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The Impact of Macroeconomic Variables on Stock Market Performance with Special Reference to BSE Sensex

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ABSTRACT

The study investigates the impact of macroeconomic variables on Indian stock market using monthly data from January 1995 to December 2018. The study covers macroeconomic variables such as; Call money Mate, Index of Industrial Production, Gold price, Wholesale Price Index and Foreign Portfolio investment as well as stock market namely BSE Sensex. The study used Augmented Dickey Fuller test and Phillip Perron test to evaluate stationarity while Perron Innovational and Additive outlier model to identify structural break point. The Autoregressive Distributed Lag (ARDL) model has been used to evaluate long run and short run relationship. The result indicates presence of long-run equilibrium relationship between macroeconomic variables and Indian stock Market. The positive impact of industrial growth rate and foreign portfolio investment found on stock market of India during long-run and short-run. However, call money rate makes negative impact on Indian stock market in both period while negative impact of inflation rate on stock market identified only in long-run.

Key Words: Unit root, structural break point, Autoregressive Distributed Lag (ARDL), bound test, Sensex,

Introduction

The movement of stock market return is highly sensitive to the variation in many internal and external factors. The factors prevailing inside the company represents internal factors. However, there are certain macroeconomic variables, present outside the company have influence on performance of the company, are considered as external factors. It is well accepted assumption that domestic macroeconomic variables play significant role in movement of stock market return. The relationship between macroeconomic variables and performance of domestic stock market is well documented in literature. In this present study, author want to evaluate impact of the selected macroeconomic variables – inflation, industrial production growth, call money rate, foreign portfolio investment and gold price - on Indian stock market performance.

Inflation may have dual effect on stock market performance. As the rise in rate of inflation leads toward increase on expectation of higher return, which will reduced value of firm and will result into lower share prices. On the other hand, increase in inflation leads towards more future cash inflow in the firm along with expectation of higher dividend. This leads towards rise in share price. Due this reasons, it is necessary to check impact of inflation on stock market performance. The industrial production growth rate represents growth of domestic industries of the countries. Thus, the positive influence of that can be expected on stock market performance. In country like India, Gold is considered as an important investment avenues. Rise and fall in gold price attract or divert investors for investment. Thus, sometimes gold investment become substitute of equity investment. This indicates expected negative relationship between gold price and stock market returns. Foreign portfolio investment represents investment made by the investors or companies from out of India. After the financial liberalisation and time to time relaxation in condition of foreign investment, nowadays foreign portfolio investment plays consistent contribution in Indian capital market. The rise and

fall in stock market is directly connected with amount of investment made by FPI. Therefore, positive influence of foreign investment can be expected. The call money rate represents interest rate prevailing in short term market. It is also consider as investment avenue by investors. Investors considered it as alternative of equity investment as sometimes it offers higher return. The negative relationship can be expected between call money rate and stock market performance.

The aim of this paper is to evaluate the impact of macroeconomic variables on performance of Indian stock market. The remainder of the paper is organised in the following sections. Section 2 includes review of the past studies. Section 3 discusses about data and methodology. Section 4 focus on result and its discussion. The study is concluded in Section 5.

Literature Review

Garg and Kalra (2018) studied impact of macroeconomic factors on Indian stock market from 1991 to 2017. The macroeconomic factors such as unemployment rate, exchange rate, inflation rate, gold prices and gross domestic product have been included in the study. The positive relationship between Sensex and exchange rate, gold price and GDP found during study period in India. Aanchal (2017) investigated impact of macroeconomic variables on Indian stock market during 2004 to 2015. Granger causality test has been applied to evaluate the impact considering macroeconomic variables such as gross domestic product, inflation, export, import and domestic investment. The result indicated absence of any cause and effect relationship between Indian stock market and macroeconomic variables.

Kotha and Sahu (2016) explored long and short run relationship among macroeconomic variables and Indian stock market during 2001 to 2015. The study used Johansen cointegration and error correction model. The study reported presence of one cointegrating relationship between Sensex and macroeconomic variables such as exchange rate, money supply, WPI and Treasury bill rate in long run. The study also reported short run bi-directional causality between Sensex and exchange rate. Tripathi et al. (2016) evaluated impact of key macroeconomic variables on movement of the Indian stock market during 2002-03 to 2012-13. The impact has been evaluated by using multiple regression analysis, considering macroeconomic variables such as index of industrial production, foreign direct investment, and wholesale price index.

Yadav (2016) examined integration of exchange rate and Indian stock market during 2005 to 2014. The correlation, Johansen cointegration test and Granger causality test used for evaluation of integration. The negative correlation found between variables while absence of co-integration reported in the study. However, causality test indicated unidirectional causality from stock returns to exchange rate in India. Tripathy (2016) investigated dynamic relationship between gold price and stock market of India during 1990 -2016. There is no causal relationship fund between gold price and stock market price in short-run. However, long-run equilibrium relationship has been identified between variables.

The relationship among oil prices, gold prices, gross domestic product and interest rate to stock market return of basic industry and chemical sector in Indonesia evaluated by Singarimbun and Noveria (2014). The study conducted from 2005 to 2013 using multiple linear regression analysis. The result indicated that oil price and interest rate made significant influence on the value of the stock return in Indonesia.

Bhunia and Pakira (2014) investigated the impact of Gold price and exchange rate on BSE Sensex during 1991 to 2013. Johansen cointegration test and Granger Causality test used to evaluate impact. The result of

cointegration test represented long run influence of gold price and exchange rate on Sensex. However, the bidirectional causal relationship found between gold price and exchange rate in India.

Venkatraja (2014) evaluated impact of macroeconomic variables on Indian Stock market performance during 2010 to 2014. Multiple regression analysis has been used. The high degree of positive significant influence of WPI, FII and real effective exchange rate found on Sensex. However, the gold price reported negative significant influence on Indian stock market.

Kumar (2013) evaluated effect of macroeconomic factors on Indian stock market performance during 2001 to 2013. For evaluation, the factor analysis method has been used covering macroeconomic variables such as money supply, consumer price index, gold price, crude oil price, foreign exchange reserves, foreign direct investment, foreign institutional investment, call money rate, balance of trade, foreign exchange rate, repo rate and industrial growth rate. The result indicated that macro environment, industrial performance and policy rate were major factors influencing performance of Indian stock market.

Patel (2012) investigated the effect of macroeconomic determinants on the performance of the Indian Stock Market during 1991 to 2011. The eight macroeconomic variables such as interest rate, inflation, exchange rate, index of industrial production, money supply, gold price, silver price and oil price have been considered. The data of BSE Sensex and NSE nifty have been used to represent Indian stock market. The effect of macroeconomic variables has been evaluated by using Johansen Cointegration test, Granger Causality test and Vector Error Correction Model. The result of the study reported long run relationship between macroeconomic variables and stock market return and found causality from exchange rate to stock market and from stock market to IIP and oil prices.

Sultana & Pardhasaradhi (2012) have studied impact of flow of FDI and FII on stock market of India from 2001 to 2011. The BSE-Sensex and NSE-Nifty have been used as an indicator of Indian capital market. The strong positive relationship identified between Sensex & FDI and Nifty & FDI. Whereas a moderate positive relationship found between Sensex & FII and Nifty & FII. The study concluded that there is significant influence of FDI and FII on stock market of India.

Paliwal & Vashishtha (2011) have evaluated direction of causality between foreign institutional investment and Indian stock market from 1992 to 2010. The Granger causality test and variance decomposition have been applied on FII and BSE Sensex average. The positive relationship has been found between FII and BSE Sensex as well as bidirectional causality was found between FII and BSE Sensex.

Sharma and Mahendru (2010) evaluated interrelationship between stock prices and macroeconomic variables in India from 2008 to 2009. The study covered exchange rate, foreign exchange reserves, inflation rate and gold price as macroeconomic variables. The result of multiple regression analysis indicated that exchange rate and gold price effect on BSE stock Market.

Wang et al. (2010) shows that there was no co-integration exist in U. S. stock market while co-integration was exists in Germany, Japan Chine and Taiwan. They also studied that Taiwan group shows two way feedback relations between oil price and stock price as well as oil price and gold price. Chakravarty (2006) examined causal relationship between macroeconomic variables and stock price of India during 1991 to 2005. The Toda and Yamamoto modified Granger causality test used for evaluation of relationship. The result reported that unidirectional causality from IIP and inflation rate to BSE as well as from BSE to Money supply in India.

Objective of the study

- To evaluate the impact of macroeconomic variables on Indian stock market during long run.
- To evaluate the impact of macroeconomic variables on Indian stock market during Short run.

Data Collection

The study is mainly based on secondary data from January 1995 to December 2018. The monthly data of Wholesale Price Index, Index of Industrial Production, Call Money Rate, Gold Price, Foreign Portfolio Investment and BSE Sensex are collected from Hand book of Statistics on Indian Economy publish by Reserve Bank of India and SEBI. The return of BSE Sensex (SensexR) is calculated to represent performance of Indian Stock Market. Rate of WPI (WPIR) is used to represent inflation rate. The Rate of IIP (IIPR) is used to represent industrial production growth rate. The Call money rate (CMRate) is used to represent interest rate prevailing in short term market.

Data Analysis

The study has applied Unit Root test (i.e. Augmented Dickey Fuller test and Phillip-Perron test) to evaluate stationarity. As the ADF and PP test evaluate only unit root property of time series variable without considering break point. So, the Perron (1997) Innovational outlier (IO) and Additive Outlier (AO) model is used to identify structural break point considering unit root properties of SensexR. In order to check impact of macroeconomic variables on stock market performance of India in long-run and short-run, Autoregressive Distributed Lag Approach (ARDL) of Cointegration is applied on the variables. This study differs from existing studies as; First, the study evaluated data by using econometrics tool i.e. Autoregressive Distributed Lag Approach (ARDL) of Cointegration which used to measure impact of studied variables on Indian capital market performance during long-run as well as in short-run. Second, this study used Perron Innovational Outlier and Additive Outlier model to evaluate structural break in time series.

Beak Point Unit Root Test

A break point is a place or time at which an interruption or change is taken place in the trend. In Econometrics, a structural break or structural change is an unpredicted change in the time series that may create forecasting errors and unreliability of the model in general (Gujarati, 2007). The structural breaks occurs due to economic changes such as; financial crisis, institutional changes, policy changes, regime changes or random shocks at domestic and international level in long run time series variables. In this study Perron (1997) Innovational Outlier and Additive Outlier model has been used for determining structural break point with evaluation of stationarity.

Perron Innovational Outlier Model

Perron (1997) re-examine his 1989 results with modification by introducing unknown break point. He represented statistical procedure which is used to test unit root with unknown structural break in trend function. According to Perron (1997), the Innovational outlier (IO) model evaluates break point considering gradual changes in intercept of time series (IO1) as well as gradual changes in both intercept and the slope (IO2) of the trend function as follows:

$$IO1: \quad Y_t = \beta_1 + \gamma.DU_t + \beta_2.t + \theta.D(T_b)_t + \alpha.Y_{t-1} + \sum_{t=1}^{m} c_i \Delta Y_{t-i} + \varepsilon_t \qquad (6)$$

$$IO2: \quad Y_t = \beta_1 + \gamma.DU_t + \beta_2.t + \delta DT_t + \theta.D(T_b)_t + \alpha.Y_{t-1} + \sum_{t=1}^{m} c_i \Delta Y_{t-i} + \varepsilon_t \qquad (7)$$

Where T_b stands for the time of break ($1<T_b<T$) which is unknown, $DU_t = 1$ if $t > T_b$ and zero otherwise, $DT_t = T_t$ if $t > T_b$ and zero otherwise, $D(T_b)_t = 1$ if $t = T_b+1$ and zero otherwise, Y_t is any general ARMA[1] process and ε_t is the white noise residual term. If the absolute value of the t-statistic for $\alpha = 1$ is greater than critical value, the null hypothesis of unit root is rejected.

Perron Additive Outlier Model

In contrary to the evaluation of gradual change with the help of IO model, the immediate structural changes in time series allows in Additive Outlier model (AO). The two-step procedure is given for evaluating stationarity under the AO framework. In first step, the trend is removed from the time series:

$$Y_t = \beta_1 + \beta_2.t + \delta DT_t * + \tilde{y}_t \qquad (8)$$

Where, $\tilde{y}_t$ is detrended series. The reason for using detrended time series is that the AO framework assumes that only slope coefficient is influenced by the structural break. Thus, the second step evaluates change in the slop coefficient as follows:

$$\tilde{y}_t = \alpha.\tilde{y}_{t-1} + \sum_{t=1}^{m} c_i \Delta Y_{t-i} + \varepsilon_t \qquad (9)$$

The IO model and AO model has been applied on time series of BSE Sensex in the present study to identify structural break point.

Autoregressive Distributed Lag (ADRL) Approach of Cointegration

The ARDL approach of cointegration has been implemented in this study to evaluate impact of macroeconomic variables on Indian stock market performance. According to Pesaran and Pesaran (1997) and Pesaran et al. (2001); the augmented ARDL ($p, q_1, q_2, ..., q_k$) is given by the following equation:

$$\alpha\,(L, p)\, y_t = \alpha_0 + \sum_{i=1}^{K} \beta_i\,(L, q_i)\, x_{it} + \lambda' w_t + \varepsilon_t \qquad (10)$$

Where $\alpha\,(L, p) = 1 - \alpha_1 L - \alpha_2 L^2 - ..... - \alpha_p L^p$ *and* (11)

$$\beta_i\,(L, q_i) = \beta_{i0} + \beta_{i1} L + \beta_{i2} L^2 + ... + \beta_{iqi} L^{qi} \qquad i = 1,2,...., k \qquad (12)$$

where y_t is the dependent variables, α_0 is the constant term, L is the lag operator such that $Ly_t = y_t\text{-}1$; and w_t is a $s \times 1$ vector of deterministic variables employed such as intercept term, dummy variables, time trends and other exogenous variables with fixed lags. The x_{it} in equation (4.7.20) is the i independent variable where $i = 1, 2, \ldots, k$. In the long-run estimation, the $y_t = y_{t-1} = \ldots = y_{t-p}$ and $x_{it} = x_{i,t-1} = \ldots = x_{i,t-q}$ in that $x_{i,t-q}$ represents the q^{th} lag of the i^{th} variable.

The equation for estimating long-run coefficients with respect to the constant term can be written as follows:

$$y = \alpha_0 + \sum_{i=1}^{K} \beta_i x_i + \lambda' w_t + v_t, \qquad \alpha = \frac{\alpha_0}{\alpha(1,p)} \tag{13}$$

The long-run coefficients considering a unit change in x_{it} in response to change in y_t are estimated by followings:

$$\boldsymbol{\phi}_i = \frac{\widehat{\beta_i}(1,\hat{q}_i)}{\alpha\ (1,\hat{p})} = \frac{\widehat{\beta_{i0}} + \widehat{\beta_{i1}} + \ldots + \widehat{\beta_{iq}}}{1 - \widehat{\alpha_1} - \widehat{\alpha_2} - \ldots - \widehat{\alpha_p}} \qquad i = 1, 2, \ldots, k \tag{14}$$

Where $\hat{p}$ and $\hat{q}_i$, $i = 1, 2, \ldots, k$ are the selected values of p and q_i, i = 1, 2,…, k. The long-run coefficients are estimated from:

$$\pi = \frac{\hat{\lambda}(\hat{p}, \hat{q}_1, \hat{q}_2, \ldots, \hat{q}_k)}{1 - \hat{\alpha}_1 - \hat{\alpha}_2 - \ldots - \hat{\alpha}_{\hat{p}}} \tag{15}$$

Where $\hat{\lambda}(\hat{p}, \hat{q}_1, \hat{q}_2, \ldots, \hat{q}_k)$ denotes the OLS estimates of λ in equation (10) for the selected ARDL model. The error correction representation of the ARDL $(\hat{p}, \hat{q}_1, \hat{q}_2, \ldots, \hat{q}_k)$ model can be obtained by writing equation (10) in terms of lagged levels and the first difference of y_t, $x_{1t}, x_{2t}, \ldots, x_{kt}$ and w_t:

Δ

$$y_t = \Delta a_0 - a(1,\hat{p})EC_{t-1} + \sum_{i=1}^{k} \beta_{i0} \Delta x_{it} + \lambda' \Delta w_t - \sum_{j=1}^{p-1} \alpha * \Delta y_{t-j} - \sum_{i=1}^{k} \sum_{j=1}^{\hat{q}_{i-1}} \beta_{ij} * \Delta x_{i,t-j} + \varepsilon_t \tag{16}$$

Here, ECt is the error correction term defined as follows:

$$ECt = y_t - \hat{a} - \sum_{i=1}^{k} \hat{\beta}_i x_{it} - \lambda' w_t \quad (17)$$

And Δ is the first difference operator, α*, λ' and βij* are the coefficients relating to the short-run dynamics of the model's convergence to equilibrium while α (1, $\hat{p}$) measures the speed of adjustment.

The ARDL bound test approach involves two steps for estimating the long-run relationship. First, the existence of a long-run relationship among the variables has been established by using Wald test (F-statistics). Second, the long-run and Short-run coefficients are estimated to evaluate impact of macroeconomic variables on stock market performance of India. This study uses the following error correction regressions, taking SensexR as a dependent variables:

Δ

$$\boldsymbol{SensexR} = \alpha_0 + \sum_{j=1}^{n} b_j \Delta SensexR_{t-j} + \sum_{j=0}^{n} c_j \Delta CMRate_{t-j} + \sum_{j=0}^{n} d_j \Delta WPIR_{t-j} + \sum_{j=0}^{n} e_j \Delta IIPR_{t-j} + \sum_{j=0}^{n} f_j \Delta FPI_{t-j} + \sum_{j=0}^{n} g_j \Delta GoldP_{t-j} + \delta_1 SensexR_{t-1} + \delta_2 CMRate_{t-1} + \delta_3 WPIR_{t-1} + \delta_4 IIPR_{t-1} + \delta_5 FPI_{t-1} + \delta_6 GoldP_{t-1} + \delta_8 DB_1 + \varepsilon_{1t}$$

(18)

Where, α_0 represents intercept, t represents trend coefficient and D represents dummy variable of structural break point identified by Perron (1997).

Results and Discussion

Unit root test is used to evaluate stationarity property of time series variables. Most of the time series data contains unit root and if it is not treated properly, it leads towards spurious regression. To avoid this problem and to determine the order of integration, Augmented Dickey Fuller and Phillips-Perron unit root test are applied on time series variables. The result of ADF and PP unit root test have been represented in table 1:

Table 1: Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Unit Root Test Result

Variable		ADF test	Result	PP test	Result
SensexR	At level	-14.0044 (0.0000)	Stationary	-14.3049 (0.0000)	Stationary
WPIR	At level	-10.5418 (0.0000)	Stationary	-10.5659 (0.0000)	Stationary
IIPR	At level	-26.3485 (0.0000)	Stationary	-26.6079 (0.0000)	Stationary
FPI	At level	-10.0424 (0.0000)	Stationary	-10.2121 (0.0000)	Stationary
GoldP	At level	-1.7459 (0.7282)	Unit Root	-1.8466 (0.6794)	Unit Root
	At First difference	-15.3356 (0.0000)	Stationary	-15.6141 (0.0000)	Stationary
CMRate	At level	-6.0263 (0.0000)	Stationary	-9.8524 (0.0000)	Stationary

The ADF and PP test revealed similar results. It indicates that return of BSE Sensex (SensexR), rate of inflation (WPIR), industrial growth rate (IIPR), foreign portfolio investment (FPI) and call money rate (CMRate) are stationary at level. However, gold price (GoldP) contains unit root at level, but attains stationarity at first difference. Thus, the series of SensexR, WPIR, IIPR, FPI and CMRate have I(0) order of integration while GoldP have I(1) order of integration.

The purpose of this study is to evaluate impact of macroeconomic variables on performance of Sensex. Thus, SensexR is dependent variables in evaluation. The result of unit root test indicates that SensexR is stationary time series. But the ADF and PP test evaluate only unit root property of time series variable without considering break point. Thus, the Perron (1997) Innovational outlier (IO) and Additive Outlier (AO) model is applied to identify structural break point considering unit root properties of SensexR. The results are reported in table 2.

Table 2: Result of Perron Innovational Outlier (IO) Model and Additive Outlier (AO) Model

Variables	Innovational Outlier (IO) Model			Additive Outlier (AO) Model		
	ADF test	Break Point	Result	ADF test	Break Point	Result
SensexR	-14.4406 (<0.01)	2006M06*	Stationary with Structural Break	-14.1758 (<0.01)	2005M03	Stationary

The results from Perron IO and AO model reported that SensexR is stationary at level. Along with stationarity, the result of Innovational outlier model has identified significant structural break point at June 2006. The structural break point identified by Perron IO model reveals that return of BSE Sensex faced structural break before the period of global financial crisis of year 2008. However, the result of Additive outlier model indicates that SensexR is stationary at level and identified break point at March 2005 but break point is not statistically significant. Thus, the only significant structural break point of SensexR is included in further analysis of Autoregressive Distributed Lag (ARDL) model.

ARDL Bound test

After determining the order of integration and significant structural break point, the next step is to evaluate the cointegration or long-run relationship among the variables of the model. For selection of optimal lag length of modal, the Akaike Information Criteria (AIC) is used. The AIC lag selection criteria selected lag specification (1, 4, 0, 0, 2, 0) where numbers indicate the lags of variables SensexR, CMRate, WPIR, IIPR, FPI and GoldP. The significant structural break is also included as dummy variable in ARDL model. After selection of ARDL model, ARDL bound test is applied. In ARDL Bound test; if calculated F-statistics indicates higher value that upper-bound critical value at 5 percent level, it indicates presence of long-run relationship among the variables. The result of ARDL bound test reported in table 3.

Table 3: ARDL Bound Test

Null Hypothesis: No long-run relationships exist			Critical Value Bounds		
Test Statistic	**Value**	**K**	**Significance**	**I0 Bound**	**I1 Bound**
F-statistic	28.93993	5	10%	2.49	3.38
			5%	2.81	3.76
			2.5%	3.11	4.13
			1%	3.5	4.63

The result of table 3 indicates calculated F-statistics value of Bound test is 28.94, which is greater than the critical value of the upper bounds at 5 percent level of significance. As a result, this test strongly reject the null hypothesis of "No long-run relationship". Thus, it can be interpreted that all variables of the model are co-integrated or long-run relationship prevailing among the variable.

The next step is to estimate long-run and short-run estimates of ARDL model. The estimated long-run and short-run coefficients ate reported in table 4.

The coefficient of the Error Correction Term (-0.82) is negative and significant indicating that there is a long run causality running from independent variables to return of BSE Sensex. The coefficient of ECM is highly significant with expected sign and also indicates that the speed of adjustment of Δ SensexR to its long-run equilibrium following a shock. The ecm(-1) of -0.82 suggests that a deviation from the long-run equilibrium level of SensexR in one month is corrected by about 82 percent in the next month. Moreover, a significant error correction term confirms the existence of a stable long-run relationship between the significant regressors and dependent variables, SensexR.

The short run coefficients indicate call money rate has negative significant influence on Sensex return while industrial growth rate and foreign portfolio investment have positive significant effect on return of Sensex. The structural break point of June 2006 makes negative significant impact on SensexR. On the other hand, call money rate and inflation rate makes

negative significant impact on Sensex return in long run while industrial growth rate and foreign portfolio investment brings positive significant influence on return of Sensex. In summation call money rate, industrial growth rate and foreign portfolio investment brigs significant influence development of Indian capital market.

Table 4: Estimated Long-Run Coefficients and Short-Run Error Correction Model (ECM)
Dependent Variable: SensexR

Cointegrating Form			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
D(CMRATE)	-0.2021	-1.725324	0.0856
D(CMRATE(-1))	0.1659	1.269493	0.2054
D(CMRATE(-2))	0.0835	0.639395	0.5231
D(CMRATE(-3))	0.4621	3.934888	0.0001
D(WPIR)	-0.5449	-1.094087	0.2749
D(IIPR)	0.3479	3.872166	0.0001
D(FPI)	0.0207	7.892002	0.0000
D(FPI(-1))	0.0041	1.596490	0.1116
D(GOLD)	-0.0003	-0.521574	0.6024
D(D_2006M06)	-16.6924	-3.577291	0.0004
C	3.2378	9.071076	0.0000
CointEq(-1)	-0.8196	-14.241475	0.0000
Long Run Coefficients			
Variable	**Coefficient**	**t-Statistic**	**Prob.**
CMRATE	-0.3774	-2.106823	0.0361
WPIR	-1.2512	-1.822009	0.0696
IIPR	0.4207	2.179605	0.0302
FPI	0.0133	3.122568	0.0020
GOLD	0.0001	0.396658	0.6919
D_2006M06	-1.7513	-1.211144	0.2269
@TREND	-0.0026	-0.158466	0.8742

To evaluate appropriateness of the ARDL model, diagnostic tests are reported in table 6. The Key regression statistics of the ARDL model are also represented in Table 5. The diagnostic tests indicate that the model passes all the test for serial correction, functional form and heteroscedasticity. The value of R^2 for all the ADRL model indicated the overall goodness of fit is appropriate. The F- statistics which indicate joint significance of all regressors in all the

ARDL model are statistically significant at the one percent level. The Durbin-Watson statistics of model is over two, also represents absence of autocorrelation among residuals.

Table 5: Key Regression Statistics:

Dependent variable	R^2	DW	F-stat
$F_{SensexR}$(SensexR | CMRate, WPIR, IIPR, FPI, GoldP, D1)	0.2798	2.03	7.4640 (0.0000)

Table 6: Diagnostic Tests Results

Dependent variable	Serial Correlation [a]	Functional Form [b]	Heterosce dasticity [c]
$F_{SensexR}$(SensexR | CMRate, WPIR, IIPR, FPI, GoldP, D1)	0.4257 (0.6538)	1.3568 (0.2451)	1.4717 (0.1212)

aBreusch-Godfrey Serial Correlation LM Test
b Ramsey RESET Test for functional form
c Heteroskedasticity Test: Breusch-Pagan-Godfrey

Conclusion

This paper investigated the impact of macroeconomic variables on Indian capital market using monthly data from January 1995 to December 2018. The empirical analysis found four notable results. First, BSE Sensex, rate of inflation, industrial growth rate, foreign portfolio investment and call money rate are I(0) while gold price is I(1). Second, the significant structural break point at June 2006 is found in BSE Sensex which represent time period before the global financial crisis. Third, the presence of long-run equilibrium relationship found between macroeconomic variables and Indian stock Market. Fourth, the positive impact of industrial growth rate and foreign portfolio investment found on stock market of India during long-run and short-run. However, call money rate makes negative impact on Indian stock market in both period while negative impact of inflation rate on stock market identified only in long-run. The findings of this study have some important policy implication. First, the flow of foreign portfolio investment brings positive effect on performance of stock market, so policy maker should frame appropriate foreign investment policy which encourages foreign investors to make more investment. Second, other than foreign investment, industrial growth rate of country makes significant effect on return of capital market. So effective domestic industrial policy need to frame. Third, call money rate and inflation are variables that makes negative effect on performance of Indian capital market. So, policy maker should try to control them.

References

- Aanchal. (2017, May). Impact of Macroeconomic Variables on Indian Stock Market. SSRG International Journal of Econmics and Management Studies, 4(5), 77-82.
- Bhunia, A., & Pakira, S. (2014, Fenruary). Investigating the Imapact of Gold Price and Exchange rates on Sensex: An Evidence of India. European Journal of Accounting, Finance and Business, 2/2014(1), 1-11.

- Chakravarty, S. (2006). Stock Market and Macroeconomic Behaviour in India. Discussion Paper-106, Institute of Economic Growth , New Delhi.
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of teh estimates for autoregressive time series with a unit root. Journal of American Statistical Association, 74(366), 427-431.
- Dickey, D., & Fuller, W. (1979). Distribution of the estimators for autoregressive time series with a unit root. Journal of the American Statistical Association, 74, 427-431.
- Garg , K., & Kalra, R. (2018). Impact of Macroeconomic Factors on Indian Stock Market. Parikalpana - KIIT Journal of Management, 14(1), 134-145. doi:10.23862/kiit-parikalpana/2018/v14/i1/173248
- Gujarati, D. (1995). Basic Econometrics (3 ed.). New York: McGraw-Hill.
- Gujarati, D. (2007). Basic Econometrics. New Delhi: Tata McGraw-Hill.
- Gujarati, D. (2011). Econometrics By Example. New York: Palgrave Macmillan.
- Kotha, K., & Sahu, B. (2016). Macroeconomic Factors and the Indian Stock Market: Exploring Long and Short Run Relationships. International Journal of Economics and Financial Issues, 6(3), 1081-1091.
- Kumar, R. (2013, Sep-Oct.). The Effect of Macroeconomic Factors on Indian Stock Market Performance: A Factor Ananlysis Approach. IOSR Journal of Economics and Finanace, 1(3), 14-21.
- Paliwal , M., & Vashishtha, S. (2011, January). FIIs and Indian Stock Market: A Causality Investigation. Comparative Economic Research, 14(4), 5-24. doi:10.2478/v10103-011-0024-0
- Patel, S. (2012, August). The Effect of Macroeconomic Determinants on Performance of the Indian Stock Market. NMIMS Management Review, 117-127.
- Perron, P. (1997). Further Evidence on Breaking Trend Functions in Macroeconomic Variables. Journal of Econometrics, 80(2), 335-385.
- Pesaran, M. H., & Pesaran , B. (1997). Working with Macrofit 4.0: Interactive Econometric Analysis. Oxford, Oxford University Press.
- Pesaran, M. H., & Shin, Y. (1998). An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis. In S. Storm, A. Holly, & P. Diamond, Econometrics and Economic Theory in teh 20th Century: The Ranger Frisch Centennial Symposium. Cambridge: Cambridge University Press.
- Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bound testing approaches to the analysis of level relationships. Journal of applied Econometrics, 16, 289-326.
- Phillips, P., & Perron, P. (1988). Testing for Unit root in Time series Regression. Journal of Econometrics, 33, 335-346.
- Sharma, G. D., & Mahendru, M. (2010, August). Impact of Macro-economic Variables on Stock Prices in India. Glonal Journal of Management and Business Research, 10(7), 1-18.

- Singarimbun , C. M., & Noveria, A. (2014). The Relationship among Oil Prices, Gold Prices, Gross Domestic Product and Interest rate to the Stock Market Retrun of Basic Industry and Chemincal Sector in Indonesia in 2005-2013. Journal of Business and Management, 3(4), 401-409.
- Sultana, S. T., & Pardhasaradhi, S. (2012, July). Impact of Flow of FDI and FII on Indian Stock Market. Finance Research, 1(3), 4-10.
- Tripathi, R., Singh, A. B., & Singh, P. T. (2016, June). Impact of Key Macroeconomic Variables on Movement of Indian Stock Market with reference to BSE Sensex. Indian Journal of Finance, 10(6), 38-50.
- Tripathy, N. (2016, Auguest). A Study on Dynamic Relationship between Gold Price and Stock Market Price in India. European Journal of Economics, Finance and Administrative Science(88).
- Venkatraja, B. (2014, November). Impact of Macroeconomic Variables on Stock Market Performance in india: An Empirical Analysis. International Journal of Business Quantitative Economics and Applied Management Research, 1(6), 71-85.
- Wang, M.-l., Wang, C.-P., & Huang, T.-Y. (2010). Relationship among Oil Price, Exhange Rate and International Stoxk Markets. International Researcher Journal of Finance and Economics(47), 80-89.
- Yadav, S. (2016, Octomber). Integration of Exchange rate and Stock Market: Evidence from the Indian Stock market. Indian Journal of Finance, 10(10), 56-63.