Macroeconomic Antecedents of Stock Returns and Exchange Rate

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Abstract

This study attempted to empirically test the trend and behaviour of macroeconomic variables, that is, money supply, interest rate, inflation rate, GDP, stock returns, and exchange rates during different policy periods classified as liberalization, globalization, world recovery, and global financial crisis in India over the period from April 1991 to March 2015 by using dummy variable : structural growth equation both for intercept and slope. These macroeconomic antecedents surround the relationship between stock returns and exchange rates ; although, these macroeconomic antecedents may not be the direct determinants of foreign exchange rates and stock returns. It was observed that all the four global policy periods had a statistically significant impact sometimes on the levels and sometimes on the growth rate of the macroeconomic antecedents under study.

Keywords : economic growth, stability, exchange rate volatility, Indian rupee, U.S. dollar, inflation, GDP, interest rates, exposure

JEL Classification : E31, F31, F41, F43

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F oreign exchange rate is one of the most important means through which a country's relative level of economic health is determined. A country's foreign exchange rate provides a window to its economic stability, which is why it is constantly watched and analyzed. The founders of the Bretton Woods System 60 years ago were primarily concerned with orderly exchange rate adjustments in a world economy that was characterized by wide spread restrictions on international capital mobility. In contrast, the rapid pace of liberalization and globalization during recent years poses new challenges for the international monetary system. The exchange rate is defined as the rate at which the domestic currency may be converted into a foreign currency. It may fluctuate daily with the changing market forces of supply and demand of currencies from one country to another. Both the level of foreign exchange rate and its volatility are indicators of the health of the economy. On the other hand, an equally important economic indicator that summarizes the health of the economy at the industry level is the returns on stocks. This volatility became severe in the past few years, affecting the relationship between stock returns and exchange rate.

Therefore, there is a need to test empirically the trends in the money supply, interest rate, inflation rate, GDP,

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Table 1. Expected Theoretical Relationship Between Macro - Economic Indicators, Stock Returns, and Exchange Rate

Variables	Exchange Rate	Stock Returns
GDP	Positive	Positive
Interest Rate	Negative/ Positive	Negative
Money Supply	Negative	Positive
Inflation	Positive	Negative
Exchange Rate	---	Positive/ Negative

stock returns, and exchange rate in India. These macro - economic variables surround the relationship between stock returns and exchange rate. The macroeconomic factors considered in the present study with their relationship with stock market and foreign exchange market is briefly explained in the Table 1.

Before addressing the substantive question about determinants in this regard, we need to test for their nature and trends. Therefore, this study is of antecedents of the two variables. Secondly, there are certain global policy periods that affect these trends. This study builds upon Lillte's work and develops a new policy period framework based on the LPG paradigm. There were complicated world-wide changes, policies, and events happenings during the period from 1990 - 91 to 2014 -15.

On the basis of the observed patterns of growth and structural changes, the period has been divided into four policy periods, each with its distinguishing features as :

✧ **Liberalization (1990 - 91 to 1993 - 94) :** The presence of high degree of regulation in various sectors hindered the economic growth and lowered the efficiency and competitiveness ; so, need for policy on liberalization was recognized in early 1991. Liberalization was internal for the economy and concerned with deregulation of interest rates, de-licencing, removal of CCI, and coming up of free pricing through book building, reduction in procedures, removal of tariff and non-tariff barriers, removal of quotas, inward oriented to outward oriented policies, or moving from public sector to private sector. It was felt that providing operational and functional autonomy to institutions, opening the external sector in a calibrated fashion, and enabling price discovery particularly by market determined interest rates would assist in efficient allocation of resources.

✧ **Globalization (1994 - 95 to 2000 - 01) :** The policy period of globalization is about commonness/integration with the whole world and has been initiated in the form of setting up of WTO. Main principles that seek to ensure such a commonness and equal opportunity to trade as well as invest across the world on equal terms are MFN (Most Favoured Nations), level playing field (i.e. fairness to all), and national treatment (i.e. no discrimination for MNCs and Indian companies). Establishment of certain agreements, mainly TRIPS (Trade Related Intellectual Property Rights) and TRIMS (Trade Related Investment Measures), foreign direct investment (FDI), common policy on removal of tariffs, etc. facilitated towards this integration. The expectation, therefore, was that with the advent of WTO, a new era began, narrowing down the divergence between the developed and developing countries. Global economy exhibited a pattern of growth and development from 1991 to 1997, but globalization is such a policy period which allows benefits (or losses) to all on a common basis.

✧ **World Recovery (2001 - 02 to 2006 - 07) :** From 1997 to 2001, world growth slowed down because of the Asian Financial Crisis and withdrawal of portfolio investment after the crisis. This crisis had a cascading effect in the form of the Y2K bug and the dot com bubble because of which the world economy witnessed a near disaster.

However, Indian IT companies, based on sound business principles and viable business models faced little trouble, and the world economy showed resilience and witnessed an upsurge in a couple of years. Starting from 2001- 02, the world observed positive growth trends in terms of world GDP across the world. Thus, the period from 2002 to 2007 is considered as a period of world recovery, and we attempt to analyze this hypothesis in the analytical exercise to come.

✤ **Crisis Period (2007- 08 to 2014 - 15) :** The global financial crisis originated in U.S. on account of sub-prime mortgage bubble, which resulted in economic downturn and a great recession affecting the whole world. This phase of the global economy reflects the converse of world recovery. During the period of recovery, there was a resurgence of the world economy, while during the period of crisis, there was a decline. Onset of the global credit crunch and the fall of Northern Rock turned out to be a starting point for big financial landslides followed by sub-prime mortgage-induced financial crisis, which had a significant impact on the economy and the foreign exchange market.

On the whole, each of the policy periods, namely liberalization, globalization, world recovery, and global financial crisis had a significant impact on the macro-economic variables and the foreign exchange markets and stock markets. Thus, there is a need to study this structural shift in different policy periods for an in-depth analysis.

Review of Literature

The study of asset prices began a long time ago when Fama (1965) clearly put to light the highly stochastic nature of their behaviour. Most studies on exchange rate models prior to the 1970s were based on the fixed price assumption (Dua & Rajan, 2010). With the advent of the floating exchange rate regime amongst major industrialized countries, an important advance was made with the development of the monetary approach to exchange rate determination. Several researchers have centred their empirical studies on the determinants of exchange rate both in emerging and developed capital markets.

Zakaria, Ahmad, and Iqbal (2007) tested empirically bilateral nominal exchange rate determination for Pak - rupee against its 12 major trading partners and found that :

✤ Exchange rates of Pak - rupee were mostly driven by monetary variables. Therefore, in the presence of high inflation, the practice of administering exchange rate as an independent instrument may not be recommended and the adoption of a restricted monetary policy seems desirable not only for fighting inflation, but also for producing exchange rate stability and sustained trade balance.

✤ Real factors such as trade restrictions, capital flows, foreign exchange reserves, and trade policies played significant roles in the determination of nominal exchange rates. Therefore, policy makers need to pay attention to foreign exchange and trade policies along with monetary policy.

Boykorayev (2008) examined long run determinants of nominal and real exchange rates in a cross-section of countries for the period from 1974 - 2003. He addressed the basic theory of exchange rate underlining the influence of various factors on its dynamics and also the likelihood of constructing a universal theory that would be legitimate for most countries with different economic conditions. The author underlined two types of determinants of nominal exchange rates : variables that affect the inflation rate in the long run and variables that affect the real exchange rate in the long run. Openness and per - capita GDP growth variables were significant in explaining the rate of nominal depreciation when countries with an inflation rate of less than 30% were selected. For highly volatile countries, GDP was found to be important for assessing nominal exchange rates. The evidence

on other variables, such as central bank independence (CBI), debt, and terms of trade was weaker for nominal value estimations. However, the results for the terms of trade turned out to be strongly significant for estimating real exchange rates.

Shylajan, Sreejesh, and Suresh (2011) examined the link between Indian rupee - U.S. dollar and macroeconomic fundamentals using the flexibile - price monetary model. The authors employed Johansen - Juselius co-integration and vector error correction model (VECM) to examine the relationship between exchange rate and macroeconomic fundamentals. They reported significant relationships between the rupee - dollar exchange rate and interest rate, money supply, and index of industrial production (IIP). Also, they found that exchange rate was related to macroeconomic fundamentals in the long run, while there was no short run causal relationship in VECM analysis. Therefore, it became important to capture the macroeconomic factors affecting the rupee - dollar exchange rate to support the long-term trade viability between U.S. and India.

Karmarkar, Karamchandani, and Mantri (2012) explored the long - run causal relationships between the rupee - dollar exchange rate and key macroeconomic indicators in the post liberalization era. Empirical results exhibited significant causal relation between exchange rate and foreign exchange reserves, Sensex, and reserve money. The authors observed bi-directional causality between exchange rate and macroeconomic variables, that is, foreign exchange reserves, Sensex, and RBI open market operations (net). There was strong evidence for Indian exchange rate being influenced mostly by the fundamental variables of the external sector, financial market, and financial sector, while weak evidence was found in favour of the real sector.

Mirchandani (2013) diagnosed the cause of rupee volatility with reference to different macroeconomic determinants, that is, inflation, interest rate, current account balance, GDP, and FDI for the period of 1991 to 2010 by using the technique of correlation. The results showed that there was significant correlation between the volatility of rupee and interest rate, inflation rate, GDP, and FDI. The author attempted to identify the various probable reasons associated with the high volatility of the rupee over the years, like lower capital inflows and uncertainty over domestic economy made investors nervous over Indian economy which further exaggerated depreciation pressures.

Raju and Gokhale (2014) empirically investigated the correlation between the exchange rate, inflation, and interest rate using a time - series data between 1990 and 2010 by using the unit root test and regression analysis. The unit root test suggested that the data were not stationary at level and thereby, the VAR analysis had been undertaken. The authors observed that both the interest rates and inflation jointly influenced the exchange rates substantially ; whereas, the inflation as well as interest rates did not exhibit any long-run association with the exchange rates in the long run.

Ramasamy and Abar (2015) studied the influence of macroeconomic variables on exchange rates for three different countries namely United States, Australia, and Germany. The macroeconomic variables considered were gross domestic product, interest rate, inflation, balance of payments, borrowing rate, employment rate, budget deficit/surplus, corruption index, and tax rate. Bootstrapping technique was used to increase the sample size. The results established that macroeconomic variables significantly influenced the exchange rates except employment and budget deficit. Most of the macroeconomic variables showed opposite sign contrary to the expectations and finally identified the psychological factors like investors' confidence dominated over economic variables in influencing the exchange rates.

Khera and Singh (2015) studied the influence and interrelationships of macroeconomic factors, that is, GDP growth rate, lending interest rate, inflation, foreign direct investment (FDI), and current account deficit affecting the price of Indian currency (rupee) for the period from 1991 -1992 to 2012 - 2013. They found that inflation had a statistically significant negative correlation with exchange rate of Indian currency ; lending interest rate had a statistically significant negative correlation with exchange rate ; relationship between exchange rate and FDI was positive and statistically significant ; association between GDP growth rate and exchange rate was positive and

statistically significant ; and lastly, the correlation between current account deficit and exchange rate was found to be negative and statistically significant.

Vidyavathi, Keerti, and Pooja (2016) carried out a research for India to examine the impact of leading macroeconomic indicators such as interest rate, inflation rate, foreign direct investment, GDP, and external debt on the volatility of exchange rate for the period from 2006 to 2016 by conducting correlation test to find the degree of association between the macroeconomic factors and exchange rate. They observed negative influence of GDP, inflation, interest rate, and external debt on the exchange rate and a weak positive influence of FDI on exchange rate.

Kaur (2016) analyzed the impact of macroeconomic variables (namely broad money, call money rate, crude oil price, exchange rate, foreign exchange reserves, foreign institutional investors, gross fiscal deficit, index of industrial production, inflation rate, and trade balance) on the functioning of the Indian stock market index BSE 500 and exchange rate, which was found to be significant.

Das and Megaravalli (2017) inspected the relationship between the selected macroeconomic variables namely exchange rate, foreign institutional investments, call money rate, and consumer price index (CPI) and the Indian stock market by taking quarterly observations from April 2005 to March 2015 and revealed that causality ran from NIFTY 50 Index to exchange rate and call money rate to NIFTY 50 Index.

Singh and Aggarwal (2017) examined the antecedents of exchange rate by addressing the purchasing power parity theory as well as interest rate parity theory. The authors also found statistically significant correlation between the nominal exchange rate and the macroeconomic variables namely GDP, interest rate, money supply, and inflation.

Venkatesan and Ponnamma (2017) analyzed the macroeconomic factors affecting foreign exchange rate of USD, pound, and yen using ARDL model for a period of 15 years from 2000 to 2015 for India. The macroeconomic variables used in the study were GDP, IIP, FII, exports, imports, inflation rate, FDI, GDS, forex reserve, money supply, WPI, oil price, interest rate, and CAD. FDI was found to have a long term relationship with high significance. Inflation rate and GDS were found to be less significant. Overall, significance of all factors had a strong impact on pound's exchange rate. Granger causality test estimated that inflation rate, CAD, FDI, interest rate, oil price, and GDS had an impact on each other, affecting the overall economy as well as the exchange rate.

Bhuvaneshwari (2018) analyzed the cointegration and causality among select macroeconomic variables namely foreign direct investment (FDI), exports, and imports and selected stock indices of India like Nifty 50, Nifty FMCG, and Nifty Pharma over the period from January 2001 - December 2015 and concluded that the macroeconomic variables had the ability to correct the disequilibrium in the price movements of the stock indices. They found unidirectional causality, and also, the sectoral stock indices responded and fluctuated with shocks to FDI, exports, and imports at a certain level of variation.

Objectives and Hypotheses

Objectives :

(1) To study the pattern of growth in individual macroeconomic variables and the impact of different policy periods on these variables.

(2) To study the overall impact of different policy periods across all macroeconomic variables under study.

Hypotheses :

Individually, each of these variables would also display the impact of four identifiable phases of trade and

development - liberalization, globalization, world recovery, and global financial crisis which we incorporate through exogenous structural breaks using dummy variables. In this context, we formulated the following secondary hypotheses :

(1) H$_o$: (β$_1$) = There is no impact of globalization on the level of log of stock returns.
   H$_1$: (β$_1$) = There is an impact of globalization on the level of log of stock returns.

(2)H$_o$: (β$_2$) = There is no impact of world recovery on the level of log of stock returns.
   H$_1$: (β$_2$) = There is an impact of world recovery on the level of log of stock returns.

(3) H$_o$: (β$_3$) = There is no impact of global financial crisis on the level of log of stock returns.
   H$_1$: (β$_3$) = There is an impact of global financial crisis on the level of log of stock returns.

(4) H$_o$:(β$_4$) = There is no impact of liberalization on the growth rate of log of stock returns.
   H$_1$: (β$_4$) = There is an impact of liberalization on the growth rate of log of stock returns.

(5) H$_o$: (β$_5$) = There is no impact of globalization on the growth rate of log of stock returns.
   H$_1$: (β$_5$) = There is an impact of globalization on the growth rate of log of stock returns.

(6) H$_o$: (β$_6$) = There is no impact of world recovery on the growth rate of log of stock returns.
   H$_1$: (β$_6$) = There is an impact of world recovery on the growth rate of log of stock returns.

(7) H$_o$: (β$_7$) = There is no impact of global financial crisis on the growth rate of log of stock returns.
   H$_1$: (β$_7$) = There is an impact of global financial crisis on the growth rate of log of stock returns.

A set of 42 hypotheses in total, that is, seven hypotheses for each of the variables namely GDP, interest rate, money supply, wholesale price index, and the nominal exchange rate have been developed on the lines stated above.

Data and Methodology

(1) Analysis for Structural Breaks : For the purpose of our analysis, we have divided our entire time period (1991 to 2015) to account for the impact of four identifiable phases of development namely :

↳ 1991 to 1994 (the advent of liberalization in India)
↳ 1995 to 2001 (the period of globalization)
↳ 2002 to 2007 (the period of world recovery)
↳ 2008 to 2015 (the period of global financial crisis)

It is a dummies variable exercise (OLS) both for intercept dummy and time dummy and we have included difference dummies both in intercept and slope across the four time periods taking liberalization to be the base period.
   Dummy variables, also known as categorical or qualitative variables, are variables that indicate the presence or absence of a quality or an attribute. These variables are incorporated into regression analysis to capture the effect

on the dependent variable of variables that are essentially qualitative or of nominal scale in nature. Dummies take on values of 1 or 0, 1 indicating the presence of an attribute and 0 indicating the absence of that attribute. For example, $D2$ would take on values 1 for the period from 1995 to 2001 and the value 0 for the rest of the period.

Steps :

✤ For the stock returns, we have used level dummy or the direct dummy where there is no intercept. It is used where there is no base with which we are comparing.

✤ For the rest of the macroeconomic variables, difference dummy modelling is used.

✤ Semi-log equations are used for determining the growth rate of different variables.

✤ We construct graphs based on the predicted values of all the variables under study.

✤ An overall analysis is carried out for different policy periods across all the macroeconomic variables.

(2) Structural Growth Equations : To account for the impact of these four global policy periods, we should incorporate three dummy variables in our growth model namely D_2 for the period of globalization, D_3 for the period of world recovery, and D_4 for the period of crisis.

So, after including the dummy variables, the regression equation can be written as follows :

$$\log Y = \alpha_1 + \beta_1 t + \beta_2 D_2 + \beta_3 D_3 + \beta_4 D_4 + \beta_5 D_2 t + \beta_6 D_3 t + \beta_7 D_4 t + \mu_t$$

where,
Ln Y = natural log of variable Y,
α_1 = intercept at the first policy period,
β_1 = growth rate in the first policy period,
β_2 = difference in the intercept of II and I policy period,
β_3 = difference in the intercept of III and I policy period,
β_4 = difference in the intercept of IV and I policy period,
β_5 = difference in the growth rate of II and I policy period,
β_6 = difference in the growth rate of III and I policy period,
β_7 = difference in the growth rate of IV and I policy period,
μ_t = error term.

Hence, with the help of the above regression equation, we can easily find out the intercept as well as growth rate for different policy periods :

Period	Intercept	Slope
I Liberalization	α_1	α_1
II Globalization	$\alpha_1 + \beta_2$	$\alpha_1 + \beta_5$
III World Recovery	$\alpha_1 + \beta_3$	$\alpha_1 + \beta_6$
IV Global Financial Crisis	$\alpha_1 + \beta_4$	$\alpha_1 + \beta_7$

(3) Graphical Analysis : Visually, we have tried to capture the impact of the exogenous structural breaks caused

due to the advent of WTO, the period of world recovery, and the global financial crisis on each of the variables under study.

(4) Data and Sources

↳ **Period :** As the extant literature does not give any sub - period after 1991, therefore, the policy implications of the recent policy period and developments have not been analyzed by the extant studies. We have, therefore, restricted our study to the period from 1991 to 2015. During this period, we have identified four policy periods :

Period I : Liberalization (1991 to 1994)

Period II : Globalization (1995 to 2001)

Period III : World Recovery (2002 to 2007)

Period IV : Crisis Period (2008 to 2015)

↳ **Periodicity and Source :** Macro data were collected annually. The annual data for the stock prices were collected from www.bseindia.com. Nominal exchange data were collected from IMF's e-Library. GDP, money supply, interest rate, and wholesale price index data were collected from RBI's *Handbook of Statistics on Indian Economy*.

(5) Operational Definitions : The operational definitions and symbols for indicators of stock market, foreign exchange market, and macroeconomic variables are briefly explained in the Table 2.

For the analysis of data and to arrive at meaningful conclusions, we have performed the whole analysis by taking log of all the variables because log series do not assume a linear relationship among the variables.

Table 2. Operational Definitions

Category	Variables Used	Definition	Symbols Used
Stock Market	BSE Sensex Stock Returns	It is an index comprising of 30 stocks with base year 1978 - 79 (Year-end adjusted price).	SR
Foreign Exchange Market	Nominal Exchange Rate (₹ per $)	Actual value (end of year)	NER
Macroeconomic Variables	Gross Domestic Product (at current prices)	Gross domestic product is a monetary measure of the market value of all final goods and services produced in a period (yearly) of time.	GDP
	Interest Rate (91 days T-bills)	A treasury bill is a promissory note issued by the government under discount for a specified period stated therein. Its implied yield in percentage is considered.	INT
	Money Supply	Broad Money, that is, M3 is used	MS
	WPI (Wholesale Price Index)	It represents an overall upward price movement of goods and services. Inflation happens either when prices go up or when it takes more money to buy the same item (Index with base year 1990 - 91).	INF

Analysis and Results

(1) Policy Wise Change in Growth Rate in Macroeconomic Antecedents of Stock Returns of Index and Exchange Rate

(i) Log Returns from the Index : The following are the test results for log returns with structural breaks. Only the liberalization period is found to be influential compared with other periods.

Functional Form :

$R_t = f(t, D_2, D_3, D_4, D_2t, D_3t, D_4t)$

Estimating Equation :

$\log R_t = \beta_1 D_2 + \beta_2 D_3 + \beta_3 D_4 + \beta_4 t + \beta_5 D_2 t + \beta_6 D_3 t + \beta_7 D_4 t + \mu_{t1}$

Estimated Equation :

$\log R_t = -10.21 D_2 - 96.30 D_3 + 24.14 D_4 + 0.0002 t + 0.004 D_2 t + 0.048 D_3 t + 0.011 D_4 t + \mu_{t1}$
$p-$value (.939)(.573)(.826)(.0306)(.941)(.574)(.829)

In Table 3, R square value of 0.428018 suggests that our regression line is not a very good fit of the data. However, it must be kept in mind that we are not estimating a structural equation. This is only a univariate equation that uses "time" as a "catch-all" variable.

Stock returns are usually stationary, therefore, it can be expected that these would vary around the mean, and hence, it is theoretically unjustified to have an intercept which shows that in all time periods, there is a minimum return. Hence, in the above model, we have not considered the intercept.

It can be inferred from the Table 3 that Index started with moderate stock returns and a negligible growth rate (0.00020), which was a statistically significant trend (p - value : 0.0306) during the liberalization period. Hence,

Table 3. Summary Output for Log Returns (with Structural Breaks) : Regression Statistics

Multiple R	0.654231		
R Square	0.428018		
Adjusted R Square	0.181802		
Standard Error	0.35042		
Observations	25		
	Coefficients	**t - Stat**	**p - value**
D_2	-10.214	-0.077	0.9393
D_3	-96.302	-0.573	0.5733
D_4	-24.140	-0.221	0.8268
$D_2 t$	0.00491	0.0741	0.9417
$D_3 t$	0.04802	0.573	0.5735
$D_4 t$	0.011845	2.345	0.8290
Year (t)	0.00020	-1.808	**0.0306****

Note. **Indicates p - value significant at the 5% level.

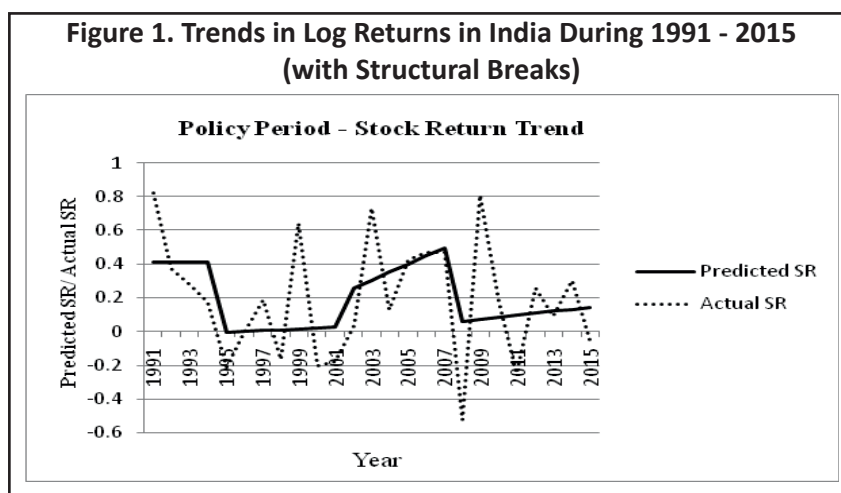#### Table 4. Policy Period Analysis for Log Returns from the Index

Policy Periods	Log (R_t)	
	Intercept	Slope
Liberalization	–	00.02 % p.a.
Globalization	–	00.02 % p.a.
World Recovery	–	00.02 % p.a.
Global Financial Crisis	–	00.02 % p.a.

we do not accept our null hypothesis for β_4 (growth rate of stock returns during liberalization). Hence, stock returns grew at a very small but significant rate during liberalization.

Subsequently, the WTO phase shows a dip in the intercept (-10.214), which is, however, not statistically significant. Also, in terms of slope, there is a microscopic rise (0.00491), which again is not statistically significant (0.9417). Hence, we do not reject our null hypothesis for β_1 (intercept) and β_5 (slope). This may be because India experienced the impact of the Asian Financial Crisis having a cascading effect in the form of the Y2K bug and the dot com bubble because of which the economy witnessed instability. Consequently, the stock returns continued to grow at the rate of 00.02 % p.a. (see Table 4) during the WTO period. There was no significant change in the growth rate of stock returns. The impact of WTO on the Indian stock market was insignificant.

The world recovery period also does not yield a definite pattern, although the level of stock returns from the index falls considerably (-96.302) and the slope improves (0.04802). This is because the dot com bubble burst and then the world recovered, but these values are not found to be statistically significant (since the *p* - values are 0.5733 and 0.5735 for the intercept and slope, respectively). We do not reject our null hypothesis for β_2 (intercept) and β_6 (slope). This implies that there is not any significant deviation from the trend of stock returns growing at the rate of 00.02 % p.a. (see Table 4) during the world recovery period.

Given the importance of FII investments in driving Indian stock markets, the pull-out triggered a collapse in stock prices in the year 2008 and stock returns from the index fell ironically (-24.140) in the crisis period, but it is not found to be statistically significant (0.8268). However, there was an increase in the growth rate (0.011845), which is again not statistically significant (0.8290). Hence, we do not reject our null hypothesis for β_3 (intercept)

Figure 1. Trends in Log Returns in India During 1991 - 2015 (with Structural Breaks)

and β_7 (slope). In different policy periods, stock returns continued to grow at the rate of 00.02 % p.a. (see Table 4).

The Figure 1 clearly shows that the behaviour of stock returns was quite erratic in different policy periods under consideration. Liberalization observed a somewhat declining trend. World recovery was the only favourable period throughout. After a long spell of growth, the Indian economy experienced a downturn. However, the trend improved in the crisis period.

(ii) Gross Domestic Product (GDP) : The following are the test results for gross domestic product with structural breaks. Only the globalization period is found to be influential compared with the other periods.

Functional Form :

$$GDP_t = f(t, D_2, D_3, D_4, D_2t, D_3t, D_4t)$$

Estimating Equation :

$$\log GDP_t = \alpha_1 + \beta_8 D_2 + \beta_9 D_3 + \beta_{10} D_4 + \beta_{11} t + \beta_{12} D_2 t + \beta_{13} D_3 t + \beta_{14} D_4 t + \mu_{t2}$$

Estimated Equation :

$$\log GDP_t = -281.54 + 72.56 D_2 + 19.96 D_3 + 37.85 D_4 + 0.14t - 0.036 D_2 t - 0.01 D_3 t + 0.019 D_4 t + \mu_{t2}$$

p - value (3.16832E−09)(0.017)(0.496)(0.175)(1.96651E−09)(0.017)(0.491)(0.175)

In the Table 5, the R - square value of 0.9993 signifies that our regression line fits the data really well.

To begin with, the gross domestic product is rather low (- 281.544) initially, but it grows during the liberalization period at the rate of 14.58%, which is statistically highly significant (3.16832E-09). Hence, we

Table 5. Summary Output for GDP (with Structural Breaks) : Regression Statistics

Multiple R	0.999657918		
R Square	0.999315953		
Adjusted R Square	0.999034286		
Standard Error	0.028396865		
Observations	25		
	Coefficients	**t - Stat**	**p - Value**
Intercept	-281.544	-11.126	3.16832E-09
D_2	72.559	2.640	**0.017***
D_3	19.962	0.694	0.496
D_4	37.850	1.412	0.175
$D_2 t$	-0.0363	-2.636	**0.017***
$D_3 t$	-0.010	-0.702	0.491
$D_4 t$	-0.019	-1.414	0.1752
Year (t)	0.1458	11.483	**1.96651E-09***

Note. ***Indicates p - value significant at 1% level.

        **Indicates p - value significant at 5% level.

       *Indicates p - value significant at 10% level.

Table 6. Policy Period Analysis for GDP

| Policy Periods		
	GDP	
	Intercept	Slope
Liberalization	(-) 281.544	14.58 % p.a.
Globalization	(-)208.985	10.95 % p.a.
	(- 281.544 + 72.559)	(14.58 % - 3.63 %)
World Recovery	(-) 281.544	14.58 % p.a.
Global Financial Crisis	(-) 281.544	14.58 % p.a.

reject our null hypothesis for β_{11} (growth rate of GDP during liberalization). During this period, there was a whole transformation of India from a regulated regime to an unregulated open economy resulting in major structural changes in the form of de-licencing, deregulation of interest rates and exchange rates, and hence, the growth in GDP was expected.

During the WTO period, there was a jump (72.559), which is highly significant (0.017). So, we reject our null hypothesis for β_8. During this period, however, GDP growth slumped by 3.63% p.a. (see Table 6) and this trend is highly significant (0.017). The growth rate fell because during the WTO period, the performance in terms of GDP was subject to many pressures. India had lost in an open economy model, although the WTO agreement aimed to remove tariffs to promote transparent market access and integrate global markets.

The world recovery period, however, shows a dip in the intercept (19.962). Nevertheless, it remains negative (-281.544) because the decline (19.962) is not statistically significant (0.496). Also, in terms of slope, there is a decline (-0.010), which again is not significant (0.491). Hence, we do not reject our null hypothesis for β_9 (intercept) and β_{13} (slope). This implies that GDP continued to grow at the rate of 14.58% p.a. (see Table 6) during the world recovery period.

Finally, the crisis period did not result in any significant trend in GDP in terms of the intercept or slope, as a result of which, we do not reject our null hypothesis for β_{10} (intercept) and β_{14} (slope). Hence, there was no deviation from the trend of GDP growing at the rate of 14.58% p.a. (see Table 6) during this period.

The Figure 2 shows that in terms of the continuous trend, there was a rising trend. We observe that there is very less difference in the predicted GDP and actual GDP.

Figure 2. Trends in GDP in India During 1991 - 2015 (with Structural Breaks)
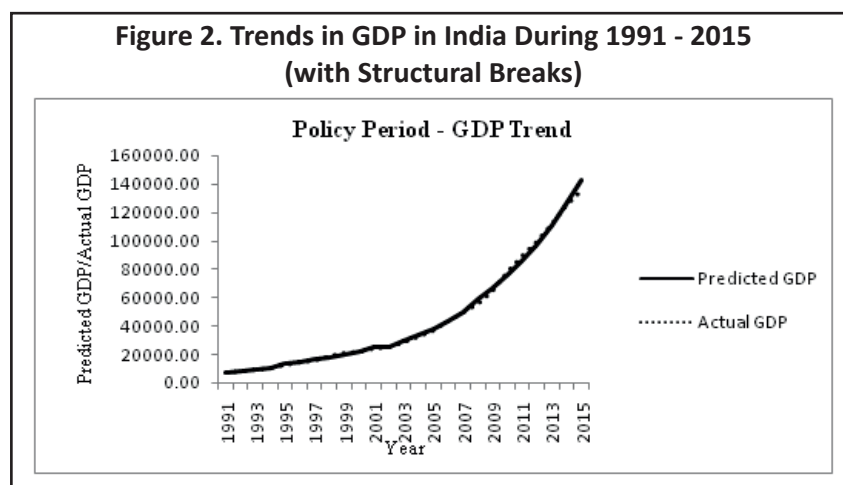
(iii) Interest Rate (INT): The following are the test results for interest rate with structural breaks. The crisis period has been dropped from the model; whereas, the globalization period and the world recovery period are found to be the most influential compared with the liberalization period.

Functional Form:

$$INT_t = f(t, D_2, D_3, D_4, D_2t, D_3t, D_4t)$$

Estimating Equation:

$$\log INT_t = \alpha_2 + \beta_{15}D_2 + \beta_{16}D_3 + \beta_{17}D_4 + \beta_{18}t + \beta_{19}D_2t + \beta_{20}D_3t + \beta_{21}D_4t + \mu_{t3}$$

Estimated Equation:

$$\log INT_t = 42.66 + 73.63D_2 - 135.696D_3 - 0.0201t - 0.0368D_2t - 0.0675D_3t + \mu_{t3}$$

p - value $(2.79908E{-}07)(0.04)(0.004)(6.0657E{-}07)(0.040)(0.004)$

In Table 7, the R square of 0.907103 suggests that our regression line is a good fit of the data.

The interest rates have followed a discernible pattern. Using the framework of four policy periods, it can be seen that the level of interest rate is substantial (42.661) at the beginning of the liberalization period, which is statistically highly significant (2.79908E-07). However, during liberalization, the growth rate of interest rate, though negative, shall be treated as zero and it is found to be statistically significant (6.06574E - 07). Hence, we do not accept our null hypothesis for β_{18} (growth rate of interest rate during liberalization). During this period, the domestic financial markets were opened up and interest rates were no longer controlled and determined by free market forces. Against this backdrop, drastic fall in the growth rate of interest rate was expected.

Subsequently, however, during the WTO phase, the intercept rises (73.630), which is highly significant (0.040). So, we reject our null hypothesis for β_{15}. This means when WTO started, there was a sudden shock to the economy and, therefore, the intercept jumps. However, the global trend of interest rates affected the trend within

Table 7. Summary Output for Interest Rate (with Structural Breaks) : Regression Statistics

| Multiple R	0.95242		
R Square	0.907103		
Adjusted R Square	0.882657		
Standard Error	0.087497		
Observations	25		
	Coefficients	**t - Stat**	**p-value**
Intercept	42.661	7.726	**2.79908E-07*****
D_2	73.630	2.198	**0.040*****
D_3	-135.696	-3.208	**0.004*****
D_2t	-0.0368	-2.195	**0.040****
D_3t	0.0675	3.202	**0.004*****
Year (t)	-0.0201	-7.323	**6.06574E-07*****

Note. ***Indicates p - value significant at 1% level.

**Indicates p - value significant at 5% level.

*Indicates p - value significant at 10% level.

Table 8. Policy Period Analysis for Interest Rate

Policy Periods	Interest Rate	
	Intercept	Slope
Liberalization	42.661	(-)2.01 % p.a.
Globalization	116.291	(-)5.69 % p.a.
	(42.661 + 73.63)	(- 2.01 % - 3.68 %)
World Recovery	(-) 93.035	2.74% p.a.
	(42.661 - 135.696)	(- 2.01 % + 6.75 %)
Global Financial Crisis	_	_

Figure 3. Trends in Interest Rate in India During 1991 - 2015 (with Structural Breaks)
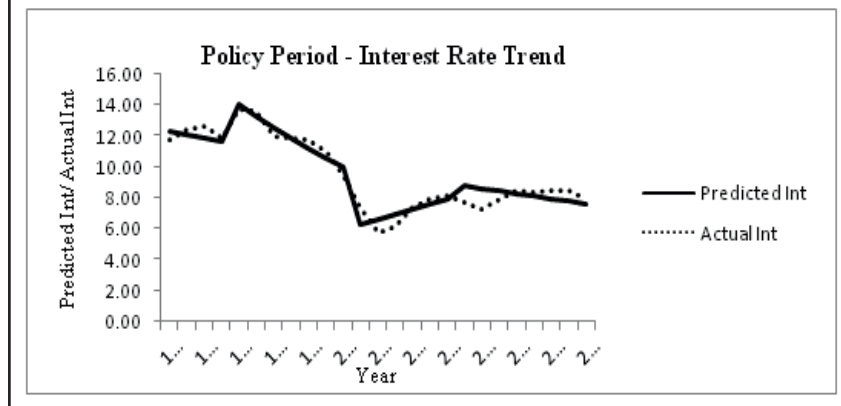
the Indian financial markets and ,therefore, interest rate growth fell further (-0.0368) and this trend is highly significant (0.040). Hence, we reject our null hypothesis for β_{19}, which implies that overall, growth rate of interest rate was (-) 5.69 % p.a. (see Table 8) during this period.

The falling trend brings down the intercept somewhat permanently and the world recovery period witnesses a substantial fall (-135.696), which is highly significant (0.004). Hence, we reject our null hypothesis for β_{16}. During this period, however, the interest rate grew at the rate of 6.75% p.a., which is highly significant (0.004). This high growth rate of interest rate could be attributed to the boom like situation in the global economy during this period, which benefitted nations across the globe. Hence, we reject our null hypothesis for β_{20}. So, the overall growth rate in the world recovery period became 4.74% (see Table 8).

The crisis period experienced a lot of volatility in the interest rates. Therefore, neither the intercept nor the slope is significant, and hence, we removed the period from the equation. All this shows that the globalization period was somewhat favourable for the Indian economy as the falling interest rates mean lower exchange rate.

It can be observed from the Figure 3 that different policy periods have had some differences in the behaviour of interest rates, but the overall secular trend was towards a substantial decline.

(iv) Money Supply (MS) : The following are the test results for money supply with structural breaks. Significant differences in the level and growth rate of money supply have been observed in the liberalization period and the crisis period.

Functional Form :

$$MS_t = f(t, D_2, D_3, D_4, D_2t, D_3t, D_4t)$$

Estimating Equation :

$$\log MS_t = \alpha_3 + \beta_{22}D_2 + \beta_{23}D_3 + \beta_{24}D_4 + \beta_{25}t + \beta_{26}D_2t + \beta_{27}D_3t + \beta_{28}D_4t + \mu_{t4}$$

Estimated Equation :

$$\log MS_t = -329.8 + 29.78D_2 - 0.38D_3 + 86.01D_4 + 0.169t - 0.015D_2t + 9.4D_3t - 0.042D_4t + \mu_{t4}$$

p- value $(2.0354E-11)(0.217)(0.987)(0.001)(1.3693E-11)(0.217)(0.993)(0.001)$

In Table 9, the R square value is 0.99968, which indicates goodness of fit of this regression. To begin with, the money supply is rather low (-329.8127) initially, but it grows during the liberalization period at the rate of 16.9% p.a., which is statistically highly significant (1.3693E-11). Hence, we do not accept our null hypothesis for β_{25} (growth rate of money supply during liberalization). During this period, the markets were liberalized, industrial licencing was done away in general, and therefore, economic activities increased. For all these, the money supply had to grow.

The globalization period marked the advent of WTO and consequent fall in trade and investment barriers between countries. A positive consequence of such global convergence resulted in a rise in the level of money supply (29.7771), which is, however, not statistically significant (0.2176). Also, in terms of slope, there is a decline (- 0.0149), which again is not significant (0.2176). Hence, we do not reject our null hypothesis for β_{22} (intercept) and β_{26} (slope). This implies that the money supply continued to grow at the rate of 16.9% p.a. (see Table 10) during the WTO period.

Table 9. Summary Output for Money Supply (with Structural Breaks) : Regression Statistics

|			
Multiple R	0.99984		
R Square	0.99968		
Adjusted R Square	0.99955		
Standard Error	0.024032		
Observations	25		
	Coefficients	**t-Stat**	**p-value**
Intercept	-329.8127	-15.40112032	2.0354E-11
D_2	29.7771	1.280287828	0.2176
D_3	-0.37568	-0.015450748	0.9878
D_4	86.009	3.792854234	**0.001***
D_2t	-0.0149	-1.280115287	0.2176
D_3t	9.4008	0.007713986	0.9939
D_4t	-0.0428	-3.772653957	**0.001***
Year (t)	0.1696	15.78871861	**1.3693E11***

Note. ***Indicates p - value significant at 1% level.

**Indicates p - value significant at 5% level.

*Indicates p - value significant at 10% level.

Table 10. Policy Period Analysis for Money Supply

Policy Periods		
	Money Supply	
	Intercept	**Slope**
Liberalization	(-)329.812	16.96 % p.a.
Globalization	(-)329.812	16.96 % p.a.
World Recovery	(-)329.812	16.96 % p.a.
Global Financial Crisis	(-)243.804	12.68 %
	(-329.812 + 86.009)	p.a. (16.96 % - 4.28 %)

Figure 4. Trends in Money Supply in India During 1991 - 2015
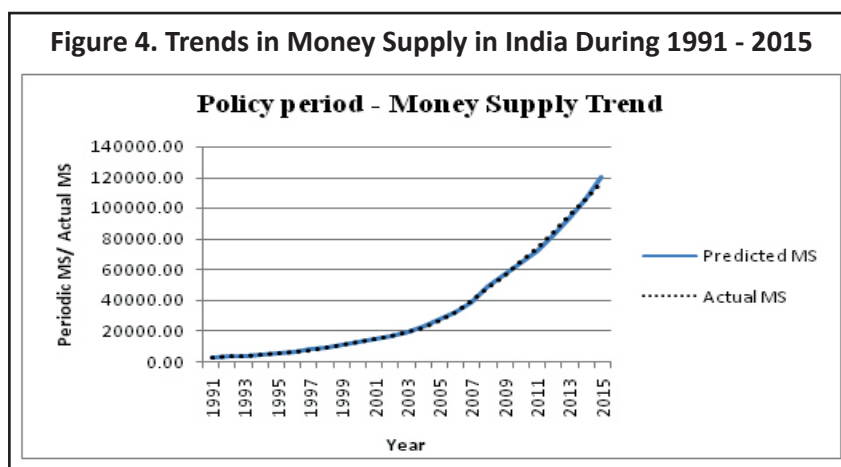
The world recovery period surprisingly led to a fall in the intercept (-0.375), however, this was not statistically significant (0.9878). This may be because Western countries were performing well and hence, the foreign funds flowed there. The growth rate for the money supply during this period is again, not statistically significant because there was a fall in the GDP, inflation, exchange rate during this period and hence, the money supply had to fall as money supply increases only when there is a boom in the economy. Hence, we do not accept our null hypothesis for β_{23} (intercept) and β_{27} (slope). This implies that there wasn't any deviation from the trend of money supply, which continued growing at the rate of 16.9% p.a. (see Table 10) during this period.

Finally, the crisis period results in significant trends in the quantum of money supply in terms of intercept as well as slope. There is a substantial rise (86.009) (see Table 10) in the level of money supply, which is highly significant (0.001). So, we do not accept our null hypothesis for β_{24}. This may be the hot money effect whereby foreign funds got opportunities in India as Indian rates have gone down and hence, the foreign investment inflows will increase in India because Western economy interest rates are high. During this period, however, money supply growth rate slumped by 4.28 % p.a. and this trend is highly significant (0.001). This implies that the net growth rate stood at 12.68% p.a. (see Table 10) during the period of global financial crisis. Hence, we do not accept our null hypothesis for β_{28}.

In terms of the continuous trend, money supply observes a rising trend as it is clear from the Figure 4. The predicted money supply and actual money supply imbricate each other.

(v) Wholesale Price Index (INF) : The following are the test results for the wholesale price index with structural

breaks. Significant differences in the level and growth rate of inflation have been observed in all the four periods under study.

Functional Form :

$$INF_t = f(t, D_2, D_3, D_4, D_2t, D_3t, D_4t)$$

Estimating Equation :

$$\log INF_t = \alpha_4 + \beta_{29}D_2 + \beta_{30}D_3 + \beta_{31}D_4 + \beta_{32}t + \beta_{33}D_2t + \beta_{34}D_3t + \beta_{35}D_4t + \mu_{t5}$$

Estimated Equation :

$$\log INF_t = -173.97 + 66.75D_2 + 75.56D_3 + 121.77D_4 + 0.90t - 0.033D_2t + 0.037D_3t + 0.061D_4t + \mu_{t5}$$

p - value (3.225598E−06)(0.028)(0.018)(0.0003)(2.17111E−06)(0.0285)(0.0189)(0.0003)

In Table 11, R square value of 0.99572 signifies that our regression line is a very good fit of the data.

From the above mentioned equation, it can be inferred that the intercept term is negative (-173.971), which indicates that the initial level of inflation is low, which is statistically highly significant (3.22598E - 06). However, the economy hots up and leads to a growth rate of 9% and is statistically highly significant (2.17111E-06). Hence, we do not accept our null hypothesis for β_{32} (growth rate of wholesale price index during liberalization).

During the WTO period, there is a substantial rise (66.747), which is highly significant (0.028). Hence, we do not accept our null hypothesis for β_{29}. In the liberalization period, the growth in inflation can be a statistical phenomenon and the growth rate during the globalization period has fallen (-0.0334), which is highly significant (0.0189). Hence, we do not accept our null hypothesis for β_{33}. So, in the net, the overall growth rate stood at 5.56% p.a. (see Table 12) during the globalization period.

Table 11. Summary Output for Wholesale Price Index (with Structural Breaks): Regression Statistics

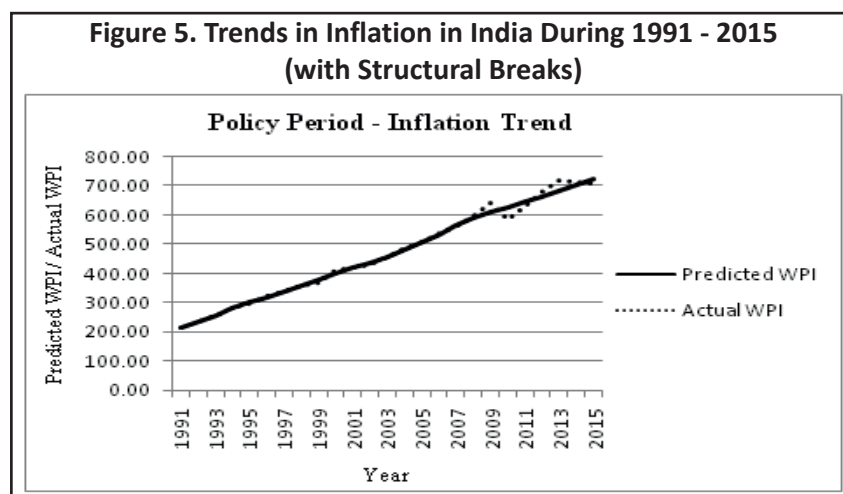|			
Multiple R	0.99786		
R Square	0.99572		
Adjusted R Square	0.99396		
Standard Error	0.02880		
Observations	25		
	Coefficients	**t - Stat**	**p-value**
Intercept	-173.9712564	-6.777730443	**3.22598E-06***
D_2	66.74746622	2.394317766	**0.028****
D_3	75.56489559	2.592820289	**0.018***
D_4	121.7656066	4.479864781	**0.0003***
D_2t	-0.03346558	-2.392905784	**0.0285****
D_3t	-0.037882666	-2.593423778	**0.0189***
D_4t	-0.060893137	-4.468371322	**0.0003***
Year (t)	0.09006952	6.99170409	**2.17111E-06***

Note. ***Indicates p - value significant at 1% level.

**Indicates p - value significant at 5% level.

*Indicates p - value significant at 10% level.

Table 12. Policy Period Analysis for Inflation

Policy Periods	Inflation	
	Intercept	**Slope**
Liberalization	(-)173.971	9.0% p.a.
Globalization	(-) 107.224	5.66% p.a. (9.0% - 3.34%)
	(-173.971 + 66.747)	
World Recovery	(-) 98.4064	5.21% p.a. (9.0% - 3.37%)
	(-173.971 + 75.564)	
Global Financial Crisis	(-) 52.2056	2.91% p.a. (9.0% - 6.08%)
	(-173.971 + 121.765)	

Figure 5. Trends in Inflation in India During 1991 - 2015 (with Structural Breaks)

At the advent of the world recovery period, there is a further rise in the intercept (75.5648) and is highly significant (0.018). So, we do not accept our null hypothesis for β_{30}. The growth rate during the world recovery period had fallen (-0.0378), which is highly significant (0.0189). Hence, we do not accept our null hypothesis for β_{34}, which implies that the overall growth rate stood at 5.21% p.a. (see Table 12) during the world recovery period. This was because the gross domestic product, the money, and the exchange rate had fallen and hence, the inflation had to get down.

As far as the crisis is concerned, there was a bubble, and hence, the inflation goes very high and stood at 121.76 (see Table 12), which is highly significant (0.0003). However, slowly and steadily, the bubble burst and the growth rate fell (-0.060893137), which is highly significant (0.0003). Hence, we do not accept our null hypothesis for β_{31} (intercept) and β_{35} (slope). So, in the net, the overall growth rate stood at 2.92% (see Table 12). As the Indian currency weakened during the crisis period and the foreign currency became strong ; hence, we import inflation.

We observe from the Figure 5 that a continuous trend for inflation had grown but after the crisis period, the volatility in the price level increased. Before the crisis period, the actual and the predicted inflation were analogous.

(vi) Nominal Exchange Rate (NER) : The following are the test results for the nominal exchange rate with structural breaks. The crisis period has been dropped from the model ; whereas, significant differences in the level and

growth rate of nominal exchange rate have been observed in the liberalization period, globalization period, and the world recovery period.

Functional Form :

$$NER_t = f(t, D_2, D_3, D_4, D_2t, D_3t, D_4t)$$

Estimating Equation :

$$\log NER_t = \alpha_5 + \beta_{36}D_2 + \beta_{37}D_3 + \beta_{38}D_4 + \beta_{39}t + \beta_{40}D_2t + \beta_{41}D_3t + \beta_{42}D_4t + \mu_{t6}$$

Estimated Equation :

$$\log NER_t = -66.49 - 41.936D_2 + 130.142D_3 + 0.035t + 0.021D_2t - 0.0649D_3t + \mu_{t6}$$

p - value $(1.82538E{-}13)(0.07438)(0.0001)(6.7188E{-}14)(0.073)(0.0001)$

In Table 13, the R square value of 0.995 signifies that our regression line fits the data really well.

The nominal exchange rate has followed a distinct pattern. Using the framework of four policy periods, it can be seen that the level of nominal exchange rate was very low (-66.492) and it is found to be highly statistically significant (1.82538E-13). This fall may be because foreign exchange reserves were depleting. The most immediate effect of that crisis on India has been an outflow of foreign institutional investment from the equity market. The withdrawal by FIIs led to a sharp depreciation of the rupee. Given the sudden exit by FIIs, the RBI was not keen to deplete its reserves too fast and hence, faced a foreign exchange crisis. With exchange rate liberalization, there would be correction in the market which led to devaluation of domestic currency. Also, the tariffs reduced during the liberalization period which, in turn, resulted in reduction in landed prices. The growth was positive, that is, 3.5% (see Table 14) and is highly statistically significant (6.7188E-14). Hence, we do not accept our null hypothesis for β_{39} (growth rate of nominal exchange rate during liberalization).

Table 13. Summary Output for Nominal Exchange Rate (with Structural Breaks): Regression Statistics

Multiple R	0.99786		
R Square	0.99572		
Adjusted R Square	0.99396		
Standard Error	0.02880		
Observations	25		

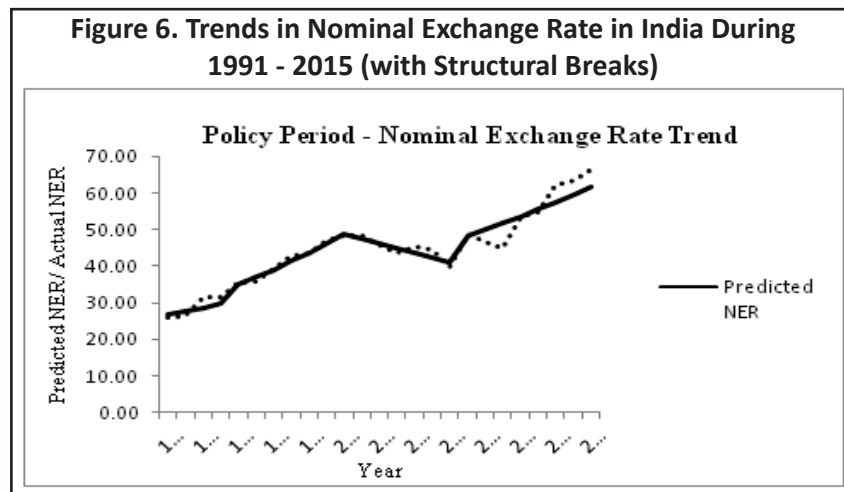| Variables	Coefficients	t-Stat	p-value
Intercept	-66.49291475	-18.16076587	**1.82538E-13***
D_2	-41.93692463	-1.888089365	**0.07438**
D_3	130.1421994	4.641108939	**0.00017***
D_2t	0.021085174	1.896885313	**0.07315**
D_3t	-0.064909409	-4.640021885	**0.00017***
Year (t)	0.035046884	19.19389989	**6.7188E-14***

Note. ***Indicates p - value significant at 1% level.

** Indicates p - value significant at 5% level.

* Indicates p - value significant at 10% level.

Table 14. Policy Period Analysis for Nominal Exchange Rate

Policy Periods	Nominal Exchange Rate	
	Intercept	**Slope**
Liberalization	(-) 66.4929	3.5 % p.a.
Globalization	(-) 108.43	5.61 % p.a.
	(-66.492 -41.936)	(3.5 % + 2.1 %)
World Recovery	63.64928	(-) 2.98 % p.a.
	(-66.492 + 130.142)	(3.5 % - 6.49 %)
Global Financial Crisis	_	_

Figure 6. Trends in Nominal Exchange Rate in India During 1991 - 2015 (with Structural Breaks)

As far as the WTO period is concerned, there was a decline in the intercept (- 41.936), which is statistically significant (0.07438). So, we reject our null hypothesis for β_{36}. This means that during this period, India lost out to the developed countries who could gain due to the globalization. During this period, however, nominal exchange rate growth improved (0.0210) and this trend is statistically significant (0.07315). Hence, we reject our null hypothesis for β_{40}, which implies that overall growth rate of nominal exchange rate stood at 5.6 % p.a. (see Table 14) during the globalization period.

At the advent of the world recovery period, there was a substantial rise in the intercept (130.142), which is highly significant (0.00017). Hence, we do not accept our null hypothesis for β_{37}. This could be attributed to a boom like situation in the global economy during this period, which benefitted nations across the globe, especially India in terms of its currency appreciation, which in turn led to depreciation of exchange rate. During this period, however, the nominal exchange growth had declined at the rate of 6.49% p.a., which is highly statistically significant at the 1% level. Hence, we do not accept our null hypothesis for β_{41}.

The crisis period had experienced a lot of volatility in the nominal exchange rate and did not result in any significant trend in nominal exchange rate in terms of intercept as well as slope. This was because the rest of the markets of the world were weak. Hence, we removed the period from the equation.

The Figure 6 clearly shows that the overall trend for nominal exchange rate is toward the rise, although the behaviour of nominal exchange rate is quite oscillating during different periods. Also, the overall rising trend depicts the currency depreciation.

Table 15. Policy Period Analysis of Macroeconomic Antecedents of Stock Returns and Exchange Rate

Policy Periods	Log Returns (LR)		Log Gross Domestic Product (LGDP)		Log Interest Rate (LINT)		Log Money Supply (LMS)		Log Wholesale Price Index (LWPI)		Log Nominal Exchange Rate (LNER)	
	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope	Intercept	Slope
Liberalization	-	00.02 % p.a.	(-) 281.544	14.58 % p.a.	42.661(-)	2.01 % p.a.	(-)329.812	16.96 % p.a.	(-)173.971	9.0 % p.a.	(-)66.4929	3.5 % p.a.
	$H_0(\beta_1)$	$H_0(\beta_4)$		$H_1(\beta_{11})$		$H_1(\beta_{18})$		$H_1(\beta_{25})$		$H_1(\beta_{32})$		$H_1(\beta_{39})$
	accepted	accepted		accepted		accepted		accepted		accepted		accepted
Globalization		00.02 % p.a.	(-)208.985	10.95 % p.a.	116.291	(-)5.69 % p.a.	(-)329.812	16.96 % p.a.	(-)107.224	5.66 % p.a.	(-)108.43	5.61 % p.a.
			(-281.544 + 72.559 %)	(14.58% - 3.63 %)	(42.661 + 73.630)	(-2.01 % - 3.68%)	(-)329.812		(-173.971 + 66.747)	(9.0% - 3.34)	(-66.492 - 41.936)	(3.5% + 2.1%)
		$H_0(\beta_5)$	$H_1(\beta_8)$	$H_1(\beta_{12})$	$H_1(\beta_{15})$	$H_1(\beta_{19})$	$H_0(\beta_{22})$	$H_0(\beta_{26})$	$H_1(\beta_{29})$	$H_1(\beta_{33})$	$H_1(\beta_{36})$	$H_1(\beta_{40})$
		accepted	accepted	accepted	accepted	accepted	accepted	accepted	accepted	accepted	accepted	accepted
World Recovery		00.02 % p.a.	(-) 281.544	14.58 % p.a.	(-)93.035	4.74 % p.a.	(-)329.812	16.96 % p.a.	(-)98.4064	5.21 % p.a.	63.64928	(-)2.98 % p.a.
					(42.661 - 135.696)	(-2.01 % + 6.75%)	(-)329.812		(-173.971 + 75.564)	(9.0% - 3.37%)	(-66.492 + 130.142)	(3.5% - 6.49%)
	$H_0(\beta_2)$	$H_0(\beta_6)$	$H_0(\beta_9)$	$H_0(\beta_{13})$	$H_1(\beta_{16})$	$H_1(\beta_{20})$	$H_0(\beta_{23})$	$H_0(\beta_{27})$	(β_{30})	$H_1(\beta_{34})$	$H_1(\beta_{37})$	$H_1(\beta_{41})$
	accepted	accepted	accepted	accepted	accepted	accepted	accepted	accepted	accepted	accepted	accepted	accepted
Global Financial Crisis		00.02 % p.a.	(-) 281.544	14.58 % p.a.	-	-	(-)243.804	12.68 % p.a.	(-)52.2056	2.91 % p.a.	-	-
							(-329.812 + 86.009)	(16.96% - 4.28%)	(-173.971 + 121.765)	(9.0% - 6.08 %)		
	$H_0(\beta_3)$	$H_0(\beta_7)$	$H_0(\beta_{10})$	$H_0(\beta_{14})$			$H_1(\beta_{28})$	$H_1(\beta_{28})$	$H_1(\beta_{31})$	$H_1(\beta_{35})$		
	accepted	accepted	accepted	accepted			accepted	accepted	accepted	accepted		

(2) Overall Analysis : The results of the policy period analysis for all the macroeconomic variables have been summarized in the Table 15.

The crisis period had experienced a lot of volatility in case of interest rate and the nominal exchange rate and did not result in any significant trend terms of intercept as well as slope, therefore, we removed the period from the equation both in case of interest rate and nominal exchange rate.

Out of 42 hypotheses, 19 null hypotheses have been accepted and 23 alternate hypotheses have been accepted. In the liberalization period, there was a transformation of India from a regulated regime to an unregulated open economy resulting in major structural changes. The growth in stock returns was infinitesimal; whereas, GDP grew at a statistically higher rate in the neo-liberalization period depicting euphoria. Since the markets were liberalized, industrial licensing was done away in general, and therefore, economic activities increased and the economy heated up, leading to a growth in the money supply as well as inflation. The interest rate was affected negatively. During this period, high structure of interest rate crashed and the interest rates were determined by free market forces. Against this backdrop, drastic fall in the growth rate of interest rate was expected. Falling interest rate resulted in a decline of purchasing power which, in turn, led to a rise in the exchange rate as the currency depreciated.

Subsequently, the globalization period marked the advent of WTO and consequent decline in trade and investment barriers between countries. A mix of variables (some nominal and some real) was affected. We found no significant impact on stock returns and money supply. GDP, interest rate, and inflation were affected negatively ; whereas, nominal exchange rate was affected positively. One of the effects across variables was that inflow of foreign capital had taken place, resulting in a decline of interest rate. The slump in inflation was also desirable, which could be due to the influx of capital. Globalization is a policy period which allows benefits (or losses) to all on a common basis. There were opportunities to invest and export capital as well as goods abroad. However, at the same time, because of WTO, capital import and import of goods also rose. Overall, the Indian currency weakened.

The world recovery period, being a happy period, affected the interest rate positively and inflation as well as exchange rate were affected negatively. The stock returns, GDP, and money supply were not affected significantly. This high growth rate of interest rate could be an accomplice to the boom like situation in the global economy during this period, which benefitted nations across the globe. Since the economy was growing in real terms, the nominal exchange rate fell apart, resulting in strengthening of the Indian currency. Overall, the world recovery period seemed to have a favourable impact.

The global financial crisis was an unfortunate period which resulted in great recession affecting the whole world. In terms of growth rate, the crisis period did not affect the stock returns, GDP, interest rate, and the nominal exchange rate. Since the global financial crisis was a period of uncertainty and there was a lot of volatility, therefore, it did not result in any significant trend. The crisis period affected the nominal variables namely the money supply and inflation in a negative direction.

Summary and Conclusion

In this study, we have tried to examine the antecedents of stock returns and exchange rate in India. Antecedent refers to the general influence of the macroeconomic variables that are related to the nexus between stock returns and exchange rate. Secondly, these antecedents by themselves are affected by different global policy periods namely liberalization, globalization, world recovery, and global financial crisis. Firstly, in this paper, we identify antecedents. Secondly, we analyze the trend of these antecedents. Thirdly, we judge the impact of different policy periods on these antecedents.

The novelty of our approach is to study the implications of the recent policy period and developments occurring post 1991, which have not yet been analyzed by extant studies. Hence, the main research question that this study addresses is whether the recent changes in the global economy and global policies affect the behaviour of macroeconomic variables.

All the four global policy periods namely liberalization, globalization, world recovery, and global financial crisis are found to have statistically significant impact sometimes on the levels and sometimes on the growth rate of the macroeconomic variables.

At the beginning of the liberalization period, the intercept for GDP is quite low ; whereas, it grows at a statistically higher rate during the liberalization period depicting euphoria as there may not be any other statistical base. Interest rates declined statistically. As inflation increases, it leads to a decline in purchasing power and currency depreciation, and in turn, the nominal exchange rate rises. Growth rate of stock returns from the index was infinitesimal.

Subsequently, the globalization period remarked the impact on a blend of variables. GDP, interest rate, and inflation were affected negatively, although a nominal exchange rate was affected positively. However, we found no significant impact on stock returns and money supply. Substantial decline in the interest rates were observed, which could be due to the trend within the Indian financial markets. Influx of capital took place resulting in fall of inflation. Globalization is such a policy which yields benefits (or losses) to all on a uniform basis. In the net, the Indian currency has weakened, resulting in a rise in the exchange rate.

The world recovery period, being a delighted period, witnessed a growth in the interest rates, which could be attributed to the boom like situation in the global economy benefitting the nations across the globe. However, the inflation and exchange rate were affected negatively. With the economy growing in real terms, the Indian currency strengthened, although we observed no significant impact on the stock returns, GDP, and money supply.

The global financial crisis, being a calamitous period, experienced lots of volatility and resulted in no significant trend in interest rates and nominal exchange rate. In terms of growth rate, the crisis period did not affect the stock returns as well as the GDP. The crisis period adversely influenced the inflation and the money supply as the bubble burst.

This points out to the need for a full-fledged theoretical and measurement framework to examine the relationship between stock returns and exchange rate. As of now, it appears to be a complex one requiring a two - level analysis. One to show the relationship between macroeconomic variables and exchange rate and two, to show the relationship between exchange rate and stock returns.

Limitations of the Study

Before addressing the substantive question about determinants of exchange rate and stock returns, we need to test for their nature and trends over time. Therefore, this study is just a preliminary analysis of market microstructure, trends, and behaviour of macroeconomic variables during global policy periods.

(1) Periodicity of variables can be increased for more in-depth analysis.

(2) More variables namely oil prices, government control, and psyche of the participants, that is, bandwagon effect (or change in expectation of future exchange rates) can be incorporated in the analysis for better prediction of stock returns and exchange rate movements.

(3) More elaborate testing of time series properties was not done.

(4) Here, we have accounted for the nominal exchange rate. We could analyze for other measures of exchange rate as well.

Opportunities for Further Research

For studies aimed at the relationship between exchange rate and stock returns :

⇨ Future studies should consider macroeconomic antecedents. The extant studies tend to only rest upon the immediate determinants.

⇨ While examining the macroeconomic antecedents, the impact of global policy periods needs to be measured and accounted for.

References

Bhuvaneshwari, D. (2018). Can select macroeconomic variables explain long- run price movements of Indian stock indices ? *Indian Journal of Research in Capital Markets, 5*(1), 35 - 53. doi:10.17010/ijrcm/2018/v5/i1/122907

Boykorayev, B. (2008). *Factors that determine nominal exchange rates and empirical evidence of cross-sectional analysis.* Retrieved from pure.au.dk/portal-asb-student/files/3262/Bahodir _Boykorayev._Master_thesis.pdf

Das, A., & Megaravalli, A. V. (2017). Macroeconomic indicators and stock market boogie : The case of National Stock Exchange, India. *Indian Journal of Research in Capital Markets, 4*(3), 20 - 32. doi:10.17010/ijrcm/2017/v4/i3/118913

Fama, E. F. (1965). The behaviour of stock-market prices. *The Journal of Business, 38*(1), 34 - 105. Retrieved from https://www.jstor.org/stable/2350752

Karmarkar, Y., Karamchandani, M., & Mantri, A. (2012). Exchange rate and macro-economic indicators: A causal study for India of the past decade. *Pacific Business Review International, 5*(3), 97 - 113. Retrieved from http://www.pbr.co.in/2012/2012_month/Sep/9.pdf

Kaur, G. (2016). Relevance of macroeconomic variables in the Indian stock market. *Indian Journal of Research in Capital Markets, 3*(1), 47 - 62.

Khera, K., & Singh, I. (2015). Effect of macro economic factors on rupee value. *Delhi Business Review, 16*(1), 87 - 96. Retrieved from http://delhibusinessreview.shtr.org/V16n1/dbr_v16n1h.pdf

Mirchandani, A. (2013). Analysis of macroeconomic determinants of exchange rate volatility in India. *International Journal of Economics and Financial Issues, 3*(1), 172-179. Retrieved from http://www.econjournals.com/index.php/ijefi/article/view/349

Raju, J. V. R., & Gokhale, M. S. (2014). An econometric analysis pertaining to exchange rate dynamics in India. *SAMVAD, International Journal of Management, 8*(1). Retrieved from http://samvad.sibmpune.edu.in/index.php/samvad/article/view/98290

Ramasamy, R., & Abar, S. K. (2015). Influence of macroeconomic variables on exchange rates. *Journal of Economics, Business & Management, 3*(2), 276 - 281. Retrieved from http://www.joebm.com/papers/194-W10044.pdf

Shylajan, C. S., Sreejesh, S., & Suresh, K. G. (2011). Rupee-dollar exchange rate and macroeconomic fundamentals: An empirical analysis using flexible-price monetary model. *Journal of International Business and Economy, 12*(2), 89 - 105. Retrieved from https://www.i-jibe.org/achive/2011fall/2011_12(2)_5.pdf

Singh, A. K., & Aggarwal, A. (2017). Exchange rate determinants in India: An analysis. *"SAARANSH" RKG Journal of Management, 9*(1), 1 - 7.

Venkatesan, T., & Ponnamma, M.S. (2017). An analysis of macroeconomic factors affecting foreign exchange rate. *SDMIMD Journal of Management, 8*(1), 21 - 29. doi.org/10.18311/sdmimd/2017/15716

Vidyavathi, B., Keerti, K., & Pooja, A. (2016). A study on macro economic indicators and their impact on exchange rates. *International Journal of Engineering and Management Studies, 7*(3), 160 - 169. Retrieved from http://scienceandnature.org/IJEMS-Vol7(3)-July2016/IJEMS%20Vol7(3)-1.pdf

Zakaria, M., Ahmad, E., & Iqbal, M., (2007). Nominal exchange rate variability: A case study of Pakistan. *Journal of Economic Cooperation, 28*(1), 73 - 98.

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