by the currencies Pounds Sterling and Euro. There is no presence of multicollinearity in the regression analysis. The null hypothesis is rejected.

## Regression Analysis - Trade Balance and select Foreign Currencies

It has been done to find the impact of exchange rate fluctuations on the trade balance. The following null hypothesis have been framed.

**H<sub>0</sub>:** Exchange rate of select foreign currencies do not affect Trade balance

The table 7.6 presents the regression analysis for the exchange rate of Indian rupee against foreign currencies on trade balance.

**Table 7.6**

### Regression Analysis for Foreign Currencies Vs Trade Balance

#### Dependent Variable: Trade Balance

	Regression Coefficients (B)	Std.Error	Beta	t	Sig.	VIF
(Constant)	335.804	220.784				
USD	1.090	4.828	.039	.226	Ns	4.232
POUNDS	-5.464	4.551	-.223	-1.201	Ns	4.843
YEN	-9.964	3.889	-.358	-2.562	*	2.731
EURO	.643	6.432	.019	.100	Ns	5.205

Source: Computed

R	R Square	F	Sig.
.424	.180	6.302	**

Source: Computed

Table 7.6 depicts the Regression analysis between the trade balance and the major currencies, namely, US dollar, Pound Sterling, Euro and Yen as independent variables. It is inferred from the table that the currency - Yen has resulted a positive effect on trade balance and found to be significant. Due to bilateral trade relations and agreement-special strategic and global partnership signed between Indian and Japan. The regression results have shown the value ( $R^2=0.180$ ), which implied that the trade relations with Japan are strong and improves the level of India's trade balance. The null hypothesis is rejected. There is no presence of multicollinearity in the regression analysis.

### **7.3 CONCLUSION**

In this chapter, the impact of exchange rate of Indian rupee against select foreign currencies on exports, imports and trade balance has been analysed by using Correlation analysis and Regression analysis. Granger causality test has been applied to examine the short run relationship and causal effect between the variables. The currencies, namely, USD, GBP, EURO and YEN are positively correlated with exports, imports and trade balance in most of the years during the study period and the currencies, namely, USD, GBP, YEN are negatively correlated with exports, imports and trade balance. The Granger causality tests have shown that there exist causality relationship between currencies and trade balance, currencies and exports, currency and imports. The Regression analysis has shown that exchange rate of Indian rupee against foreign currencies has a positive impact on trade balance. It implies that currency depreciation stimulates the level of exports in the trade balance. Hence, the exporters need to promote their commodities to other nations to increase the trade relations and also to achieve the objectives of foreign trade policies.