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Study of Relationship Between USD/INR Exchange Rate and BSE Sensex from 2008-2017

Hardeepika Singh Ahluwalia,
Assistant Professor,
Periyar Management and Computer College, India.

Kulbir Kaur Bhatti,
Assistant Professor,
Periyar Management and Computer College, India.

ABSTRACT

Markets are driven by rationality is what is claimed by many economic and financial theories. However, an emerging discipline of behavioral economics determines that markets are not always driven by rationality but rather at times is driven by Animal spirit, a term quoted by J.M. Keynes. The present study focused on finding the relationship between USD/INR exchange rate and BSE Sensex during the period ranging from 2008-2017. The purpose of selecting the said period was the US Debt crisis of 2008 which had a spillover impact on many developed and developing economies which lead to huge amount of volatility in USD/INR rate. Granger causality testing was used to find the direction of causality and results showed a bi-directional relationship between two variables thereby indicating that investors adopt a selling preposition when rate depreciates thus causing a fall in Indices and vice-versa. The same is true with respect to economic theories which lay same foundation for an export driven economy.

Keywords: USD/INR exchange rate, relationship, BSE Sensex.

INTRODUCTION:

The markets are moved by Animal spirit, and not by reasons.

--J.M. Keynes (The General Theory of Employment, Interest and Money)

John Maynard Keynes a proponent of Keynesian economics and whose theory is a contradiction to what classical economist supported. Classical economists believed and purports the idea of full employment in the economy and that whenever aggregate demand in the economy fell, it will coincide with reduction in prices, wages, production and ultimately lower level of inflation and this will induce capital investment and more employment and thus economic growth will be restored. Keynesian economics however gave a clear picture on how monetary and fiscal forces actually behave and that government intervention plays a pivotal role in driving the economy and that aggregate demand drives it. Contradictory to classical theory, Keynesian theory argued that inadequate overall demand could lead to prolonged period of unemployment. Sarwant Jahan et. al.(2014) explains the Keynesian mechanism by following example during economic downturns uncertainty often erodes consumer confidence, causing them to reduce their spending especially on discretionary purchases which results in less investment spending by businesses and thus a requirement of Governement intervention to restore the equilibrium in economy. Both the theories quoted above and many more which followed stressed on the role of monetary and fiscal policies to define how economic and financial environment works. However, economic downturns do act like the way these theories have explained however economy and its financials are also driven by irrationalities of investors who otherwise have been termed as rational in every financial and economic theory assumptions. Behavioral finance an emerging discipline in the area of finance and economics explains the irrationalities of investor and how their actions and decisions sometimes do not support the economic and financial fundamentals.

Keynesian economics define economy's output as sum of consumption, Investment, government spending and net exports (the difference between what a country buys and sell from and to foreign countries). Since the period of Globalization massive business have been gained or eroded because of fluctuations in exchange rate and thus massive literature supports the view that there is a negative relationship between exchange rate and stock index. Depreciation leads to decrease in stock index and vice-versa. The present study focuses on proving this preposition using granger causality testing and thus a derivation can be drawn on the basis of result whether the result supports the economic theory or is there any irrationality.

REVIEW OF LITERATURE:

Literature widely supports relationship between exchange rate and stock Index. In order to find what relations have been previously drawn by researchers about this relation various research papers were referred. O. Aydemir, Erdal Demirhan (2009), determined that finding the relationship between macroeconomic variables and stock prices are the key to undertake investment decisions by many economist. He undertook national 100, services, financial, industrial and technology indices as stock prices indices. The result indicated a bidirectional relationship between the two variables.positive causality was find between indices and exchange rate. Gopalan Kutty (2010) examined the relationship between stock prices and exchange rates in Mexico. The Granger causality test shows that stock prices lead exchange rates in the short run, and there is no long run relationship between these two variables. However, he indicated that the findings were contradictory to many researches which indicated a long term relationship between the two variables. I-Chun Tsai (2012) used a data from six Asian countries to estimate the relationship between Stock price index and exchange rate. Using Ordinary least square method and regression model the author depicted a negative relationship between stock index and foreign exchange market is more depicted when exchange rates are extremely volatile. yongsheng yang, Xinjie Ma (2012) established a cointegration relationship between RMB exchange rate against USD and Shanghai composite index. The results presented a long term cointegration relationship and thus a positive long term elasticity. Athanasios Tsagkanos , Costas Siriopoulos (2013) estimated the relationship between stock prices and exchange rates in USA and EU pre and post crisis of 2008. The results exhibit a causal relationship from stock prices to exchange rates that is long-run in EU and short-run in USA.

OBJECTIVES:

The objective of the present study is to find the causal relationship between BSE Sensex and USD/INR exchange rate.

RESEARCH METHODOLOGY:

The present study is causal in nature and it attempts to find the relationship between BSE Sensex and USD/INR exchange rate. The relationship has been studied over a period from 2008-2017 with a total 2215 observations. Unit root testing is used to measure the stationary of variable and granger causality is used to measure the relationship between the stated variables.

Unit Root Testing: Augmented Dickey fuller Test:

A series is said to be stationary if mean and variance are time –invariant. A non stationary time series will have a time dependent mean and variance i.e. data varies with time.

$\Delta y_t = \beta_1 + \alpha\, y_{t-1} + \gamma\, \Sigma \Delta y_{t-1} + \varepsilon_{t \text{ Where } t=1}$

If the returns do exhibit autocorrelation, the stock could be characterized as a momentum stock; its past returns seem to influence its future returns. The investor runs a regression with two prior trading sessions' returns as the independent variables and the current return as the dependent variable.

The Below graph shows pattern important for assumption in Augmented dickey fuller test(ADF).The X-axis shows the number of observation which is 2215 (2008-2017) and Y axis depict BSE Sensex. If a linear line is drawn, it can be observed that the values evolve around the linear line BSE Sensex depicts an increasing trend .Therefore, BSE Sensex shows a time trend or in other words is time variant. The mean value of BSE Sensex is 20,286.812, this value lies between 20,000 and 24,000. If a horizontal line is drawn from the mean line it could be founded that observations evolve around mean values. Thus it can be concluded that the series evolve around a constant (Mean) and trend. Thus we need trend and constant to check for stationary.

H_0: S&P BSE Sensex has a unit root (non-stationary)

Graph 1: BSE Sensex

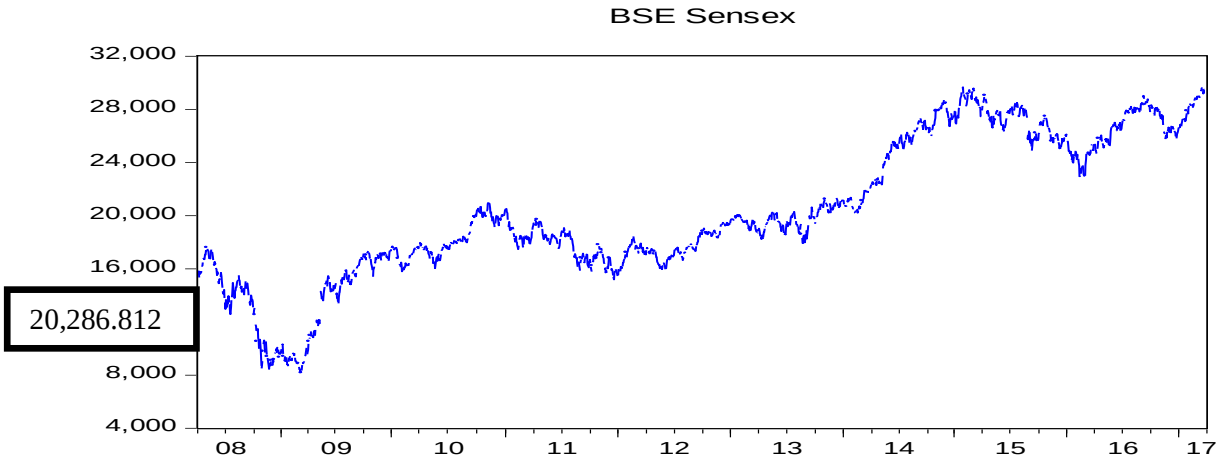
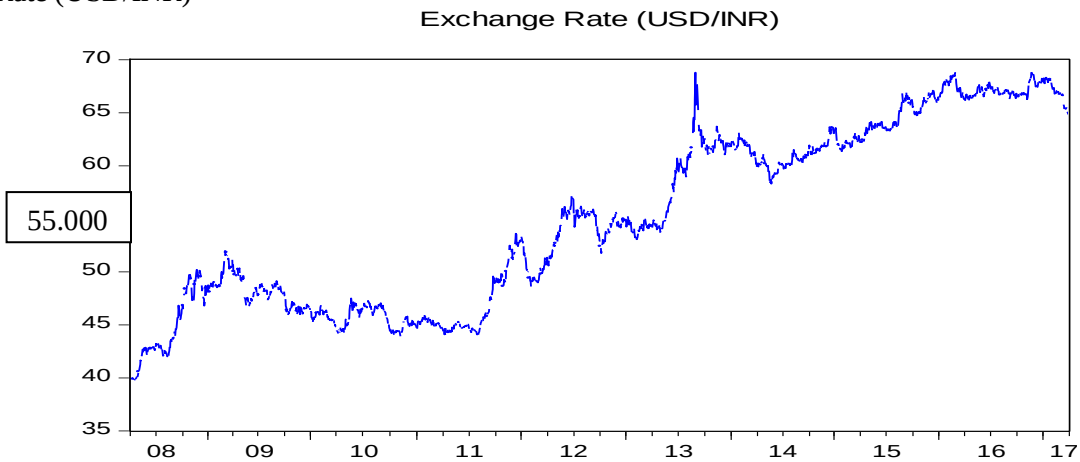


Table1: H_0: S&P BSE Sensex has a unit root

Variables	t-statistic	p-value	Decision	t-statistic	p-value	Decision
	Level			First Difference		
SCI	-2.85612	0.1773	Do not reject Null hypothesis	-44.0530	0.0000	reject Null hypothesis

Level of significance	Critical Values
1%	-3.962176
5%	-3.411831
10%	-3.127806

On the basis of the graph-1, it was assumed that BSE Sensex follows a trend and evolve around a constant (Mean). Thus we check for stationary using trend and intercept. Comparing the critical values of t-statistic with actual values of t-statistic it can be observed that absolute test statistic is less than critical value at first difference .Thereby, null hypothesis (H_0) is rejected and the data used for study is stationary and not time variant.
Exchange Rate (USD/INR)



The above graph shows pattern important for assumption in Augmented dickey fuller test(ADF).The X-axis shows the number of observation which is 2215 (2008-2017) and Y axis depict Exchange rate (USD/INR). If a linear line is drawn, it can be observed that the values evolve around the linear line i.e Exchange Rate depicts an increasing trend .Therefore, Exchange rate shows a time trend or in other words is time variant. The mean value of USD/INR is 55.00. If a horizontal line is drawn from the mean line it could be founded that observations evolve around mean values. Thus it can be concluded that the series evolve around a constant (Mean) and trend. Thus we need trend and constant to check for stationary.
H_0: USD/INR Exchange rate has a unit root (non-stationary)

Table 2: H_0: USD/INR Exchange rate has a unit root

Variables	t-statistic	p-value	Decision	t-statistic	p-value	Decision
	Level			First Difference		
SCI	-2.0774	0.177	Do not reject Null hypothesis	-35.581	0.000	reject Null hypothesis

Level of significance	Critical Values
1%	-3.962176
5%	-3.411831
10%	-3.127806

On the basis of the graph-2, it was assumed that USD/INR follows a trend and evolve around a constant (Mean). Thus we check for stationary using trend and intercept. Comparing the critical values of t-statistic with actual values of t-statistic it can be observed that absolute test statistic is less than critical value at first difference. Thereby, null hypothesis (H_0) is rejected and the data used for study is stationary and not time variant.

Granger Causality Test:

Granger causality is a technique for determining whether one time series is significant in forecasting another. Granger test seeks to determine whether past values of the variable helps to predict changes in another variable or it measures the information given by one variable in explaining the latest value of another variable.

Regression model for Foreign exchange rate causes S&P BSE Sensex

$$\text{BSE Sensex}_t = A_{11}\ \text{USD/INR}_{(t-j)} + A_{12}\ \text{BSE}_{(t-j)} + E(t)$$

Regression model for S&P BSE granger causes foreign exchange rate

$$\text{USD/INR}_t = A_{21}\ \text{USD/INR}_{(t-j)} + A_{22}\ \text{BSE}_{(t-j)} + E(t)$$

Where, t-j is lagged values or the lag period
E (t): Residual value or the error term
A_{11}, A_{12}, A_{21}, A_{22} are the coefficients

H_0: S&P BSE Sensex does not granger cause foreign exchange rate
H_0: Exchange rate USD/INR does not granger cause BSE_Sensex

Table 3: Granger causality between USD/INR and BSE Sensex

P<5% : Decision Rule	Null Hypothesis	Relation
BSE_Sensex does not granger cause Exchange rate USD/INR	Rejected (0.0123<0.05)	Bi-directional Relationship
Exchange rate USD/INR does not granger cause BSE_Sensex	Rejected (0.0002<0.05)	

According to table 3, for p-values are less than 5% in both the cases. Therefore, null hypothesis that USD/INR does not granger cause BSE Sensex is rejected and thus USD/INR help in predicting BSE Sensex and null hypothesis BSE Sensex does not granger cause USD/INR is also rejected. Thereby, there is a bidirectional relationship between USD/INR and BSE Sensex.

FINDINGS AND CONCLUSION:

Globalization has lead to integration of world economies and economic, financial, political and technological changes in one nation tend to have spillover impact on other economies. Exchange rate fluctuations have greater impact on the import bill and export revenue and thereby impacts Balance of payment accounts. It's thereby important to understand the mechanism of movement of exchange rate vis-à-vis stock indices. The results from granger causality testing proved a bi-directional relationship between the variables under study i.e. variation in exchange rate lead to change in stock indices and vice-versa. Thereby, this relationship can be an effective to undertake an investment decision.

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