

RELATIONSHIP BETWEEN EFFECTIVE EXCHANGE RATE INDICES AND INDIAN FOREIGN TRADE – AN EMPIRICAL EXPERIENCE

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ABSTRACT

Competitiveness of a country's exports is decided not only by the nominal exchange rate, but also relative price movements in domestic and foreign markets. The indices of Real Effective Exchange Rate (REER) and Nominal Effective Exchange Rate (NEER) are used as indicators of external competitiveness. NEER is the weighted average of bilateral nominal exchange rates of the home currency in terms of foreign currencies. Present article is an attempt to study the relationship between exchange rate indices (36 currencies based) and Indian foreign trade parameters during the post reforms period. The study is based on the monthly statistics pertaining to the selected indices and Indian foreign trade from 1993-2010. The analysis of change in the value of Indices during all months of the study period indicates that there has been significant change in the value of indices during various months of the study period. Application of log linear regression analysis indicates that per cent age change in the value of selected indices has statistically significant impact in terms of per cent age change in the value of imports and exports.

Key Words: *Real Effective Exchange Rate, Nominal Effective Exchange Rate, Exports, Imports.*

INTRODUCTION

Cross-currency movements in exchange rates may not be adequately represented by a bilateral exchange rate. Therefore, effective exchange rates may be more meaningful indicators of external competitiveness. Effective exchange rates are expressed as indices. The nominal effective exchange rate (NEER) is a weighted average of bilateral nominal exchange rates. The weights reflect the relative importance of each currency in the home country's external transactions.

NEER is expressed as an index using bilateral export weights or bilateral total trade (exports plus imports) weights in India. The NEER is constructed as a 5-country, 10-country and 36-country based index on a monthly as well as annual basis. The 36-country NEER is the most comprehensive, representing 65-70% of total exports/trade during 1975 and 1991 (Source: RBI Bulletin July 1993). In constructing the NEER, the exchange rates of the currencies are expressed as the number of units of numeraire per unit of currency. Special Drawing Rights (SDRs) chosen as the numeraire as the exchange value of the SDR is determined by a weighted average of a basket of currencies which could offset fluctuations in individual currencies.

Real Effective Exchange Rate (REER) is defined as a weighted average of nominal exchange rates adjusted for relative price

differential between the domestic and foreign countries. Central banks use the concept of 'real effective exchange rate', or REER, to adjust nominal effective exchange rate for inflation. REER is the weighted average of nominal exchange rates adjusted for the price differential between the domestic and foreign countries. The price differential, however, is based on the purchasing power concept. The currencies used are those countries with which trade is the highest. The weighted average of a country's currency relative to an index or basket of other major currencies adjusted for the effects of inflation. The weights are determined by comparing the relative trade balances, in terms of one country's currency, with each other country within the index.

REVIEW OF LITERATURE

Studies have been conducted to establish the linkage between exchange rate indices and foreign trade parameters such as imports, exports and foreign investment. Brief review of some of the studies relevant to the present field of study has been presented here to provide an insight about previous research work.

Oskooee, Mohsen Bahmani and Payesteh Sayeed (1993) investigated trade flows of six less developed countries in relation to exchange rate volatility using quarterly data over 1973-1990 periods. Application of Co Integration Technique rejected the notion of any long run relationship between imports and exports and their determinants and concluded that volatility of real effective exchange rates had depressed the import and export volumes of Least Developed Countries but consistent with Developed Countries in respect of 50% countries in the sample.

Shirvani Hassan and Wilbratte Barry (1997) presented an empirical reassessment of relationship between real exchange rate and trade balance, using the Multivariate Co-integration Approach based on bilateral trade between the U.S. and the other G7 countries. The study concluded that trade balance is unresponsive to the exchange rate in the very short run but is significantly affected by it within two years. The study supported the empirical validity of the Marshall-Lerner Condition, indicating that devaluations improved the trade balance in the long run.

C. Arize Augustine, Osang Thomas, J. Slottje Daniel (2000) investigated the impact of real exchange-rate volatility on the export flows of 13 less developed countries (LDC's) over the quarterly period 1973-1996. Estimates of Co Integration relations are obtained using Johansen's Multivariate Procedure. The results showed that increase in the volatility of the real effective exchange rate, approximating exchange change rate uncertainty exert a significant negative effect on export demand in both the short-run and the long-run in each of the 13 LDC's.

Dholakia, Ravindra H. and Saradhi, Raveendra V. (2000) the study indicated that targeting Real Effective Exchange Rate in India might not satisfactorily address the concerns for the trade balance, though it might be useful for export promotion.

It was found that increased exchange rate volatility had adverse impact on the prices paid and realized by the average Indian importers and exporters respectively though, it has not affected the quantum of the external trade of India negatively. The Indian export quantity is sensitive to all the three component variables of the real effective exchange rate.

Jalali Cherkaoui and Ahmad Reza Mouna Naini (2001) concluded that more stable and balanced Real Exchange Rate is conducive to export expansion. Sustained export expansion requires export diversification, product innovation, and quality upgrade, to form a more income elastic basket of export products as occurred in the newly industrialized countries. Real exchange rate realignment has been associated with export diversification in Morocco and Tunis.

Hau Harald (2002) examined the role of non tradable items for the volatility of the real exchange rate. Monetary Theory described that real exchange rate volatility is inversely related to economic openness. Non trade able requires large exchange rate changes so that the exchange rate passes through of tradable prices can contribute to the short run money market equilibrium after a money supply shock. The result laid stress on a cross section of 54 countries (and particularly the OECD subsample) is supportive of the conjectured openness volatility linkage. The inverse relationship between volatility and openness is robust to the inclusion of various control measures. Study also suggested discarding an endogenous risk-trade channel, distance related LOP deviations or a systematic concentration of relative shocks in closed economies as alternative explanations for the observed relationship. Results predicted large real exchange rate volatility for the future Euro/Dollar rate or the Euro/Yen rate if the level of intercontinental trade remains on its presently modest level.

Yol Marial and Z. Baharumshah Ahmad (2005) examined the effects of exchange rate changes on the bilateral trade balance of Egypt, Morocco and Tunisia vis-à-vis the US and Japan, using Johansen Co Integration and Error-Correction Model on the annual data in the period 1970-2003. The findings confirmed the existence of both the short-run dynamics and long-run causal relationships between trade balance and the set of specified independent variables.

Dua Pami and Sen Partha (2006), the study examined the relationship between the Real Effective Exchange Rate, level of capital flows, volatility of the flows, fiscal and monetary policy indicators and the current account surplus for the Indian economy for the period 1993 Q2 to 2004 Q1. The study indicated that the variables are Co Integrated. The generalized variance decompositions showed that determinants of the real exchange rate, in descending order of importance included net capital flows and their volatility, government expenditure current account surplus and the money supply. Results suggested that a similar analysis can be performed for the foreign exchange reserves held by RBI.

Sekantsi, Lira (2007), the study empirically examined the impact of real exchange rate volatility on trade in the context of South

Africa's exports to the U.S. for the South Africa's floating exchange rate period January 1995-February 2007 through Generalised Autoregressive Conditional Heteroskedasticity. Results indicated that real exchange rate volatility exerted a significant and negative impact on South Africa's exports to the US but stable and competitive exchange rate and sound macroeconomic fundamentals are required to improve international competitiveness and greater penetration of South African exports to international markets.

Olimov Ulugbek and Sirajiddinov Nishanbay (2008) studied the quantitative analysis of exchange rate volatilities and misalignment in Uzbekistan for the period of 1994 q3–2005q2. The results suggested that the real exchange rate volatility and misalignment have depressing effects on the volume of trade, mainly exports in Uzbekistan.

Caglayan Mustafa and Di Jing (2008) investigated the effect of real exchange rate volatility on sectoral bilateral trade flows between the US and her top thirteen trading countries. Investigation considered the effects on trade flows arising through changes in income volatility and the interaction between income and exchange rate volatilities. Study provided evidence that exchange rate volatility mainly affects sectoral trade flows of developing but not that of developed countries and effect of the interaction on trade flows is opposite that of exchange rate volatility yet there is little impact arising from income volatility.

Suresh, K.G.Reddy, V. Nagi (2010) in the study exchange rate and GDP of OECD economies are explained in the exports of India for the period 1994 to 2008. The ADF and Phillips-Perron Tests showed the First Order Co Integration in Indian exports, OECD GDP and exchange rate, the first difference of the log of exports of India has been regressed on first differences of the log of OECD GDP and the log of one of the four exchange rate variables at a time namely the Trade Weighted Real Effective Exchange Rate (REERT), Exports Weighted Real Effective Exchange Rate (REERX), Trade Weighted Nominal Effective Exchange Rate (NEERT) and Export Weighted Nominal Effective Exchange Rate (NEERX). The results indicated that only OECD GDP is significant in explaining the Indian exports.

Alam, Shaista (2010), the study investigated the impact of exchange rate volatility on Pakistan's aggregate exports demand by employing quarterly data for the period 1979Q3-2005Q4. The empirical results based on the Autoregressive Distributed Lag Analysis showed that real exports had co integration with foreign economic activity, Real Effective Exchange Rate and volatility of Real Effective Exchange Rate. Foreign economic activity had a significant positive effect on exports, Real Effective Exchange Rate carries significant negative coefficient, while the volatility of Real Effective Exchange Rate, has adversely affected the Pakistan's aggregate exports. The dynamic short run causality had not been detected from exchange rate volatility for exports in Pakistan.

Bhattacharyya Ranajoy and Mukherjee Jaydeep (2011) studied the effect of change in exchange rate on the volume of exports

of India with the help of 36 countries REER and NEER Index. The study concluded that the rupee was actually appreciating in terms of the Real Effective Exchange Rate. This weakened the impact of the Real Effective Exchange Rate on exports to insignificant levels. Exports in India are mostly caused by other factors, not by the Real Effective Exchange Rate.

Broda Christian and Romalis John (2003) study developed a model of international trade in which international trade depresses Real Exchange Rate Volatility and exchange rate volatility impacts on trade products differently according to their degree differentiation. Commodities are less affected by exchange rate volatility than more highly differentiated products. The study used disaggregates trade data for a large number of countries for the period 1970-1997. Results supported the prediction that trade dampens exchange rate volatility. Also addressed the reverse causality problem, the large effects of exchange rate volatility on trade found was greatly reduced. The estimated effect of currency unions on trade reduced from 300 per cent to be between 10 and 25 per cent.

Adeniyi Oluwatosin, Omisakin Olusegun and Oyinlola Abimbola (2011) queried the existence of a J-Curve in four West African Monetary Zone (WAMZ) countries: namely The Gambia, Ghana, Nigeria and Sierra Leone. Study used the data from 1980 to 2007 and a bounds Testing Approach, with an Autoregressive Distributed Lag (ARDL) Methodology, to Co Integration in capturing the impact of devaluation on the trade balance. Results showed that Co Integration exists among the trade balance, foreign income, the Real Effective Exchange Rate and domestic income in all countries.

The review of the literature clearly indicates that some of the studies have indicated the relationship between REER and NEER based on export and trade indices on foreign trade while some of the studies do not conclude on similar lines. The present study has been carried out to test the relationship between change in Real Effective Exchange Rate and Net Effective Exchange Rate indices and India's foreign trade.

RESEARCH METHODOLOGY

The present study is based on published data pertaining to the exchange rate indices and foreign trade (exports and imports) performance. Resistance for opening up of the economy and sectors was based upon the philosophy that the gains of international trade are biased in favour of the developed countries. So the developing countries have to be extra cautious while framing policies so as to take benefit from the opportunities ahead and also to face the challenges ahead in a more strategic manner.

Objectives of the Study

Keeping in view the key importance of exchange rate indices and their impact on foreign trade of India the present article "Relationship Between Exchange Rate Indices and Indian Foreign Trade- An Analytical Study" has been taken up to

study the relationship between selected exchange rate indices on India's foreign trade. The objectives of the study are:

To study the extent of change in the REER and NEER indices during the study period.

To study the relationship between REER and NEER indices and India's exports.

To ascertain the relationship between REER and NEER indices and India's imports.

Data Sources and Analysis

The published data for the study variables (foreign exchange rates, exports products and export destinations) has been obtained from RBI Data Base, Economic Survey, RBI Publications and Reports of DGCI&S. The analysis of published data has been carried out with the help of Mean Value, Coefficient of Variation, T-Value, and Log Linear Regression Model taking the value of index as an independent variable and the value of exports and imports as dependent variables.

Study Period

Monthly data in respect of the selected indices and value of exports and imports has been collected for the study period. Study period ranged from 1993 to 2010.

ANALYSIS AND RESULTS

Real exchange rate measures the relative purchasing power of two currencies in the goods market in terms of the real effects of exchange rate movements. It is calculated by deflating the nominal exchange rate by an index of relative prices between home and abroad. The bilateral US- India real exchange rate, for instance, may be measured by the nominal rate multiplied by the ratio of the US producer price index (PPI) to India's wholesale price index (WPI). The real effective exchange rate (REER) is the weighted average of bilateral price-deflated nominal rates. In other words, it is the weighted average of NEER adjusted by domestic to foreign relative local-currency prices. REER is also measured monthly and annually on the basis of 5, 10 and 36 country trade and export weights. The REER Index (RBI, 1993) used is based on export weights and official exchange rates from January 1975 to February 1992 with base 1985=100. As regards, the broad-based indices, the old 36-country indices were constructed with 1985 as the base period. The year 1993-94 is chosen as the base year for the revised 36-currency REER/NEER series in line with the WPI base year. The method of developing 36 country export based and trade based indices is presented in Table 1.

Table: 1

36 Currency Normalised Weights 1993-94

Analysis of weights assigned to thirty six countries for developing the export based and trade based indices indicates that the highest weight age was provided to US followed by

Table 1. 36 Currency Normalised Weights 1993-94

Sr.	Country	Export Based (%age)	Trade Based (%age)	Sr.No	Country	Export Based (%age)	Trade Based (%age)
1	USA	23.63	20.16	19	Egypt	1.66	0.92
2	UK	10.77	10.6	20	Indonesia	1.05	0.64
3	Germany	8.62	10.25	21	Israel	0.38	0.32
4	Japan	16.2	13.49	22	Kenya	0.51	0.27
5	France	3.63	3.94	23	Malaysia	1.13	2.48
6	Italy	3.79	3.16	24	Pakistan	0.28	0.34
7	Switzerland	2.08	1.71	25	Philippines	0.26	1.02
8	Australia	2.01	2.63	26	Saudi Arabia	3.25	5.85
9	S. Korea	1.24	1.49	27	Singapore	2.42	2.85
10	Mexico	0.09	0.23	28	Sri Lanka	1.45	0.66
11	Canada	1.56	2.64	29	Thailand	0.95	0.68
Subtotal (1 to 11)		73.62	70.3	30	Turkey	0.21	0.31
12	Belgium	3.32	5.28	31	Yugoslavia	0.75	0.64
13	Netherlands	3.41	2.92	32	Nigeria	0.8	0.38
14	Argentina	0.06	0.22	33	Sudan	0.61	0.34
15	Bangladesh	1.87	0.82	34	Myanmar	0.1	0.18
16	Brazil	1.17	1.63	35	Guatemala	0.01	0
17	China	0.71	0.89	36	Uruguay	0.02	0.01
18	Colombia	0.01	0.04	Subtotal (12 to 36)		26.39	29.69
Total						100.01	99.99

Source: Reserve Bank of India Bulletin, July 1993

Note: The first 11 countries are also included in the 15-country leading index. The countries included in the 15-country leading index but not included in the 36-countries for REER and NEER are Spain, Sweden, New Zealand, and Taiwan.

Table 2. 36-currency Normalised Weights for 2005-06

S.	Country	Trade Weight	ExportWeight	S.	Country	Trade Weight	Export Weight
1	Argentina	0.53	0.17	19	Mexico	0.33	0.51
2	Australia	2.66	1.03	20	Myanmar	0.43	0.16
3	Bangladesh	1.40	2.61	21	Nigeria	0.55	0.95
4	Brazil	0.79	0.78	22	Pakistan	0.34	0.55
5	Canada	1.30	1.33	23	Philippines	0.48	0.69
6	China	6.69	5.52	24	Qatar	0.35	0.24
7	Hong Kong	4.08	5.52	25	Russia	1.45	1.18
8	Denmark	0.40	0.41	26	Saudi Arabia	1.74	1.99
9	Egypt	0.47	0.63	27	Singapore	3.85	3.97
10	Euro	19.37	18.38	28	South Africa	2.44	1.11
11	Indonesia	2.73	1.87	29	Sri Lanka	1.25	2.07
12	Iran	1.09	1.58	30	Sweden	0.81	0.36
13	Israel	1.36	1.35	31	Switzerland	3.63	0.79
14	Japan	3.95	3.26	32	Thailand	1.26	1.41
15	Kenya	0.28	0.47	33	Turkey	0.55	0.92
16	Korea	2.94	1.38	34	UAE	6.43	8.70
17	Kuwait	0.47	0.56	35	UK	5.56	5.23
18	Malaysia	2.51	1.56	36	USA	15.56	20.78
					Total	100.00	100.00

Japan, U.K. and Germany. Total weights of these four countries have been more than fifty per cent of the total weights for export based and trade based indices. So, the movement of exchange rate of Indian Rupee in respect of these selected currencies must have played effective role in determining the value of NEER and REER Indices. From March 1992, FEDAI indicative rates are used and the base moves to 1993-94=100. The number of country used is thirty six and represent 65-70 percent of total exports /trade during 1975 and 1991. The monthly average of the REER and NEER for the base year is benchmarked to the level of 100. As against the practice of having three base years in the case of existing five-country indices, viz., 1991-92, 1993-94 and 2003-04, the last being a moving base updated every year to facilitate comparison with a more recent period, the new six-currency indices will have two base years, 1993-94 as fixed base and 2003-04 as a moving base, which would change every year as at present.

The thirty six-country indices have been revised and replaced with new 36-currency indices of NEER/REER. In this regard, the RBI Press Release dated November 4, 2005 had set out the broad outline of the revision of the REER/NEER indices. The normalized weights developing exchange rate indices for the 36-currencies for the year 2005-06 are based on trade shares of previous three years in respect of thirty six countries has been described in Table 2.

The revised thirty six countries/regions, represented by the thirty six currencies, together accounted for around 76 per cent of India's total foreign trade in 2004-05 as compared with a lower coverage of around 60 per cent of India's total foreign trade in the case of the existing indices. As in case of the revised indices of the six-currency REER/NEER, the thirty six-currency indices also use 3-year moving average weights (both exports and trade weights) in the construction of the new

series, keeping in view the rapid change in the direction of trade in contrast to the fixed weights used hitherto for constructing REER/NEER series. The use of bilateral trade and export weights is based on the restrictive assumption that from buyer's point of view, the elasticity of substitution between the sources of supply is zero. The domestic producers are the only competitors of India's export and competition from third country exporters do not exist. An ideal measure of effective exchange rate should attempt to use estimated measures of elasticity. However, data limitations normally favour the use of bilateral weights.

The Real Effective Exchange Rate (REER) is defined as a weighted average of nominal exchange rates adjusted for relative price differential between the domestic and foreign countries, relates to the Purchasing Power Parity (PPP) Hypothesis. The REER Index is used as indicator of external competitiveness. The fluctuations in the value of REER exports based index and trade based indices are reported in Table 3.

Analysis of REER export based index and trade based index reveals that the value of indices has been changing in different months of the study period. Coefficient of variation indicates the extent of change in the value of index. High value of coefficient of variation indicates more fluctuations in the value of index and low value of coefficient of variation indicates more consistency in the value of index. The coefficient of variation has been highest in respect of 1994-95 and 2008-09 in respect of REER export based and trade based indices. The calculated T-value for different years of the study period (1993-94 to 2009-10) in respect of both the indices have been statistically significant at 5% level of significance during all the years of the study period. This shows that change in the value of REER Export Based Index and REER Trade based

Table 3. Monthly Fluctuations in Real Effective Exchange Rate Index.

Year	REER Export Based Index Range		C.V. (%age)	T-value	REER Trade Based Index Range		C.V. (%age)	T-value
1993-94	99.48	100.49	0.798	434.190*	99.48	100.50	0.804	430.970*
1994-95	104.09	105.67	1.188	291.700*	103.47	105.18	1.290	268.520*
1995-96	97.09	103.12	4.737	73.126*	95.08	101.31	4.987	69.463*
1996-97	98.23	99.67	1.149	301.560*	96.09	97.58	1.205	287.510*
1997-98	102.03	104.10	1.573	220.230*	99.79	101.76	1.543	224.550*
1998-99	93.36	95.31	1.632	212.300*	91.87	94.21	1.977	175.250*
1999-00	94.70	95.86	0.962	360.220*	95.34	96.64	1.065	325.360*
2000-01	98.05	99.30	0.996	347.780*	99.44	100.74	1.016	340.990*
2001-02	97.82	99.36	1.233	281.040*	100.11	101.61	1.174	294.990*
2002-03	95.49	96.49	0.820	422.480*	97.50	98.86	1.092	317.190*
2003-04	98.26	99.88	1.286	269.270*	98.70	100.41	1.355	255.700*
2004-05	97.76	98.83	0.861	402.510*	99.60	100.58	0.772	448.780*
2005-06	99.92	101.65	1.351	256.370*	101.55	103.40	1.420	243.930*
2006-07	96.43	98.71	1.833	188.970*	97.35	99.78	1.942	178.370*
2007-08	103.32	104.93	1.223	283.210*	103.91	105.71	1.350	256.530*
2008-09	90.96	97.05	5.098	67.956*	91.83	97.34	4.587	75.518*
2009-10	89.58	94.49	4.194	82.587*	90.07	94.79	4.020	86.181*

Source: Compiled from RBI Data Base.

Note: * indicates T-value statistically significant at 5% Level of Significance.

Range explains the lowest and highest value during the year.

index has changed significantly during various months of all the years of the study period.

Index of the six-currency NEER and the thirty six-currency index prepared on the basis of 3-year moving average normalized exports weights in the construction of the new

series, keeping in view the rapid change in the destinations of India's foreign trade in contrast to the fixed weights used hitherto for constructing NEER index. The fluctuations in the value of NEER indices are reported in Table 4.

Table 4. Monthly Fluctuations in Export Based Net Effective Exchange Rate Index.

Year	REER Export Based Index Range		C.V. (%age)	T-value	REER Trade Based Index Range		C.V. (%age)	T-value
1993-94	99.25	100.75	1.180	293.542*	99.22	100.78	1.227	282.292*
1994-95	97.10	99.26	1.731	200.170*	97.84	99.98	1.698	204.008*
1995-96	88.32	93.56	4.529	76.495*	88.84	94.23	4.638	74.687*
1996-97	88.13	89.94	1.605	215.833*	88.33	90.21	1.657	209.102*
1997-98	91.10	92.85	1.496	231.632*	91.19	92.90	1.461	237.065*
1998-99	89.19	91.48	1.993	173.783*	87.63	90.47	2.511	137.968*
1999-00	89.91	90.94	0.900	384.927*	90.44	91.61	1.012	342.312*
2000-01	89.91	90.94	0.900	384.927*	91.40	92.84	1.231	281.400*
2001-02	88.45	89.71	1.113	311.261*	90.89	92.27	1.181	293.438*
2002-03	86.50	87.51	0.912	379.642*	88.35	89.89	1.362	254.426*
2003-04	87.17	88.60	1.280	270.573*	86.27	88.00	1.557	222.436*
2004-05	87.55	89.27	1.528	226.711*	86.46	88.17	1.547	223.896*
2005-06	90.39	91.93	1.330	260.552*	89.10	90.59	1.299	266.699*
2006-07	86.60	88.32	1.548	223.764*	85.06	86.72	1.521	227.815*
2007-08	94.39	96.21	1.508	229.714*	92.93	94.90	1.651	209.847*
2008-09	83.77	88.15	4.010	86.384*	84.16	88.14	3.632	95.372*
2009-10	80.74	83.02	2.189	158.268*	83.60	85.78	2.020	171.528*

Source: Compiled from RBI Data Base.

Note: * indicates T-value statistically significant at 5% Level of Significance.

Range explains the lowest and highest value during the year.

Analysis of REER export based index and trade based index reveals that the value of indices has been changing in different months of the study period. Coefficient of variation indicates the extent of change in the value of index. High value of coefficient of variation indicates more fluctuations in the value of index and low value of coefficient of variation indicates more consistency in the value of index. The coefficient of variation has been highest in respect of 1994-95 and 2008-09 in respect of REER export based and trade based indices. The calculated T-value for different years of the study period (1993-94 to 2009-10) in respect of both the indices have been statistically significant at 5% level of significance during all the years of the study period. This shows that change in the value of REER Export Based Index and REER Trade based index has changed significantly during various months of all the years of the study period.

Monthly data pertaining to Indian foreign trade studied with the help of range, coefficient of variation and one sample T-test to study the extent of change in India's foreign trade. The results obtained in respect of the study variables are presented in Table 5.

The amount of exports has increased to Rs. 84664.1 crore in 2009-10 as compared to lowest value of Rs. 5421 crore in the year 1993-94. The coefficient of variation in respect of amount of monthly exports during different years of the study period has ranged from 6.5 per cent to 20 per cent. The coefficient of variation was lowest in the year 2001-02 and highest in the year 2007-08. T-value calculated for the monthly exports during the study period indicates that change in the value of exports in different months of the study period are statistically significant at 5% Level of Significance.

The amount of average imports during 1993-94 has been Rs 5696 crore and the amount of imports increased to Rs. 1, 29,332 during 2009-10. The co-efficient of variation in the value of monthly imports indicates the extent of variation in the amount of imports during a particular year. The co-efficient of variation ranged from 5 per cent to 22 per cent. The co-efficient of variation has been lowest in 2009-10 and has been highest in the year 2007-08. T-value in respect of selected years of the study period indicates that the T-value in respect of all the years of the study period has been statistically significant at 5% level of significance and explains significant change in the value of imports

LOGLINEAR REGRESSION ANALYSIS

The effect of change in total export volume due to the change in the value of REER and NEER index has been studied with the help of log linear regression model taking the value of index as an independent variable and export volume as dependent variable. The results of the analysis have been listed in Table 6.

Analysis of R Square indicates the effect of percentage change in the value of index in terms of per cent change on export performance. The calculated value of R Square indicates that the effect of per cent age change in the value of NEER trade based index has been highest on Indian exports followed by NEER export based index. The per cent change in the value of REER indices is relatively low. The calculated F-value is statistically significant at 5% Level of Significance indicating the effect of exchange rate indices on export performance in respect of all the indices and value of exports. Negative value of beta coefficient indicates the inverse relationship between value of index and export performance.

Table 5. Monthly Foreign Trade Statistics

Year	Exports Range (Rs. Crore)		C.V. (%age)	T-value	Imports Range (Rs. Crore)		C.V. (%age)	T-value
1993-94	5421.67	6203.50	10.59	32.727*	5696.11	6487.56	10.22	33.882*
1994-95	6234.79	7544.38	14.96	23.158*	6869.19	8125.81	13.19	26.264*
1995-96	8015.85	9709.82	15.04	23.031*	9404.32	11042.02	12.61	27.479*
1996-97	9334.58	10468.42	9.01	38.441*	10819.45	12333.89	10.29	33.649*
1997-98	10716.46	11817.71	7.69	45.037*	13693.21	14925.63	6.78	51.111*
1998-99	11474.27	13490.06	12.71	27.258*	14756.23	16976.27	11.01	31.460*
1999-00	15047.99	16790.51	8.61	40.215*	16718.21	18086.62	6.19	55.981*
2000-01	15504.20	17006.30	7.27	47.637*	18417.54	23149.63	6.96	49.736*
2001-02	3032.03	65364.31	6.57	52.729*	21326.12	24514.88	10.95	31.641*
2002-03	19935.50	23470.33	12.82	27.027*	24635.97	29141.70	13.19	26.270*
2003-04	26410.71	30660.62	11.72	29.557*	33787.46	39634.04	12.53	27.640*
2004-05	27535.33	32044.67	11.91	29.081*	37897.25	44257.08	12.18	28.432*
2005-06	37769.89	47129.44	17.35	19.965*	55588.48	70285.18	18.38	18.851*
2006-07	46176.01	51472.16	8.54	40.581*	66632.95	73915.72	8.16	42.476*
2007-08	57986.14	74934.52	20.07	17.262*	97362.37	129145.96	22.08	15.685*
2008-09	63130.83	69669.67	7.75	44.701*	93034.54	110725.96	13.67	25.350*
2009-10	74831.39	84664.61	9.70	35.700*	120863.78	129332.55	5.33	65.025*

Source: Compiled from RBI Data Base.

Note: * indicates T-value statistically significant at 5% Level of Significance.

Range explains the lowest and highest value during the year.

Table 6. Effect of Exchange Rate Indices on Exports

Index	Parameter Estimates		D.F.	Model Summary		
	Constant	b1		R Square	F-value	Sig. Level
REER Export Based Index	797619	-167479	202	.088	19.60	.000*
REER Trade Based Index	475164	-97163	202	.029	6.127	.014*
NEER Export Based Index.	1022781	-220760	202	.229	60.128	.000*
NEER Trade Based Index	1131111	-244670	202	.260	70.936	.000*

Note: * indicates F-value statistically significant at 5% Level of Significance.

Table 7. Effect of Exchange Rate Indices on Imports

Index	Parameter Estimates		D.F.	Model Summary		
	Constant	b1		R Square	F-value	Sig. Level
REER Export Based Index	1177315	-247477	202	.070	15.110	.000*
REER Trade Based Index	700713	-143546	202	.023	4.789	.030*
(NEER Export Based Index.	1530299	-330710	202	.186	46.021	.000*
NEER Trade Based Index	1712151	-370872	202	.215	55.407	.000*

Note: * indicates F-value statistically significant at 5% Level of Significance.

The effect of change in total import volume has been studied due to the change in the value of REER and NEER indices with the help of log linear regression relationship taking index as independent and total import as dependent variable. The effect of change has been listed in Table 7.

R Square indicates the effect of per cent change in the value of independent variable in terms of per cent age change in the value of dependent variable. The regression coefficient is highest (0.215) in respect of NEER Trade and lowest (0.023) in respect of REER Trade. It shows that the effect of per cent age change is value of NEER Trade based index is lowest on total imports and highest in respect of REER Trade based index. The negative value of beta coefficient indicates inverse relationship between effective exchange rate and value of imports in the country. The calculated F-values are statistically significant at 5 per cent level of significance in respect of REER (export based and trade based) and NEER (export based and trade based) indices indicating that there is significant relationship between exchange rate indices and imports. The calculated R Square value explains that NEER indices have strong linkage as compared to REER indices.

CONCLUSION

The weight age in respect of 36 countries selected for developing REER and NEER indices has changed in respect of the base year 1993-94 and 2004-05. The value of selected indices has changed significantly during various months of the study period. The co-efficient of variation has been different in respect of the selected indices during different years of the study period. The value of imports and exports has increased significantly during various months of the study period. The results of log linear regression model indicates that the effect of per cent change in NEER indices is relatively more important in determining the value of exports and imports as compared to effect of change in the value of REER indices. Negative value of beta co-efficient indicates the inverse

relationship between value of index and volume of exports and imports. However, there is significant relationship between the value of selected indices and the volume of imports and exports.

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