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## A Study of the Relationship between the Exchange Rate and Policy Rate in India

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### ORIGINAL ARTICLE



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### ABSTRACT

The study examines the relationship between the exchange rate and the Policy rate (Repo rate) from 2008 to 2022 with the help of Statistical and Econometrical tools. This paper shows that there is a negative correlation between the variables and the VAR model explains a 1 percent change in the Repo rate, the exchange rate fluctuates by 1.85 percent. This means domestic currency depreciates due to a rise in The Repo rate, which is against the conventional theory as given by Mundell–Flemming. This study also reveals that there is a bidirectional relationship between the exchange rate and the repo rate. This relation is examined through the Granger-Causality test.

### KEY WORDS

Exchange Rate, Repo Rate, Correlation, Unit Root Test, VAR, Granger-causality.

### INTRODUCTION

The exchange rate and the policy rate are crucial macroeconomic variables, which play a significant role in the growth of the Indian economy. The exchange rate refers to the rate at which one country's currency is converted into another country's currency. The Indian economy has faced several exchange rate regimes since independence. Currently, a managed flexible exchange rate has been used in India. In this regime, the market mechanism determines the rate and is sometimes controlled by the Government. While the policy rate is an instrument of monetary policy, which is used to control the demand and supply of money. Policy rate consists of several interest rates like Repo rate, reverse repo rate, bank rate, marginal standing facility (MSF), and standing deposit facility (SDF) rate. In these interest rates, the

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Repo rate is considered a policy rate as per the Finance Act 2016.

The repurchase option (Repo rate) is a money market instrument, which means borrowing funds by selling securities with agreements to repurchase securities on a future date at the decided price, which includes interest for the fund borrowed. Whereas the Reverse Repo rate means lending funds by purchasing securities with an agreement to resell the securities on a future date at the decided rate of interest. Here securities include either Government securities corporate securities or any other securities, that are permitted by the central bank. Indian repo market predominantly uses sovereign securities, though repo is allowed on corporate bonds and debentures, However, Non-sovereign security is also used in the world Repo rate market. Sovereign Security is a debt issued by the central and state Governments to raise money for financing Government expenditures like spending on welfare schemes, paying the old debt and interest on it, and any other Government needs.

The Repo rate and the Reverse repo rate are part of the liquidity adjustment facility(LAF), which was introduced in 1999 on the recommendation of the Narshimham Committee on banking reforms. Reserve Bank of India maintains the daily liquidity of money through LAF.

## Review of Literature

**Sargent and Wallace (1981)**: both explained in their paper that there was a reduction in demand for money due to high interest rates and an increase in price level due to a rise in interest rate, which implies that there is an increase in Government debt. That would be financed by seignorage. This will cause exchange rate depreciation.

**Furman and Stiglitz (1998)**, examined that there are two channels through which exchange rates are affected by the rise in interest rates. In the two channels, the first one is the risk of default and the second one is the risk premium. According to their paper, the interest rate reveals the promised return on domestic assets that is, actual interest receipts are equal to promised interest receipts. However, in the case of a post-crisis situation, a high-interest rate policy can decrease the profitability of repayments and increase the risk premium on domestic assets. So rise in interest rates may cause the exchange rate depreciation, especially in case of financial situation of firms and banks is fragile.

**Keminsky and Schumukler (1998)**, empirically revealed the relationship between the exchange rate and interest with the help of time series correlation based on daily collected data. Their research area considers Indonesia, Korea, Malaysia, the Philippines, Thailand, and China by applying daily data from the second half of 1997, after analysis they found that the correlation between the exchange rate and interest rate was not stable and finally concluded interest rate in these countries must not be exogenous variables.

**Gould and Kamin (2000)**, represented the relationship between interest rate and exchange rate by studying the effects of risk premium, interest rate, and default probability on exchange rate regarding countries South Korea, Malaysia, the Philippines, Thailand, and Mexico. They found that the exchange rate is influenced by credit spreads and stock prices rather than interest rates. Finally, they conclude that their result neither supports Mundell-Flemings' views nor monetarists' views.

## Research Methodology

The research is entirely based on secondary data, which is collected from RBI sites in the Handbook of Statistics on the Indian economy. This research examines the time series data from 2008 to 2022 and uses the econometrical tools Unit Root tests, Vector Autoregressive Model (VAR), and Granger-Causality test. The data is analyzed with the help of EViews12 Student Version Lite Software.

## Hypothesis of the Study

1. There is no relationship between the exchange rate and the Repo rate.
2. There is an impact of the Repo rate on the exchange rate.

## Empirical Analysis of the Study

The Indian foreign exchange rate is considered in terms of the US dollar. The table given below shows the exchange rate and Repo rate for the calendar year average data from 2008 to 2022.

Table 1

Year	Exchange Rate	Repo Rate
2008	43.50	8.04
2009	48.40	5.10
2010	45.72	5.48
2011	46.67	7.54
2012	53.43	8.21
2013	58.59	7.53
2014	61.01	8.00
2015	64.15	7.40
2016	67.19	6.50
2017	65.12	6.15
2018	68.38	6.36
2019	70.42	5.78
2020	74.09	4.45
2021	73.91	4.00
2022	78.60	5.04

(Source: RBI, The Handbook of Statistics on Indian Economy)



(Source: Computed by the Author with the help of EViews12 Student version Lite)

The above diagram reveals the combined graph of the exchange rate and the Repo rate in which the upper graph shows the exchange rate and the lower shows the Repo rate respectively. The exchange rate has been increasing continuously since the study period 2008 to 2022, which varies from RS 43.5 per dollar to RS 78.6 per dollar. It means the Indian currency rupee has been depreciating annually, while the Repo rate has been almost decreasing.

Table 2: Descriptive Statistics

	Exchange Rate	Repo Rate
Mean	61.27	6.37
Median	64.15	6.36
Maximum	78.60	8.21
Minimum	43.50	4.00

Std.Dev.	11.40	1.38
Skewness	-0.22	-0.18
Kurtosis	1.75	1.76
Jarque-Bera	1.08	1.03
Probability	0.58	0.59
Sum	919.18	95.58
Sum of Sq. Dev.	1821.97	26.49
<b>Observation</b>	15.00	15.00

Table 2 represents the descriptive statistics, which measure the frequency of data, central tendency of data, and dispersion or variation of data.

### Correlation

There is a negative correlation between the exchange rate and the repo rate, which value is -0.52. it means the correlation is moderately negative.

### Econometrical Analysis

As the study is based on time series analysis, so first of all we will check the unit root test of the data after that we will apply appropriate econometrical tools.

### Unit root test of the Exchange Rate

As per the Augmented Dickey-Fuller test analysis, the exchange rate is non-stationary at the level but stationary at 1<sup>st</sup> difference.

Table 3

Null Hypothesis: D(EXCHANGE\_RATE) has a unit root  
Exogenous: None  
Lag Length: 0 (Automatic - based on AIC, maxlag=1)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-2.452070</b>	<b>0.0189</b>
Test critical values: 1% level	-2.754993	
5% level	-1.970978	
10% level	-1.603693	

(Source: Computed by Author with the help of EViews 12 Student Version Lite)

The above table shows that the probability value is 0.01, which is less than 0.05 level of significance. it means we reject the null hypothesis and the data is stationary at 1<sup>st</sup> difference.

### Unit Root test of The Repo Rate

As per the analysis, the Repo rate is also not stationary at level but stationary at 1<sup>st</sup> difference. Here probability value is 0.0006, which is very low than 0.05. that's why we reject the null hypothesis.

Table 4

Null Hypothesis: D(REPO\_RATE) has a unit root  
Exogenous: None  
Lag Length: 1 (Automatic - based on AIC, maxlag=1)

	t-Statistic	Prob.*
<b>Augmented Dickey-Fuller test statistic</b>	<b>-4.123678</b>	<b>0.0006</b>
Test critical values: 1% level	-2.771926	
5% level	-1.974028	
10% level	-1.602922	

(Source: Computed by the author with the help of EViews 12 Student Version Lite)



After the unit root test, we found that both the variables are stationary at first difference. Therefore we apply the Vector Autoregressive Model (VAR) of times series econometrics. Through the AIC leg length criteria, this study considers the value of leg length is one(1).

Table 5

Vector Autoregression Estimates  
Date: 11/17/23 Time: 02:10  
Sample (adjusted): 2010 2022  
Included observations: 13 after adjustments  
Standard errors in ( ) & t-statistics in [ ]

	D(EXCHA...	D(REPO_RATE)
D(EXCHANGE_RATE(...	0.052102 (0.20359) [ 0.25592]	-0.194767 (0.09120) [-2.13566]
D(REPO_RATE(-1))	1.857162 (0.47687) [ 3.89451]	-0.037533 (0.21361) [-0.17570]
C	2.778348 (0.68887) [ 4.03321]	0.439326 (0.30858) [ 1.42371]

(Source: Computed by the Author with the help of EViews12 Student Version Lite)

Table 5 reveals that under the condition of the VAR model:

1. When the exchange rate is the dependent variable, it is impacted by the lag of the repo rate(previous leg value of the repo rate). It means one percentage change in the repo rate, the exchange rate will be changed by 1.85 percent, and the relationship between the variables during the study period is positive and significant. at the same time, the exchange rate is also impacted by its own previous lag value. but this relationship is not significant.
2. When the Repo rate is the dependent variable, it is impacted by the lag value of the exchange rate. It means a one percent change in the exchange rate, the repo rate will be changed by -0.19 percent. Here the relationship is negatively and significantly impacting the repo rate. Whereas the repo rate is also negatively impacted by its own previous lag value.

## Granger Causality Test

Table 6

VAR Granger Causality/Block Exogeneity Wald Tests  
Date: 11/17/23 Time: 03:51  
Sample: 2008 2022  
Included observations: 13

Dependent variable: D(EXCHANGE_RATE)			
Excluded	Chi-sq	df	Prob.
D(REPO_RATE)	15.16724	1	0.0001
All	15.16724	1	0.0001

  

Dependent variable: D(REPO_RATE)			
Excluded	Chi-sq	df	Prob.
D(EXCHANGE_RATE)	4.561061	1	0.0327
All	4.561061	1	0.0327

To find the causality between the exchange rate and the Repo rate, this table shows that the repo rate Granger causes the exchange rate because the probability value is 0.0001, which is Very low than 5% level of

significance. So we reject the first null hypothesis as per Table 6, in a similar way the exchange rate also granger causes the repo rate because its probability value is 0.03, which is also less than 5 % level of significance. Here we reject the second null hypothesis as per the Granger causality analysis. Finally, we can conclude that there is a bi-directional relationship between the exchange rate and the repo rate.

Eventually, with the help of econometrical analysis, this study rejected the first hypothesis which assumes that there is no relationship between the exchange rate and the repo rate, but this study shows there is a negative relationship between the variables.

We accept our second hypothesis, which assumes the repo rate impacts the exchange rate. This study reveals that both variables have a bidirectional impact on each other during the study period.

## CONCLUSION

There is a conflict between theoretical analysis and the empirical analysis of exchange rate and interest rate (repo rate). According to the theoretical aspect higher interest rates attract a large amount of capital inflow into the economy. Eventually, this inflow of capital caused the appreciation of domestic currency, as mentioned Mundell – Flemming model. In contrast to the theoretical aspect, the empirical aspect shows that 1 percent increase in the repo rate, the exchange rate is increased by 1.85%. which means an increase in interest rate causes the depreciation of domestic currency. This study also explains the bidirectional relationship between the exchange rate and the repo rate during the study period.

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