Impact of Key Macroeconomic Variables on Indian Stock Index

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Abstract

The objective of this paper is to understand the impact of key macroeconomic variables on Indian stock indices namely Nifty. The analysis has been carried out based on the monthly time series data for the period January 2009 (post US subprime crisis) to December 2013. The research model is based on the Multiple Linear Regression technique using Principal Component analysis, correlation matrix, ADF test. FII investments in equity, purchasing manger index, and oil price positively impact Nifty in a significant way. There is a relatively smaller positive impact of IIP on the Nifty. On the other hand exchange rate, gold price, inflation rate and Call money rate have a negative impact on the Nifty.

Keywords: Macro Economic Variables, NIFTY, Multiple Regression, Principal Component Analysis, ADF Unit Root Test.
JEL Code: E14, G19, G180, G120, G170

INTRODUCTION

The capital market of a country provides an investment channel that attracts domestic and foreign capital and contributes to the economic growth and prosperity. Indian capital market has undergone a significant change since 1991, when the Government of India adopted economic liberalization and opened the gates for foreign investment. Since then there is a growing importance of the stock market from aggregate economy point of view. Many economists believe that the performance of capital market is the mirror of the real economic environment of a country.

The economic stability in a country is measured by different macroeconomics variables namely inflation, exchange rate, industrial production index, oil price, gold prices, Balance of trade, call money rate, FII investments in equity, the Purchasing manager index etc. Various macroeconomic variables affects the industry condition which ultimately affects the company activity. That is why it is said that macroeconomic variables are the factors that could not be controlled by the companies which might be affecting the volatility of the stock price. In nutshell, the idea is that an individual stock (and hence the capital market as an aggregate) is affected not only by the performance of the respective company but also by the industry dynamics and the global macro environment.

The paper is divided into following sections, section 2 is about the Literature Review, section 3 is about Objective and Methodology, section 4 talks about Analysis and Interpretation and section 5 finally concludes.

LITERATURE SURVEY

There has been a lot of discussion on the effect of macroeconomic variables on stock returns.

Seshaiah et al (2003) examined the impact of inflation and exchange rates on gold, silver and stock returns before and after liberalization. They found that over the longer period of time, positive real rate of return was being provided by stocks after liberalization, by gold in both periods, but in short run the real return of stocks was often negative. Negative real rate of return was being provided by silver in both the periods.

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Lena Shiblee (2009) studied the impact of inflation, GDP, unemployment and money supply on stock prices on New York exchange, and identified that money supply and inflation displayed strong positive influence and the other factors displayed weak influence on most of the companies selected for the study.

Xiufang Wang (2010) found evidence that there is a bilateral relationship between inflation and stock prices, while a unidirectional relationship exists from stock prices to the interest rate. But no significant relationship between stock prices and real GDP was found.

Chen et al (1986) explored a set of macroeconomic variables as systematic influence on stock market returns by modelling equity return as a function of macro variables and non- equity assets returns for US. They empirically found that the macroeconomic variables such as industrial production anticipated and unanticipated inflation, yield spread between the long and short term government bond were significantly explained the stock returns. The authors showed that the economic state variables systematically affect the stock return via their effect on future dividends and discount rates.

Gan et al (2006) investigated the relationships between New Zealand stock market index and a set of seven macroeconomic variables from January 1990 to January 2003 using co- integration and Granger causality test. The analysis revealed a long run relationship between New Zealand's stock market index and the macroeconomic variables tested. The Granger causality test results showed that the New Zealand's stock index was not a leading indicator for changes in macroeconomic variables. However, in general, their results indicated that New Zealand stock market was consistently determined by the interest rate, money supply and real GDP.

Robert (2008) examined the effect of two macroeconomic variables (exchange rate and oil price) on stock market returns for four emerging economies, namely, Brazil, Russia, India and China using monthly data from March 1999 to June 2006. He affirmed that there was no significant relationship between present and past market returns with macroeconomic variables, suggesting that the markets of Brazil, Russia, India and China exhibit weak form of market efficiency. Furthermore, no significant relationship was found between respective exchange rate and oil price on the stock market index of the four countries studied.

Abugri (2008) investigated the link between macroeconomic variables and the stock return for Argentina, Brazil, Chile, and Mexico using monthly dataset from January 1986 to August 2001. His estimated results showed that the MSCI world index and the U.S. T-bills were consistently significant for all the four markets he examined. Interest rates and exchange rates were significant three out of the four markets in explaining stock returns. However, it can be observed from his analysis that, the relationship between the macroeconomic variables and the stock return varied from country to country. For example from his analysis it is evident that, for Brazil, exchange rate and interest rate were found to be negative and significant while the IIP was positive and significantly influenced the stock return. For Mexico, the exchange rate was negative and significantly related to stock return but interest rates, money supply, IIP were insignificant. For Argentina, interest rate and money supply were negatively and significantly influenced on stock return but exchange rate and IIP were insignificant. But for Chile, IIP was positively and significantly influence stock return but exchange rate and money supply were insignificant. These results implies that the response of market return to shock in macroeconomic variables cannot be determine a priori, since it tends to vary from country to country.

Rahman et al (2009) examined the macroeconomic determinants of stock market returns for the Malaysian stock market by employing co-integration technique and vector error correction mechanism (VECM). Using the monthly data ranged from January 1986 to March 2008, they found that interest rates, reserves and industrial production index were positively related while money supply and exchange rate were inversely related to Malaysian stock market return in the long run. Their causality test indicates a bi-directional relationship between stock market return and interest rates.

Asaolu and Ognumuyiwa (2011) investigated the impact of macroeconomic variables on Average Share Price for Nigeria for the period of 1986 to 2007. The results from their causality test indicated that average share price does not Granger cause any of the nine macroeconomic variables in Nigeria in the sample period. Only exchange rate Granger causes average share price. However, the Johansen Co- integration test affirmed that a long run relationship exists between average share price and the macroeconomic variables.

The literature review suggests that the impact of macro factors on a country's stock market is empirically evident and is significant. But the extent and strength of the correlation not only vary country wise but also the form of market efficiency.

OBJECTIVE AND METHODOLOGY

1 Objective and Hypothesis:

Based on the literature review and prior understanding the objective of the papers is to understand the impact of key macroeconomic variables namely, Inflation measured as Wholesale Price Index, Exchange Rate, Industrial Production Index, Oil Price, Gold Prices, Call Money Rate, Balance of Trade, FII investment in Equity and the Purchasing Manager Index on Indian stock indices namely Nifty. Accordingly the null hypothesis is that macro-economic variables does not impact the performance of Nifty. The alternate hypothesis is as follows:

1. There is a positive relationship between IIP and the Stock Market returns
2. There is a negative relationship between WPI and the Stock Market returns
3. There is a positive relationship between oil prices and the Stock Market returns
4. There is a positive relationship between PMI and the Stock Market returns
5. There is a negative relationship between Exchange rate and the Stock Market returns
6. There is a negative relationship between Gold Price and the Stock Market returns
7. There is a negative relationship between Call money rate and the Stock Market returns
8. There is a positive relationship between Balance of Trade and the Stock Market returns
9. There is a positive relationship between FII investments in equity and the Stock Market returns

The analysis has been carried out based on the monthly time series data gathered from the website of RBI and SEBI and Bloomberg database for the period January 2009 to December 2013.

2. Methodology

Log difference could have been used instead of percentage change in the data series. But the variable, Balance of Trade, may exhibit negative values in which case log difference cannot be used. In order to maintain uniformity, percentages changes have been used. The variables as used in the regression model are defined as given in the below table 1:

Table 1. Variables as used in Regression Model

Variable	Measured as	
Returns from Nifty	Y = ((Mt - Mt-1)/ Mt-1)*100	Mt = Avg daily closing price index of tth month
(WPI)Inflation rate	X1 = ((WPIt - WPIt-1)/ WPIt- 1)*100	WPIt = Wholesale Price Index of tth month
Exchange Rate	X2 = ((Ext - Ext-1)/ Ext-1)*100	Wt Avg USD/INR Exchange rate of tth month
IIP	X3 = ((IIPt - IIPt-1)/ IIPt- 1)*100	IIPt = Index of Industrial Production of tth month
Oil Price	X4 = ((OPt - OPt-1)/ OPt- 1)*100	OP = Monthly Avg Oil price of tth month
Gold Price	X5 = ((Gt - Gt-1)/ Gt-1)*100	Gt = Average Gold price of tth month
Call Money Rate	X6 = (IRt - IRt-1)	IRt = Wt Avg Call money Rate of tth month
Balance of Trade	X7 = ((BoTt - BoTt-1)/ BoTt- 1)*100	BoTt = Balance of Trade of tth month
FII Equity investments	X8 = FII_Equityt	FII_Equityt = FII in Equity of tth month
PMI	X9 = PMIt - PMIt-1	PMIt = PMI of tth month

Statistical Approach

Most of the statistical procedures are conducted primarily in E-Views and MS-Excel with a significance level (a) of 5%

3. Reporting- Lag and Adjustment

Many of the variables included in the study are reported with a time lag. For example, the monthly WPI data is reported with a time lag of approximately two weeks from the reference month. This means that the WPI data of the previous month will affect the stock market of the current month. So while considering the monthly impact of WPI on Nifty, we need to adjust this by considering a one month lag in the WPI data. Similarly, IIP is reported with a lag of six weeks, Balance of trade is reported with a time lag of two weeks, and the PMI of the month is usually released at the start of the next month. Hence the lag of these variables is suitably adjusted using E-VIEWS.

Table 2. Lag Adjustment

Variable	Lag Adjustment (in months)
WPI	1
Exchange Rate	Nil
IIP2	
Oil Prie	Nil
Gold Price	Nil
Call Money Rate	Nil
Balance of Trade	1
FII in Equity	Nil
PMI	1

4. Time series properties of the variables : ADF Unit Root test

By already incorporating the percentage change (first difference) of the original time series data set, endeavour has been made to eliminate the trend line exhibited by the variables arising due to non-stationary time series data. If a further non-stationarity of data is observed, the same has to be eliminated by using a suitable statistical method, before conducting the regression.

One of the common methods to find whether a time series is stationary or not, is the Unit Root test. There are numerous unit root tests. One of the most popular among them is the Augmented Dickey-Fuller (ADF) test. Augmented Dickey -Fuller (ADF) is an extension of Dickey -Fuller test. Therefore before we proceed to the multiple linear regression, the ADF test is computed using E-VIEWS to ensure the stationarity of the data set.

For ADF Test

Null Hypothesis H0: The data set has a Unit-Root, data set is non-stationary

Alternate Hypothesis H1: The data set doesn't have a Unit-Root, data set is stationary

5. Correlation Matrix

Multicollinearity is the undesirable situation where the correlations among the independent variables are strong. So before we proceed, it is utmost important to figure out that the variables are not mutually correlated amongst themselves. Logic behind assumption of no multicollinearity is simple that if two or more independent variables are linearly dependent on each other, one of them should be included instead of both, otherwise it will increase standard error thereby making our results biased. In order to check multicollinearity among independent variables, a Pearson's correlation analysis has been performed. A suggested rule of thumb is that if the pair wise correlation between two regressors is very high, in excess of 0.8, a strong multicollinearity exists and may pose serious problem.

Principal Component Analysis

Principal component analysis is a statistical procedure that uses orthogonal transformation to convert a set of observations of possibly correlated variables into a set of values of linearly uncorrelated variables called principal components. The most important use of PCA is probably in multiple regression. Principal Component Analysis is very useful and can be used to:

1. To find a small set of linear combinations of the covariates which are uncorrelated with each other. This will avoid the multicollinearity problem.

2. To ensure that the linear combinations chosen have maximal variance. A good regression design chooses values of the covariates which are spread out.

We will define Principal Components, Wi, which will be a linear combination of all the independent variables Xi having the largest possible variance, subject to the constraint that correlation among the principal components Wi's is zero. The advantage is, Wi's are orthogonal so t-tests for coefficients are easy to interpret as there is no multicollinearity.

$W_i = \Sigma z_{ik} X_k$: Where Wi has the largest possible variance.

$Corr(W_i, W_{\neq i}) = 0$: Wi's are mutually uncorrelated

It is noteworthy that the number of Principal Components will be equal to the number of independent variables. The objective is to use only the first few components. The usual technique is to look for where there is a sharp drop in the component variance. A good regression design will have spread out covariates, so the components with small variance (i.e. small Eigenvalues) will be omitted.

6. Regression analysis:

The research model is based on the Multiple Linear Regression technique to determine the mathematical relationship between the Stock Index returns and changes in the key macroeconomic variables. Though the actual regression is computed on the principal components (principal component analysis on the independent variables), the final mathematical relation follows:

Where:

Y Monthly percentage change in the average Nifty index

X1 Monthly percentage change in the Wholesale Price Index (WPI)

X2 Monthly percentage change in the weighted average exchange rate: USD vs Rupee

X3 Monthly percentage change in the Index of Industrial Production (IIP)

X4 Monthly percentage change in the average Oil price (OP): Brent Crude in USD per Barrel

X5 Monthly percentage change in the average gold price (G): Rs per 10 gram

X6 Monthly change in the weighted average Call money rate (CMR)

X7 Monthly percentage change in the Balance of Trade (BoT): USD million

X8 Monthly FII investments in equity market (FII_Equity): USD billion

X9 Monthly change in the Purchasing Manger Index (PMI)

ε_i Error Term

β_i Co-efficient of the corresponding Regression variable

β_0 Constant term

$$Y = \beta_0 + \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \beta_4 X4 + \beta_5 X5 + \beta_6 X6 + \beta_7 X7 + \beta_8 X8 + \beta_9 X9 + \varepsilon_i$$

In the paper regression is also performed using the principal components of the independent variables. After identifying the principal components which account for most of the variance in Xis (often, two to four of the components), these principal components is then used in regression.

Now Regress: $Y = \beta_0 + \sum \beta_i W_i + \varepsilon$

Instead of: $Y = \beta_0 + \sum \beta_i X_i + \varepsilon$

RESULTS AND ANALYSIS

1 ADF Unit Root test:

The result of ADF unit root test of basic variables is shown in table 3. It is essential for investigating the time series property of the variables. As it is evident from Table 3, most of the basic variables (except Nifty, IIP, Balance of Trade and FII investments in Equity) are non stationary in nature at a significance level (α) of 5%.

Table 3. ADF Unit-Root Test of Basic Variables

Variable	Null Hypothesis	P-Val	Result	Inference
Nifty	Nifty has a Unit root	0.038	Reject	Variable is Stationary
WPI	WPI has a Unit root	0.985	Accept	Variable is not Stationary
Exchange rate	Exchange rate has a Unit root	0.979	Accept	Variable is not Stationary
IIP	IIP has a Unit root	0.0024	Reject	Variable is Stationary
Oil Price	Oil Price has a Unit root	0.173	Accept	Variable is not Stationary
Gold Price	Gold Price has a Unit root	0.566	Accept	Variable is not Stationary
Call Money Rate	Call Money Rate has a Unit root	0.751	Accept	Variable is not Stationary
Bal of Trade Balance	Bal of Trade Balance has a Unit root	0.047	Reject	Variable is Stationary
FII in Equity	FII in Equity has a Unit root	0.00	Reject	Variable is Stationary
PMI	PMI has a Unit root	0.055	Accept	Variable is not Stationary

Since percentage changes of the basic variable have been used (except Call Money rate and FII investments in Equity) as the regression variables. After applying the ADF unit root test on regression variables, all the regression variables depict stationarity (see Table 4).

Table 4. ADF Unit-Root Test of Regression Variables

Variable	Null Hypothesis	P-Val	Result	Inference
Nifty	Nifty has a Unit root	0.000	Reject	Variable is Stationary
WPI	WPI has a Unit root	0.000	Reject	Variable is Stationary
Exchange rate	Exchange rate has a Unit root	0.000	Reject	Variable is Stationary
II P	IIP has a Unit root	0.000	Reject	Variable is Stationary
Oil Price	Oil Price has a Unit root	0.000	Reject	Variable is Stationary
Gold Price	Gold Price has a Unit root	0.000	Reject	Variable is Stationary
Call Money Rate	Call Money Rate has a Unit root	0.000	Reject	Variable is Stationary
Bal of Trade Balance	Bal of Trade Balance has a Unit root	0.000	Reject	Variable is Stationary
FII in Equity	FII in Equity has a Unit root	0.000	Reject	Variable is Stationary
PMI	PMI has a Unit root	0.000	Reject	Variable is Stationary

2 Correlation Matrix

As a thumb rule, a strong multi-colinearity exists if pairwise correlation between two variables is 0.8 or above in magnitude. From Table 5, it is observed that none of the correlation numbers are 0.8 or above. The result of the correlation matrix is shown in table 5.

Table 5. Correlation Matrix

	Y	X1	X2	X3	X4	X5	X6	X7	X8	X9
Y	1	-0.162	-0.617	0.082	0.521	-0.391	-0.317	0.022	0.566	0.492
X1	-0.162	1	0.16	0.018	-0.014	0.277	0.222	0.067	-0.297	-0.175
X2	-0.617	0.16	1	-0.279	-0.367	0.159	0.326	-0.034	-0.599	-0.449
X3	0.082	0.018	-0.279	1	0.036	0.125	0.005	0.022	-0.021	0.396
X4	0.521	-0.014	-0.367	0.036	1	-0.102	0.019	-0.152	0.2	0.348
X5	-0.391	0.277	0.159	0.125	-0.102	1	0.461	-0.113	-0.338	-0.035
X6	-0.317	0.222	0.326	0.005	0.019	0.461	1	-0.022	-0.096	-0.175
X7	0.022	0.067	-0.034	0.022	-0.152	-0.113	-0.022	1	0.068	-0.125
X8	0.566	-0.297	-0.599	-0.021	0.2	-0.338	-0.096	0.068	1	0.147
X9	0.492	-0.175	-0.449	0.396	0.348	-0.035	-0.175	-0.125	0.147	1

3 Principal Component Analysis

The maximum number of principal components is equal to the number of input independent variables. The Eigen values depict the importance of each principal component, that is, the first principal component has the highest eigenvalue and the last principal component has the least eigenvalue. As a rule of thumb all the principal components with eigenvalues less than 1 will be ignored. It is worth noting that a good regression design will have spread out covariates, so the components with small variance (i.e. small Eigenvalues) should be omitted.

In the paper the first four principal components are analysed in the first iteration of regression, which have eigenvalues greater than 1.0 and a cumulative proportion around 70% (Table 6). It is important to note that the first principal component (PC1) alone accounts for about 28%, and there is a sharp decline for the next principal component (PC2) which accounts for about 17%. This serves as an early indication that the first principal component (PC1) alone might be more important than any of the subsequent principal components. The third and the fourth principal component (PC2 and PC4) have somewhat same proportion in the Eigenvalues and it is expected that these components should have similar impact on the multiple linear regression. Other components have significantly lower proportions, and are not expected to have any significant impact, hence can be ignored.

The Eigenvectors are computed using the Eigen-equation and are linear combination of the input independent variables. In the present research, both the Eigenvalues and the Eigenvectors are computed using E-Views. Eigenvector loadings of a principal component depict the weights of different variables used to compute the linear combination.

Table 6. Eigenvalues of Principal Components

Eigenvalues:Sum=9, Average= 1					
Number	Value	Difference	Proportion	Cum. Value	cum. Proportion
1	2.511127	0.919981	0.279	2.511127	0.279
2	1.591146	0.4744	0.1768	4.102273	0.4558
3	1.116746	0.065025	0.1241	5.219019	0.5799
4	1.051721	0.173285	0.1169	6.27074	0.6967
5	0.878436	0.20061	0.0976	7.149177	0.7944
6	0.677826	0.125187	0.0753	7.827003	0.8697
7	0.552639	0.126315	0.0614	8.379642	0.9311
8	0.426324	0.23229	0.0474	8.805966	0.9784
9	0.194034	—-	0.0216	9	1

Table 7 shows X7 (monthly percentage change in Balance of Trade) and that X3 (monthly percentage change in IIP) have very small weights in the first principal component (PC1). In other words, if a regression was run using the first principal component (PC1) alone, the variables X7 (monthly percentage change in Balance of Trade) would affect the dependant variable in a limited way; and X3 (monthly percentage change in IIP) and would practically have no impact on the dependant variable.

Table 7 Eigenvectors of Principal Components

Eigenvectors (loading)										
	Variables	PC 1	PC 2	PC 3	Pc4	PC 5	PC 6	PC 7	PC 8	PC 9
X1	WPI_PC	0.289	0.257	0.182	0.284	0.674	-0.406	0.181	0.281	0.081
X2	EX_PC	0.519	-0.151	-0.124	-0.221	-0.023	0.375	0.231	0.172	0.648
X3	IIP_PC	-0.167	0.476	0.495	-0.253	-0.167	-0.011	0.529	-0.326	0.151
X4	OIL_PC	-0.297	0.286	-0.414	0.298	0.415	0.448	0.017	-0.403	0.184
X5	GOLD_PC	0.314	0.499	0.01	0.088	-0.266	-0.212	-0.627	-0.224	0.293
X6	CMR_C	0.317	0.329	-0.156	0.49	-0.406	0.26	0.312	0.233	-0.378
X7	BOT_PC	0.014	-0.23	0.711	0.401	0.067	0.453	-0.259	-0.023	0.048
X8	FII_EQUITY	-0.427	-0.16	-0.06	0.492	-0.323	-0.321	0.154	0.185	0.531
X9	PMI_C	-0.387	0.408	0.044	-0.259	0.034	0.271	-0.229	0.695	0.066

4 Multiple Linear Regression

In the first iteration of regression, we use the first four principal components (PC1, PC2, PC3 and PC4) which have Eigenvalues greater than 1. The result of the regression is tabulated in Table 8 below. The result has a R2 value of 61.9% and adjusted R2 value of 59% suggest that about 60% of the variations in the stock market can be explained on the basis of macro variables considered in the research. The F-test result suggests that these macro variables simultaneously affect the stock market.

Table 8 Multiple Regression Using Principal Component

Dependent Variable: Y (NIFTY_PC)				
Variable	Coefficient	Std. error	t-Statistic	Prob.
Constant term	1.078123	0.563445	1.913447	0.0612
PC1	-1.178631	0.177719	-6.632006	0
PC2	-0.18682	0.172507	-1.082967	0.2838
PC3	-0.024109	0.105351	-0.228843	0.8199
PC4	-0.017362	0.170447	-0.101864	0.9193
R-squared	0.619374		Mean dependent	1.553537
Adjusted R-squared	0.590095	Var		
S.E. Of regression	3.45732	Var	S.D. dependent	5.400052
Sum Squared Resid	621.5592		Akaike Info criterion	5.402496

Log likelihood	-148.9711		Schwarz criterion	5.581711
F-statistic	21.15425		Hannan-Quinn criter.	5.472145
Prob(F-statistic)	0			
			Durbin-Watson Stat	1.757552

From the p-values and the coefficients, PC3 and PC4 seem to be somewhat irrelevant to the regression. This was somewhat already indicated by their Eigenvalues when the principal component analysis was conducted earlier. We can conclude that PC1 and PC2 have no significant relationship with the dependant variable (Table 9).

Table 9. Multiple Regression Hypothesis (I)

Variable	Null Hypothesis	t- Stat	P-Val	Result
PC1	PC 1 has no significant relationship with Monthly Nifty returns	-6.63201	0.000	Reject
PC2	PC 2 has no significant relationship with Monthly Nifty returns	-1.08297	0.2838	Accept
PC 3	PC 3 has no significant relationship with Monthly Nifty returns	-0.22884	0.8199	Accept
PC 4	PC 4 has no significant relationship with Monthly Nifty returns	-0.10186	0.9193	Accept

The final regression when computed using PC1 and PC2 resulted the relatively best adjusted R2 values along with the coefficients. However, PC2 has a relatively very low significance on the regression results.

The final regression result is presented in Table 10 below. The regression has a R2 value of 61.7% and adjusted R2 value of 60.3%. This implies that about 60% of the variations in the stock market can be explained on the basis of macro variables considered in the paper. The remaining 40% can be explained by the fact that stock market is also influence by industry specific issues, company specific issues, natural disasters, and speculation. This also means that optimism in the macro-economic condition alone is more responsible for the performance of the stock market in India than any other factors taken together.

The F-test result suggests that these macro variables simultaneously affect the stock market. The value of the constant term is also observed to be highly significant. The model can be assumed to be free from auto-correlation as the value of Durbin Watson is close to 2. The problem of multi-colinearity has already been taken care of by conducting principal component analysis.

Table 10. (Final) Multiple Regression using Principal Components

Dependent Variable: Y (NIFTY_PC)				
Variable	Coefficient	Std. error	t-Statistic	Prob.
Constant term	0.955808	0.455184	2.09983	0.04 04
PC1	-1.15296	0.124111	-9.28973	0
PC2	-0.09925	0.060895	-1.62987	0.10 9
R-squared	0.617203	Mean dependent variable	1.553537	

Adjusted R-squared	0.603025	S.D. dependent variable	5.400052
S.E. of regression	3.402354	Akaike info criterion	5.338008
Sum squared resid	625 .1049	Schwarz criterion	5.445537
Log likelihood	-149 .133	Hannan -Quinn criterion	5.379798
F-statistic	43 .53339	Durbin -Watson stat	1.775185
Prob(F -statistic)	0		

Table 11 shows the principal components weight of PC1 and PC2 in terms of the original input variables. PC1 being the main component, the impact of variable X7 is clearly negligible.

The dependent variable can be estimated in terms of the key principal components as follows:

Y = 0.956 – (1.153*PC1) - (0.099*PC2)

Table 11. Weights of PC 1 and Pc2

Variables	X1	X2	X3	X4	X5	X6	X7	X8	X9
Pc1	.289	.519	-0.167	-0.297	.314	.317	.014	-.0427	-0.387
PC2	.257	-0.151	.476	.286	.499	.329	-0.230	-0.160	0.408

The dependant variable when estimated in terms of the original independent variables is given below. Clearly FII investments in equity(X8), purchasing manger index (X9), and oil price (X4) positively impact Nifty (Y) in a significant way. There is a relatively smaller positive impact of IIP (X3) on the Nifty. On the other hand Inflation rate (X1), exchange rate (X2), gold price (X5) and Call money rate (X6) have a negative impact on the Nifty. Balance of Trade (X7) has a negligible impact on Nifty.

Y = 0.956 - (0.359*X1) - (0.583*X2) + (0.146*X3) + (0.314*X4) - (0.412*X5) - (0.399*X6) + (0.007*X7) + (0.508*X8) + (0.405*X9)

CONCLUSION

Macro-economic variables have a significant impact on the Indian stock market. The research concludes that about 60% of volatility in stock prices can be explained by macroeconomic variables, while roughly 40% is governed by other factors namely, industry specific, company specific, natural disasters, and speculations.

The research emphasises that favourable macro environment is reflected positively in the performance of the key market indices. FII investments in equity, purchasing manger index, and oil price positively impact Nifty in a significant way. There is a relatively smaller positive impact of IIP on the Nifty. On the other hand exchange rate, gold price, inflation rate (measured in terms of WPI) and Call money rate have a negative impact on the Nifty. Balance of Trade doesn't have a significant impact on Nifty.

Thus it's the responsibility of both the regulators to sustain and promote macroeconomic stability in the in the country via strong fiscal and monetary policy initiatives for the smooth functioning of the stock market. The government policies can have significant impact on non-macro factors, such as industry specific factors and company specific factors. A positive and friendly business environment can create an optimism among the business and corporate community, which can significantly boost the performance of a company, the sector in which it operates, and hence the overall macro stability. Strong and stable policies also cut down the speculations. Therefore monetary policy alone should not always be looked up as the sole instrument to support the investment climate in the country.

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