



AN EMPIRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN CURRENCY FUTURES AND CURRENCY EXCHANGE RATE, ECONOMICAL FORMULAS, PREDICTION MODELS AND VOLATILITY IN INDIA WITH REFERENCE TO US DOLLAR, GREAT BRITAIN POUND AND EURO CURRENCY

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Abstract

One of the largest financial markets in the world is the “global foreign exchange market” with average daily trades in trillions of dollars. The forex market is the backbone of international trade, global investing and is critical to support imports and exports. The exchange rate is one of the most important determinants of a country's relative level of economic health. It is among the most watched, analysed and governmentally manipulated economic measures, since it impacts overall international trade. This study was aimed at identifying the important factors affecting valuation of the currency. The first approach was performing correlation analysis using historical data for 10 years for the period between 2007 and 2016 and the second was factor analysis using a data set of 100 banks professional's responses using a survey towards valuation of currencies in the world. The key findings of the correlation analysis are that, money supply, Sensex, exports/imports and business confidence index are the main factors affecting the major currencies exchange rate. With the help of factor analysis it can be concluded that trade, domestic rates and remittances are the factors determining the price of domestic currency. Finally, the main factors that best predict the appreciation or depreciation of rupee are domestic index, investment inflow and money surplus. It is therefore recommended that by keeping some of these factors strong, we will have a healthy foreign exchange market which in turn leads to a profitable economy.

Keywords : Currency Value, USD, GBP & EURO, Foreign Exchange, Forex Market.

1. Introduction

Foreign exchange abbreviated as “forex or FX” is the exchange of one currency for another or the conversion of one currency into another currency. Foreign exchange also refers to the global market where currencies are traded virtually around the clock. The largest trading centres are London, New York, Singapore and Tokyo. The Foreign Exchange Management (FEMA) 1999 Act governs the FX dealings in India. Foreign exchange transactions encompass everything from the conversion of currencies by a traveller at an airport kiosk to billion-dollar payments made by corporations, financial institutions and governments. Transactions range from imports and exports to speculative positions with no underlying goods or services. Increasing globalization has led to a massive increase in the number of foreign exchange transactions in recent decades. Foreign exchange transactions can be done for spot or forward delivery.

There is no centralized market for forex transactions, which are executed over the counter and around the clock. The forex market is a highly transparent market. That means that all current market information and news are widely accessible to all participants

The Foreign Exchange rate is never constant but varies from time to time depending on the changes in the global market. These changes in the market are usually brought about by the equilibrium between demand and supply of currencies between countries. With buyers and sellers from all corners of the globe participating in trillions of dollars of trades each day, it is therefore very important that one understands the determining factors that affect exchange rates. Even the trading activity usually is affected by the fluctuations in the exchange rate. The only instruments that can save them are **Currency swaps** where there is simultaneous purchase and sale of identical amounts of one currency for another with different value dates or an **Options** where there is a right to buy or sell a specific quantity of a given asset at a specific price on or before a specified date in the future. **Forwards** are the instruments used the most in an Indian scenario? It is a non-standard contract between two parties to buy or sell a specified amount of currency at an agreed exchange rate (delivery price) at an agreed future date. Even **Futures** can be used; these are similar to forwards in a way and the difference being that they are standardized contracts traded on a regulated exchange. These mechanism works only if the factors affecting exchange rate are predicted properly. In this study, we analyse some of the critical factors that play a major role in determining the rising and falling of the exchange rate of India.

2. Literature Review

Ashima Goyal (2015) has published an article named “Foreign Exchange Markets, Intervention and Exchange Rate Regimes”. The study describes that, bounds on the volatility of the exchange rate can lower noise trading in FX markets, decrease variance, improve fundamentals and give more monetary policy autonomy. The study describes the institutional



features of these markets, with special emphasis on the process of liberalization and deepening in Indian FX markets, in the context of global integration.

Prof. Pareshkumar J. Patel, Dr.Narendra J. Patel and Dr.Ashok R. Patel (2014) highlighted in his study named “Factors affecting Currency Exchange Rate, Economical Formulas and Prediction Models”. The researcher had an attention on the main factors which are influencing currency rates, focusing on economical formulas based on the economics theory to check the health of the currency and useful prediction models for the currency exchange rate. Currency is highly uncertain and unpredictable instrument. There is ample number of factors affecting the movement of currency. Graph of Currency trading has increased dramatically in the last few years in India, so the need for more effective ways for better analysis of movements in currency has been on a rise.

Somnath Sharma (2011) has published a research study entitled “An Empirical Analysis of The Relationship between Currency Futures and Exchange Rates Volatility in India”. This study focuses at the relation between volatility in the exchange rate in the spot market and trading activity in the currency futures. The results show that there is a two-way causality between the volatility in the spot exchange rate and the trading activity in the currency futures market.

Jason Van Bergen (2010) has published an article named “6 Factors That Influence Exchange Rates”. This report researches about the importance of exchange rate. He describes that, apart from factors such as interest rates and inflation, the exchange rate is one of the most important determinants of a country's relative level of economic health. Exchange rates play a vital role in a country's level of trade, which is critical to most every free market economy in the world. For this reason, exchange rates are among the most watched&analysed and governmentally manipulated economic measures. But exchange rates matter on a smaller scale as well: they impact the real return of an investor's portfolio. Here we look at some of the major forces behind exchange rate movements.

According to **G. Galati and C. Ho** (2003), news may play an important role in fluctuations of the euro exchange rate against dollar. The results of the study show that good news brings appreciation while bad news depreciates the currency (Galati, Ho, 2003, p. 371-398). **J.R. Sanchez-Fung** (2003) studied the same relationship and stated that exchange rate is more responsive in case of depreciation (Sanchez-Fung, 2003, p. 247-250).

In 1993 **David Romer** pointed at the great influence of openness on the exchange rate trends. In the work titled “Openness and inflation: Theory and Evidence” he conveys the correlation between inflation and openness, but it is as important for exchange rates as for inflation. Unanticipated monetary expansion leads to real exchange rate depreciation, and because the harms of real depreciation are greater in more open economies, the benefits of unanticipated expansion are decreasing in the degree of openness (Romer, 1993, p. 869-904).

3. Problem Statement

Foreign exchange plays an important role in County's growth. While exchange rates are determined by numerous complex factors that often leave even the most experienced economists perplexed, stakeholders should still have some understanding of how currency values and exchange rates play an important role in the rate of return on their investments. So it is necessary to identify and understand the factors affecting the exchange rate.

4. Objectives of the Study

- To study the structure, growth and performance of Foreign exchange rate in India and globe.
- To evaluate the factors affecting the Foreign Exchange rate with special reference to India.
- To examine the impact of demonetization on Foreign exchange.

5. Scope of the Study

1. Understanding the role played by the Foreign Exchange market.
2. Understanding the relationship between Euro GBP ,US Dollar Vs Indian Rupees
3. Examining the factors that best predict the exchange rate

6. Research Design

The design for the study is Descriptive research. Descriptive in the sense the data has been analysed and described. Historical data has been taken and analysed to find the factors which influence the FX rate. Based on the result of the questionnaire, the impact of factors influencing FX rate has been proved as well.

7. Limitations of the Study

- The number of respondents included in the research is limited to 100.
- The samples have been selected at random. Hence the results cannot be generalized.

8. Hypothesis

Null Hypothesis: H0: Macro economic factors affect the Foreign exchange rates

Alternate Hypothesis: H1: Macro economic factors do not affect the Foreign exchange rates

9. Data Collection Methods and Sources

Primary Data Collection

The primary data was collected by means of survey. It was collected from different bank professionals through questionnaire. Factor analysis is done to find out the results and also the data is represented through Pie, Bar and bubble chart.

Secondary Data Collection

The Secondary source of data used was from various news journals, other published journals and an analysis to determine the Correlation between exchange rates and various factors such as India Balance of Trade, India Business Confidence, Exports, India Imports, Inflation rate, Interest Rate, GDP Growth Rate, Sensex, Capital flow, Money supply was carried out.

10. Sampling Technique

Simple random sampling technique is used to select 100 people for the questionnaire. The Sample of USD, GBP and EUR has been taken for correlation analysis. This has been chosen based on the secondary research and studies which say these three currencies have high importance for Indian economy. These three currencies are highly traded currencies as well.

11. Tools of Analysis

Correlation and Factor analysis is used for analysing the data. Computer package of SPSS was used to carry out Factor analysis. The results of the analysis are extracted and presented in tabular form.

12. Indicators

1. **India Balance of Trade:** India's trade balance stands at USD -9490 Million as on Feb 2017. India's trade includes export of gems, jewellery, textiles, engineering goods, chemicals, leather manufactures and services. The imports include coal, oil, machinery, gems, fertilizers and chemicals. The major countries that trade with India are Europe, US, China and UAE.
2. **India Business Confidence:** The current business confidence index of India stands at 57.2. The index measures the level of optimism based on the country performance and the future prospects.
3. **Exports:** India's exports stands at USD 22115 Million as on Feb 2017. India's trade includes export of gems, jewellery, textiles, engineering goods, chemicals, leather manufactures and services. The gems and jewellery contributing to 16% of the exports and the export sector as a whole contributing to 22 % of the GDP. The major countries that trade with India are Europe, US, China and UAE.
4. **India Imports:** India's imports stands at 31955 USD Million as on February 2017. The imports include coal, oil, machinery, gems, fertilizers and chemicals. The major countries that trade with India are Europe, US, and Saudi Arabia.
5. **Inflation Rate:** India's inflation rate stands at 3.17 percent as on Jan 2017. The highest rate of 34.68 percent was observed in September 1974 and the lowest in May 1976 of -11.31 percent. The rate depicts the increase in the price of commodities measured against the purchasing power. The measures of inflation include CPI that measures consumer prices and GDP deflator measuring the inflation level of the entire economy.
6. **India Interest Rate:** The interest rate refers to the benchmark rate decided by the RBI. The highest rate of 14.5 percent was reported in the month of August 2000 and the lowest in the month of April 2009 of 3.25. The current rate being 6.25 percent.
7. **India GDP Growth Rate:** India's major GDP contributor being service industry that accounts for more than half of India's output. The highest rate of 11.80 percent was reported in the month of December 2003 and the lowest in the month of December 2002 of 1.60 percent. The current GDP growth rate is standing at 7.6 percent.
8. **Capital Flow:** The RBI has been a catalyst that enhances the capital flows into India. The capital flows in the form of foreign equity and direct investment has declined leading to an increase in the current account deficit. The rising deficit is being financed through non-equity flows and therefore the reliance on debt is increasing. There has been an increase in the inflows in the form of loans and banking capital in the first two quarters of the financial year.

9. **Money Supply:** RBI has strictly tightened the monetary measures during the Q1 of the current fiscal leading to increased growth in money supply over the quarterly GDP. The interest rates have risen bringing about increased demand and the supply not matching to it. On the other hand when the supply of money is more than the demand, it results in increased price of goods leading to inflation. However, now the gap between the money supply growth and the GDP growth is easing down implying that the monetary conditions have reached its saturation point.
10. **Sensex:** The Sensex is considered the barometer of the Indian economy. The Bombay Stock Exchange Sensex cheered Union Budget 2017 by surging more than 400 points to regain the 28,000 mark on Feb 1st 2017. The 30-share BSE index gained 485.68 points to close at 28,141.64, 1.76% up from the previous close of 27,655.9.

Average Foreign exchange rate of INR-(USD, GBP, EUR) for the period 2008- 2016

Table 1: Foreign exchange rate of INR –USD, EUR, and GBP (2008-2016)

Years	USD/INR	Euro/INR	GBP/INR
Dec 2008	43.78	64.14	80.62
Dec 2009	48.37	67.36	75.64
Dec 2010	45.66	60.58	70.57
Dec 2011	46.46	64.65	74.52
Dec 2012	53.42	68.59	84.67
Dec 2013	58.51	77.83	91.65
Dec 2014	61.01	81.06	100.49
Dec 2015	64.12	71.15	98.02
Dec 2016	67.18	74.32	91.06

Data source: in.investing.com/currencies/gbp-inr-historical-data



Figure 1 - Foreign exchange rate of INR - (USD, GBP, and EUR)

Exchange rate fluctuations have a significant impact on the overall economy of a country. From the above chart it has been observed that the USD/INR, EUR/INR and GBP/INR exchange rates have had a lot of fluctuations over the years. In 2013, we can see that the drastic fall of the Indian currency against the USD in 2013 can be attributed to the signals of ending quantitative easing by US Fed Reserve. On 28th August 2013, the Indian Rupee had gone down to an all-time low of 68.825 against the US dollar. This volatility became severe in the past few years affecting major macro-economic data, including growth, inflation, trade and investment. India runs a current account deficit, which gets compensated by the inflow on the capital account (foreigners investing in India, including direct and portfolio investments).

In recent times, India's current account deficit has widened and capital flows are not being able to bridge the gap. In the quarter ending June, the deficit expanded to 6.7% of the gross domestic product compared with 4.3% in the same quarter last year. As a result, the demand for dollars is high, while the supply remains low. Hence, the rupee is falling. Also other reasons such as importing oil can also weaken the currency as the oil prices are increasing. BNP Paribas estimates the currency will end the year at 68 per dollar. In 2015, with a complete lack of domestic data to drive changes for the British asset, fluctuations in the currency market have provoked movement for the Pound. With ongoing geopolitical difficulties in Greece and disappointing economic data out of China driving movement, the Pound was generally holding gains over high-

yielding and risk-correlated currencies. In The last two years GBP/INR rate has appreciated. The Pound Sterling to Indian Rupee (GBP/INR) exchange rate reached a high of 91.06 which is a good sign. The EUR/INR rate has depreciated over the years but comparatively, it's in a good position now than two years back.

Correlation

A direct correlation occurs if the variables move in the same direction A negative correlation occurs if the variables move in the opposite direction,

Perfect positive correlation= +1, Perfect correlation $r > 0$, Perfect negative $r = -1$, Negative correlation $r < 0$

The following Factors are considered for the Correlation analysis,

- Money supply, Sensex&Business Confidence index
- Capital flows, Inflation rate&Trade balance&Interest rate
- Economic growth, India exports&India imports

Table 1A: Correlation between USD/INR rate and the Factors

Correlation between USD/INR rate and the Factors											
FACTORS											
Years	USD /INR rate (Rs)	Money supply	Sensex	Business Confi index	Capital flows	Inflation rate (avg)	Trade balance (USD MIL)	Interest rate	Economic growth rate	India exports (USD MIL)	India Imports (USD MIL)
2007	41.49	30000	20286.99	72	120	6.39%	-3000	7	9.8	11000	14000
2008	43.78	39000	9647.31	66	80	8.32%	-7500	7	9.3	15000	22500
2009	48.37	45000	17464.81	57	60	10.83%	-6000	7	7	12500	25000
2010	45.66	55000	20509.09	64	-100	12.11%	-9500	4.3	9	16000	25000
2011	46.46	60000	15454.92	66	150	8.87%	-10000	6.25	8.8	23000	28500
2012	53.42	73000	19426.71	49	40	9.30%	-17500	8.5	5.8	25100	42500
2013	58.51	80000	21170.68	51	50	10.92%	-17500	8	5.5	23000	44000
2014	61.01	90200	27499.42	54	80	6.37%	-9000	7.8	6.3	27000	36000
2015	64.12	102000	26117.54	57	-50	5.88%	-15000	8	7.2	26900	42500
2016	67.18	115000	26626.46	54	10	4.97%	-7500	6.75	7.1	22000	29000

Table 2: Factors affecting Foreign Exchange Rate on USD (US Dollars)

Correlation Result between USD/INR rate and factors					
	Money supply	Sensex	Business Confidence index	Capital flows	Inflation rate
USD	0.9740	0.7901	-0.7527	-0.3436	-0.4801
	Trade balance	Interest rate	Economic growth	India exports	India Imports
USD	-0.4523	0.4569	-0.7157	0.7578	0.7009

Analysis

- There is a high correlation between USD rate and Money supply. The supply of money contributes to USD rate change. An increase in a country's money supply causes its currency to depreciate and vice versa.
- A negative correlation between USD rate and inflation rate exists which means that with the increase in inflation the USD rate decreases or vice versa
- There exists a moderate correlation between USD rate and interest rate. Higher interest rates attract foreign capital and cause the exchange rate to rise which in-turn provide lenders a high return. Interest rates influence exchange rates because they directly affect the supply and demand of a nation's currency. Fluctuating interest rates affect currency values in a directly proportionate manner.

- A moderate negative correlation between USD rate and trade balance prevails. The USD rate increases when Balance of payment (BOP) reduces or vice versa.
- A moderately high positive correlation exists between USD rate and imports. The USD rate can also get affected by the imports on a high level.
- There is a moderate high positive correlation between exports and USD rate. The USD rate depends on the level of exports.
- There prevails a moderately high negative correlation between USD rate and economic growth rate. A lower exchange rate makes exports cheaper and increases demand and also economic growth.
- A high negative correlation between USD rate and business confidence index exists. Better the business confidence index lower is the USD rate.
- The USD rate and the capital flows have a low negative correlation.
- There exists a moderate high correlation between USD rate and the sensx. If Sensx is growing, Indian economy has a high probability of growing in the near future.
- Therefore the main contributing factors to the USD rate includes money supply, Sensx, Business confidence index and the exports.

Table 3: Factors affecting Foreign Exchange Rate on EUR(Euro)

Correlation between EUR/INR rate and the Factors											
FACTORS											
Years	EUR /INR rate (Rs)	Money supply (BIL)	Sensex	Business Confi index	Capital flows (USD MIL)	Inflation rate (AVG)	Trade balance (USD MIL)	Interest rate	Economic growth rate	India exports (USD MIL)	India Imports (USD MIL)
2007	56.68	30000	20286.99	72	120	6.39%	-3000	7	9.8	11000	14000
2008	64.14	39000	9647.31	66	80	8.32%	-7500	7	9.3	15000	22500
2009	67.36	45000	17464.81	57	60	10.83%	-6000	7	7	12500	25000
2010	60.58	55000	20509.09	64	-100	12.11%	-9500	4.3	9	16000	25000
2011	64.65	60000	15454.92	66	150	8.87%	-10000	6.25	8.8	23000	28500
2012	68.59	73000	19426.71	49	40	9.30%	-17500	8.5	5.8	25100	42500
2013	77.83	80000	21170.68	51	50	10.92%	-17500	8	5.5	23000	44000
2014	81.06	90200	27499.42	54	80	6.37%	-9000	7.8	6.3	27000	36000
2015	71.15	102000	26117.54	57	-50	5.88%	-15000	8	7.2	26900	42500
2016	74.32	115000	26626.46	54	10	4.97%	-7500	6.75	7.1	22000	29000

Table 4: Correlation Result between EUR/INR rate and factors

	Money supply	Sensex	Business Confidence index	Capital flows	Inflation rate
EUR	0.7747	0.5761	-0.8123	-0.0544	-0.2300
	Trade balance	Interest rate	Economic growth	India exports	India Imports
EUR	-0.4722	0.5494	-0.8394	0.7374	0.7367

Analysis

- A moderately high correlation between EUR rate and money supply prevails. An increase in a country's money supply causes its currency to depreciate. A decrease in a country's money supply causes its currency to appreciate.
- There exists a low negative correlation between EUR rate and inflation rate .It simply means that with the increase in inflation the EUR rate decreases
- A moderate correlation between EUR rate and Interest rate is present. The interest rate does contribute to EUR rate change.
- There is a moderate negative correlation between EUR rate and trade balance. The EUR rate increases when BOP reduces.

- The EUR rate depends on the level of exports and imports and that is why there exists a moderately high positive correlation between EUR rate and imports&exports.
- A high negative correlation between EUR rate and economic growth can be seen. A lower exchange rate makes exports cheaper and increases demand. This can provide additional demand which increases economic growth.
- It is seen that there is a high negative correlation between EUR rate and business confidence index. Better the business confidence index lower is the EUR rate.
- A very low negative correlation can be observed between EUR rate and the capital flows.
- A moderate positive correlation between EUR rate and the sensex prevails. The stock index does affect the EUR rate to some extent.
- Therefore the main contributing factors to the EUR rate include money supply, business confidence index, economic growth rate and exports/imports.

Table 5: Factors affecting Foreign Exchange Rate on GBP(Great Britain Pound

Correlation Between GBP/INR Rate And The Factors											
FACTORS											
Years	GBP /INR Rate (Rs)	Money Supply (Bil)	Sensex	Business ConfIndex	Capital Flows (Usd Mil)	Inflation Rate (AVG)	Trade Balance (USD MILL)	Interest Rate	Economic Growth Rate	India Exports (Usd Mil)	India Imports (Usd Mil)
2007	82.94	30000	20286.99	72	120	6.39%	-3000	7	9.8	11000	14000
2008	80.62	39000	9647.31	66	80	8.32%	-7500	7	9.3	15000	22500
2009	75.64	45000	17464.81	57	60	10.83%	-6000	7	7	12500	25000
2010	70.57	55000	20509.09	64	-100	12.11%	-9500	4.3	9	16000	25000
2011	74.52	60000	15454.92	66	150	8.87%	-10000	6.25	8.8	23000	28500
2012	84.67	73000	19426.71	49	40	9.30%	-17500	8.5	5.8	25100	42500
2013	91.65	80000	21170.68	51	50	10.92%	-17500	8	5.5	23000	44000
2014	100.4	90200	27499.42	54	80	6.37%	-9000	7.8	6.3	27000	36000
2015	98.02	102000	26117.54	57	-50	5.88%	-15000	8	7.2	26900	42500
2016	91.06	115000	26626.46	54	10	4.97%	-7500	6.75	7.1	22000	29000

Table 6: GBP/INR rate and the Factors

Correlation Result between GBP/INR rate and factors					
	Money supply	Sensex	Business Confidence index	Capital flows	Inflation rate
GBP	0.722384663	0.70494834	-0.535222214	-0.048025132	-0.656006302
	Trade balance	Interest rate	Economic growth	India exports	India Imports
GBP	-0.340994329	0.709352186	-0.578876745	0.671047638	0.591776738

Analysis

- A moderately high correlation can be observed between GBP rate and interest rate. The interest rate contributes to GBP rate change.
- A negative correlation between GBP rate and inflation rate is seen. It simply means that with the increase in inflation the GBP rate decreases.
- There exists a moderately high correlation between GBP rate and money supply.
- A low negative correlation between GBP rate and trade balance can be noticed. The GBP rate increases when BOP reduces.
- A moderate positive correlation between GBP rate and imports is seen. The GBP rate is affected by the imports.
- There is a moderate correlation between exports and GBP rate. The GBP rate depends on the level of exports.
- A moderate negative correlation can be observed between GBP rate and economic growth. A lower exchange rate makes exports cheaper and increases demand. This can provide additional demand which increases economic growth.

- There exists a moderate negative correlation between GBP rate and business confidence index. Better the business confidence index lower is the GBP rate.
- It is noted that there is a very low negative correlation between GBP rate and the capital flows.
- Looking at the GBP rate and the sensex, there is a moderately high correlation between them. The stock index affects the GBP rate to some extent.
- Therefore the main contributing factors to the GBP rate include money supply, Sensex, and interest rate.

13. Factor Analysis: Factor analysis has been done for last three questions in the questionnaire in order to find out the factors affecting exchange rate.

4. The Factors affecting the price of Indian currency against a foreign currency?

Communalities		
Factors	Initial	Extraction
Trade deficit	1.000	.936
Fx invt inflow	1.000	.954
Inflation	1.000	.945
Fx outflow	1.000	.901
Sell. Currency	1.000	.929
Buy. Currency	1.000	.886
Nri remittance	1.000	.982
Bop positive	1.000	.999

Extraction method: principal component analysis.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.480	43.499	43.499	3.480	43.499	43.499	3.219	40.240	40.240
2	2.744	34.300	77.799	2.744	34.300	77.799	2.988	37.350	77.590
3	1.307	16.342	94.141	1.307	16.342	94.141	1.324	16.551	94.141
4	.383	4.793	98.934						
5	.085	1.066	100.000						
6	5.213E-017	6.516E-016	100.000						
7	-6.240E-017	-7.800E-016	100.000						
8	-9.622E-017	-1.203E-015	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix			
Factors	Component		
	Factor 1	Factor 2	Factor 3
Trade deficit	.966	-.032	.046
Fxinvt inflow	.115	.959	.149
Inflation	.178	.938	.181
Fx outflow	-.676	.589	-.312
Sell. Currency	.854	-.175	-.412
Buy. Currency	.383	-.842	.175
Nri remit	-.106	.084	.982
Bop positive	.948	.308	-.073

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

Grouping Table 1		
Trade	Domestic Rates	Remittances
The increase in imports or the decrease in exports contributing to the increase in the trade deficit	Increase in domestic interest rates contributing to increased FX investment inflows	Increased FX remittance by NRI's
A positive balance of payment contributed by increase in exports over the imports	The increase in the price of international commodities leading to inflation	
The Indian Central Bank selling foreign currency to ensure support for the rupee	Buying of currency by Foreign Institutional Investors contributing to excess foreign outflow	
The Indian Central Bank buying foreign currency to ensure support for the foreign currency		

Table 1–Grouping of variables under three factors(Trade, Domestic rates, Remittances)

Interpretation

- Eigen Value – “Total variance explained” table helps us to know how much data has been retained while doing the factor analysis. The table states that there are 3 factors which have Eigen values greater than 1.
- It is noted that the three factors extracted together account for 94.2% of the total variance. This is a pretty good bargain because we are able to economise on the number of variables (**from 8 we have reduced to 3 underlying factors**). While we have lost only 5.8% of the information content, most of the data has been retained
- Communality is the proportion of variance in any one of the original variables, which is captured by the extracted factors.
- From the “Rotated component matrix” it is noted that variables Trade deficit and BOP positive, sell currency with loadings .966,.948,.854 has a high impact on Factor 1. The factor can be termed as **Trade**
- To interpret Factor 2 it is noticed that variables FX investment inflow, inflation, with loadings .959,.938, has an impact on the factor. The factor can be termed as **Domestic rates**.
- Factor 3 is impacted by the variables NRI remittance with loading .982. The factor can be termed as **Remittances**.

Therefore from this analysis and looking at the grouping table 1, it is clear that the Factors affecting the price of Indian currency against a foreign currency can be grouped as Trade, Domestic rates and Remittances.

5. In what way is FX used by the bank?

Communalities		
	Initial	Extraction
Trade	1.000	.534
Education	1.000	.887
Travel	1.000	.939
Medical	1.000	.782
Gift Don	1.000	.916

Extraction Method: Principal Component Analysis.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.400	48.002	48.002	2.400	48.002	48.002	2.301	46.013	46.013
2	1.659	33.186	81.188	1.659	33.186	81.188	1.759	35.175	81.188

3	.730	14.601	95.789						
4	.111	2.229	98.019						
5	.099	1.981	100.000						
Extraction Method: Principal Component Analysis.									

Grouping Table 2

Customer servicing	Customer survival
Education	Trade
Travel	Medical
Gifts and Donations	

Table 2 - Grouping of variables under two factors (Customer servicing and customer survival)

Interpretation

- The table states that there are 2 factors which have Eigen values greater than 1.
- It is noted that the two factors extracted together account for 81.2% of the total variance. This is a pretty good bargain because we are able to economise on the number of variables (**from 5 we have reduced to 2 underlying factors**), While we have lost only 18.8% of the information content.
- From the “Rotated component matrix” it is noted that variables - education, travel with loadings .910, .969 has an impact on Factor 1. The factor can be termed as **Customer servicing**.
- To interpret Factor 2 it is noticed that variables Trade and Medical with loadings .730, .662 has an impact on the factor. The factor can be termed as **Customer survival**.

Therefore from this analysis and looking at the grouping table 2, it is clear that the way in which FX used by the bank can be grouped as Customer servicing and Customer survival.

The indicators that best predict the appreciation or depreciation of rupee

Factors	Communalities	
	Initial	Extraction
CPI	1.000	.994
BOT	1.000	.837
IIP	1.000	1.000
GDP	1.000	.981
BussCon	1.000	.882
IntRate	1.000	.994
Emplyt	1.000	.651
MoneySupply	1.000	.988
Capital Inflow	1.000	.950
Sensex	1.000	.912
Extraction Method: Principal Component Analysis.		

Grouping of variables under three factors (Domestic index, Investment inflow, Money surplus) Rotated Component Matrix			
Factors	Component		
	1	2	3
CPI	.995	-.062	-.017
BOT	.310	.860	-.026
IIP	.973	.160	.168
GDP	.539	.628	.544
BussCon	.246	-.103	.901
IntRate	.995	-.062	-.017
Employment	-.038	-.131	.795
Money Supply	.300	-.940	-.118
CapitalInflow	-.078	.212	.948

Sensex	-.041	.938	-.172
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.			
Grouping Table 3			
Domestic index	Investment inflow	Money surplus	
Consumer price Index	Balance of trade index	Business confidence index	
Industrial production index	Gross domestic product index	Employment indicator	
Bench Mark interest rate	Sensex	Capital inflow	
Money supply			

Interpretation

- The table states that there are 3 factors which have Eigen values greater than 1.
- It is noted that the three factors extracted together account for 91.2 of the total variance. This is a good bargain because we are able to economise on the number of variables (**from 10 we have reduced to 3 underlying factors**) there by losing 8.2% of the information content.
- To interpret Factor 1 it is noticed that variables Consumer Price Index (CPI) ,Industrial production index (IPI), Interest rate with loadings .995, .973,.995 has an impact. .The factor can be termed as **Domestic index**
- From the rotated component matrix it is noted that the variables - Balance of Trade (BOT), Sensex with loadings .860 .938 has an impact on Factor 2.The factor can be termed as **Investment inflow**.
- Factor 3 is impacted by the Business Confidence index and Capital inflow with loading .958, .968.The factor can be termed as **Money surplus**.

Therefore from this analysis and looking at the grouping table 23, it is clear that the best indicators to predict the appreciation or depreciation of rupee can be grouped as Domestic index, Investment inflow and Money surplus.

14. Findings

- It was found that the main contributing factors which affect the USD rate include money supply, Sensex, business confidence index and the exports.
- For the GBP rate, the factors like money supply, Sensex, and interest rate play a major role.
- For the EUR rate, the factors such as money supply, business confidence index, economic growth rate and exports/imports impacts.
- The currency on which the Indian Economy is dependent is the US dollars
- The extent to which the inter-day volatility affects the currency rate is moderate
- The Hedging tool best suited to reduce this volatility is Forwards
- Factor analysis done on the indicators that best predict the appreciation or depreciation of rupee can be grouped under domestic index, Investment inflow, Money surplus.
- Factor analysis done on the Factors affecting the price of a domestic currency against a foreign currency can be grouped under remittances, trade, domestic rates.
- It was found that, the way FX is used by bank can be grouped under Customer survival, customer servicing through Factor analysis.

15. Recommendations

After a detailed analysis, few of the recommendations are as follows:

- The Indian investors are to be educated on the various FX transactions in the financial reports.
- Bringing about new derivative products like forward swaps that increases competitiveness and also bring liquidity in the market
- Better growth opportunities have to be provided by the bank for income received to be reinvested by foreign investors
- Understanding the reasons behind why you are making a trade are paramount to a successful trade.
- Having a diversified portfolio is important. So high risk currency trading could be a good part of an investment plan. High risk can lead to very high return; just make sure you do not over-extend in this market.
- The Importers are not provided the opportunity to spread their payments over a period of time by the bank.



16. Conclusion

Since Exchange rates play a vital role in a country's level of trade and is critical to most every free market economy in the world, it is important to examine the factors that affect the foreign exchange market. Therefore, after the detailed analysis, it was found that the main contributing factors to the USD rate included money supply, Sensex, business confidence index and the exports. For the GBP rate, the factors like money supply, Sensex, and interest rate played a major role. And finally for the EUR rate, the factors like money supply, business confidence index, economic growth rate and exports/imports impacted a lot. The research was also supported with the help of questionnaire results analysed through Factor Analysis and conclusions being drawn. Through the analysis it was found that the factors which impacted the exchange rate could be grouped under Domestic Inflow, Investment Inflow and Money Surplus. In conclusion, Currency moves can have a wide-ranging impact not just on a domestic economy, but also on the global one. Recent demonetization has also taken into account and the impact of the same has been discussed. Because currency moves can be a potent risk when one has a large forex exposure, it may be best to hedge this risk through the many hedging instruments available. So stakeholders should study the factors affecting the FX rate before they put their money in the foreign exchange which in turn can lead to a profitable and a healthy economy.

17. References

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