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Factors affecting Currency Exchange Rate, Economical Formulas and Prediction Models

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Abstract

Graph of Currency trading has increased dramatically in last few years in India, so the need for more effective ways for better analysis of movements in currency has been arise. Currency is highly uncertain and unpredictable instrument. There are ample of of factors affecting movement of currency. People have started using Currency futures as an investment option and they can trade various currencies as per the current economical condition of the country. Before investment it is important to identify effect of various factors on index value of currency. The purpose of this paper is to indicate main factors which are influencing currency rates, focusing on economical formulas based on the economics theory to check health of the currency and useful prediction models for currency exchange rate.

Keywords: Currency Exchange Rate, FOREX, Factors affecting currency, Prediction Models, Purchasing Power Parity, Artificial Neural Network based Prediction Models

1. INTRODUCTION

In recent years forecasting of financial data such as interest rate, exchange rate, stock market and bankruptcy has been observed to be a potential field of research due to its importance in financial and managerial decision making [3]. Currency Exchange give a rate of currencies in pair of currency of two countries e.g. USDINR for U.S. Dollar and Indian Rupee. This rate can be used to buy or sell from Currency Exchange. Nowadays the trading of currency is increased and people invest their money in specific currency as per the future scope of profitability. Currency Exchanges monitor events all round the world and the currency rates are managed globally based on the economical valuation of any country's currency.

Main focus of this paper is to identify important factors affecting valuation of the currency, economic formulas used to find currency valuation based on theory of economics and prediction of future values through different prediction models.

Everybody involved in currency trading are always interested in better prediction of future values of the currency. As it is highly uncertain, it is not possible to exactly predict the value of a currency but we can get nearer predicted value using various statistical models and other advanced prediction models. We have analyzed existing models and identified few models which are helpful for prediction of the currency exchange rate.

2. FACTORS INFLUENCING EXCHANGE RATES

In this section emphasis is on various factors affecting currency movement and their characteristics. We have included important factors which can affect the valuation of FOREX. We have also indicated positive and negative effect of each factor on currency valuation [5].

INFLATION

Inflation plays an important role in valuation of currency of any country. If the rate of inflation in the India is lower than other countries comparatively, then Indian exports will increase. There will be an increase in demand for Rupee to buy Indian goods. Also foreign goods become cheaper and so Indian citizens will pay less ultimately import decreases. Therefore lower inflation rates tend to see an appreciation in the currency value of any country.

RATE OF INTEREST

If rate of interest in India increase relatively to other countries, it will become attractive to invest money in India. Investor will get a higher return from saving in the Indian banks. Therefore demand for Indian Rupee will rise. Higher interest rate is an appreciation for money inflow which will have negative impact on local businesses of the country. Higher interest rate reduces purchase power of the consumer while the loan borrowers have to pay more interest.

CAPITAL ACCOUNT BALANCE

For any country current account deficit indicates higher values of imports of services and goods in comparison to the values of exports. Countries having surplus in their financial account are benefited than countries with deficit. They can attract more capital from other countries and can see appreciation in the currency value relative to the countries with capital account deficit.

ROLE OF SPECULATORS

Speculator is a person who takes more risk in investment, and can do a major change in the future price of the asset. If they believe the Indian Rupee will increase in near future, they start demanding Rupee now to earn profit in future. This kind of demand causes Indian Rupee value to rise. Such movement doesn't reflect any economical fundamentals; they are only due to positive sentiments of the financial markets. Like, if financial investors see news about a rate of interest decreasing, exchange value of Rupee will go down most probably [10].

COST OF MANUFACTURE

If the country can produce goods at more economical rate, they can sell goods at attractive price. In anticipation to low rate export increases and in affect of this value of currency also increases. China is the best example of competitive market for economical goods in the world. It gives rise to the currency of any country in longer term.

DEBT OF THE COUNTRY

Countries' spending more on public sector projects and fund for social upliftment of the society has more debt on the country. Such spending stimulates the domestic economy. Countries with higher public debt are not attractive to foreign investors. Because higher debt of the country leads to higher inflation ultimately increases debt to control inflation. Some standard organizations like Standard & Poor's, Moody's gives debt rating of the country, and it is very important determinant of its exchange rate [4].

GROSS DOMESTIC PRODUCT

"The gross domestic product of a country is a measure of all of the finished goods and services that a country generated during a given period"[5]. GDP gives best measure of health of country's economy. It is the number calculated by consolidation of total expenses of government, money spent by business, private consumption and exports of the country. Increment in GDP indicates economic growth. Foreign investors get attracted towards the countries with economically strong countries with good GDP. It leads to better valuation of the currency of the country because more and more money comes to the country.

POLITICAL STABILITY AND ECONOMIC PERFORMANCE

Countries with stable government can give better growth in economy through completion of the projects in hand. Investors invest their money in the countries with strong economic performance. As India has coalitions government and no party has got full majority so there are lot of problems for stability of the government and the government can't take decisions strongly. So, it causes loss of confidence in foreign investors. It affects economic growth and money moves out of the country.

EMPLOYMENT DATA

Employment data indicates level of prosperity of economy. Generally countries release their data of employment after certain interval. As the rate of employment is higher people in the country gets enough chance for work of their choice and expertise. In most cases the value of currency increases as the number of unemployed people decreases. But sometimes high employment increases purchase power parity of the people and can lead to higher inflation in the country, so it can adversely affect valuation of the currency.

RELATIVE STRENGTH OF OTHER CURRENCIES

Currency valuations are also equally affected by global parameters. Country's economical strength is compared with other countries strength and if other countries are strong money moves to those countries. It ultimately reduces valuation of the country with comparatively poor health of the economy.

MACROECONOMIC AND GEOPOLITICAL EVENTS

In the case of events like elections, wars, monetary policy changes, financial crisis, currency of the country is highly affected. Such macroeconomic and geopolitical events also affect other parameters. These events have the ability to change or reshape of the country including fundamentals of the country. For example, wars can put a huge economic strain on a country and greatly increase the volatility in a region, which could impact the value of its currency. It is important to keep up to date on these macroeconomic and geopolitical events.

3. ECONOMICAL FORMULAS

Study of economic theories indicates that foreign exchange mainly depends on parity conditions. "A parity condition is an economic explanation of the price at which two currencies should be exchanged, based on parameters like interest rate and inflation"[5]. Historical data study and the formulas were derived using the parity conditions of different countries. We have shown basic economic formulas used to check currency valuation and its effects [14].

PURCHASING POWER PARITY (PPP)

Purchasing Power Parity is price levels between two countries should be equivalent to one another after adjustment of exchange rate. The main base of this theory is the rule of one price, where the cost of identical goods should be the same around the world. If the difference in price is very large between two countries for the same product after exchange rate adjustment, an arbitrage opportunity is created, because the product can be obtained from the country that sells it for the lowest price.

Formula for Purchasing Power Parity is as below:

$$\mathbf{e} = \frac{\pi 1 - \pi 2}{1 + \pi 2} \qquad (1)$$

Where **e** is the rate at for exchange rate change, π_1 is first country's inflation and π_2 is second country's inflation
Let's take and example, there are two countries C1 and C2, country C1 has Inflation = 10% and country C2 has Inflation=5%
So, Expected Currency Appreciation (ECA) is

$$ECA = \frac{C2 - C1}{1 + C1} = \frac{0.10 - 0.05}{1 + 0.05} = 4.76\% \quad (2)$$

Here country C1's currency should realize 4.76% in opposition to C2's currency.

INTEREST RATE PARITY (IRP)

Interest Rate Parity is also similar to Purchasing Power Parity in terms of if both the countries have similar rate of interest there will not be any opportunity for arbitrage. If countries IRP are similar there will be equal asset valuation and risk is also same. Fundamentally IRP is also rule of one price, means purchase of asset in any country should give equal return as other country. If it is not so, rate of exchange needs to adjusted to manage the difference between them.

We can find IRP using:

$$(i1 - i2) - \left(\frac{F-S}{S}\right)(1 - i2) \quad (3)$$

Where, F indicates exchange rate of future market, S indicates the exchange rate of current market, $i1$ is first countries interest rate, $i2$ is second countries interest rate.

BALANCE OF PAYMENTS THEORY

Balance of Payments of any country has main two segments

- The Capital Account which measures capital of a country
- The Current Account measures import and exports of the country

In case, country is having large CAD or surplus, it is the indication of exchange rate is not in normal range. To maintain the currency into control of normal range, the exchange rate needs to be adjusted. If a country is running is having surplus money, the value of currency will increase, and higher deficit will lead to depreciation of the currency.
The balance of payments theory works on the current account, which deals with trade of goods, to get an idea of exchange rate directions.

The basic formula for balance of payments is:

$$\mathbf{BCA + BKA + BRA = 0} \quad (4)$$

Here, BCA indicates balance of the current account; BKA indicates balance of the capital account; and BRA indicates balance of the reserves account.

4. PREDICTION MODELS

As per the literature survey, we found many prediction models used for prediction of a currency value. We have listed models which are more popular specifically for FOREX prediction. In 1970 to 1990 most of the work of prediction was done using Statistical models [2] and time series analysis [1]. Later on trend of Artificial Intelligence and Data Mining related models started [11]. Nowadays researchers are working more on hybrid models. List of prediction models is given below [10].

- Random Walk model (RW)
- Purchasing Power Parity model (PPP)
- Uncovered Interest Rate Parity model (UIP)
- Sticky Price Monetary model (SP)
- Econometric Model
- Dornbusch-Frankel monetary model
- Hybrid model of monetary factors and productivity differentials (HBS model)
- Taylor Rule Models
- Artificial Neural Network based Prediction models
- Feed Forward Neural Network (FFNN)
- Standard Backpropagation (SBP)
- Scaled Conjugate Gradient (SCG)
- Backpropagation with Bayesian Regularization (BPR)

We can measure accuracy of above given prediction models using different measures of forecast accuracy like ARIMA, ARCH, GARCH, and ARMAX [1]. These models may not suit for all countries. So, before using the models it must be tested for specific data.

5. CONCLUSION

Prediction of a currency is mainly based on major factors listed in this paper. For healthy economy a country should closely monitor and work on the above factors. Secondly, the economics theory has given basic formulas to calculate currency valuation using PPP, IRP and other such formulas. These formulas are proven by economists and used widely for currency valuation. Countries economical data can be studied and future value of currency can be predicated using prediction models. We have listed popular prediction models in this paper. Each model needs to be studied before applying economical data for prediction of a value [15]. Special prediction accuracy measures can be used to check accuracy of the models.

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