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Empirical Relationship among Various Macroeconomics Variables on Indian Stock Market

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Abstract: ***This paper discusses the various macroeconomic variables on Indian stock market, here variable to study on selected macroeconomic variables liked reverse repo rate, CRR, SLR, Repo rate, inflation rate, CPI, Index of industrial production, gold rate, oil rate, exchange rate to identify its relationship with stock market movement and predict market behavior in future. Main objectives of this study are to find inter relationship between macroeconomic variables and its impact. Hypothesis testing on correlation between stock market indices and macroeconomic variables. Empirical study period were selected January 2004 to December 2012. Each variables is tested one by one to find out significant relationship between the macroeconomic variables and SENSEX.***

Keywords: Empirical research, Reserve Rate, Cash Reserve Ratio, Statutory Reserve Ratio, Index of Industrial Production, Gold Rate, Exchange Rate, Correlation, ANOVA Test.

I. INTRODUCTION

The stock market is one of the most important sources for companies to raise money. This allows businesses to be publicly traded, or raise additional financial capital for expansion frtby selling shares of ownership of the company in a public market. The liquidity that an exchange affords the investors gives them the ability to quickly and easily sell securities. This is an attractive feature of investing in stocks, compared to other less liquid investments. Some companies actively increase liquidity by trading in their own shares.

II. INTRODUCTION ABOUT MACRO ECONOMIC VARIABLE

The macro economy is an aggregate picture of an entire economic environment. The following are some of the factors that need to be taken care of if India has to achieve its potential. These are • control inflation • liberalize financial markets • increase trade with neighbors • increase agricultural productivity • raise educational achievement • increase quality and quantity of universities • introduce a credible fiscal policy • improve infrastructure and • improve governance. Macro economy study of the economy as a whole, and the variables that control the macro-economy. The study of government policy meant to control and stabilizes the economy over time, that is, to reduce fluctuations in the economy.

Macroeconomics treats the components of the economy as one unit, as one aggregate, that is looks for relationships between the various components. These variables are indicators or main signposts signaling the current trends in the economy and understand the major variables that determine the current behavior of the macro-economy. So government must understand the forces of economic growth, why and when recession or inflation occur, and anticipate these trends, as well as what mixture of policy will be most suitable for curing whatever ills the economy.

The Indian economy slowed significantly during 2011-12, with growth decelerating to 6.5 per cent. The growth prospects for 2012-13 remain weak due to a combination of global and domestic macro-economic factors. Global growth is turning

weaker than anticipated. GDP (Gross Domestic Product), the inflation rate and the unemployment are three widely cited and watched macroeconomic variables of economic activity. Individual macroeconomic variables, such as banking, the consumer price index, and changes in government regulations, each influence multiple areas of economic growth.

III. Relationship Between Macroeconomic Variable and Stock Market

After globalization, international capital market got integrated rapidly and this had positive effect on economic growth in terms of higher returns, portfolio diversification, market oriented reforms, etc. concurrent with these effects was the rising incidence of financial crisis. Macroeconomic variables (e.g. economic output, unemployment and employment, and inflation) play a vital role in the economic performance of any country. For the past three decades, evidence of key macroeconomic variables helping predict the time series of stock returns has accumulated in direct contradiction to the conclusions drawn by the Efficient Market Theory. The majority of research concentrates on the financial markets of the developed countries, which are efficient enough and do not suffer from the inefficiency problems found in less developed countries. Considering this matter, the subject of financial markets in developing countries still needs lengthy analysis and more research attention.

Prediction of market in different economic situation

Traders are always trying to understand the factors that cause the market to rise and fall. There are a multitude of factors, and millions of investors make decisions that impact the market every day. Corporate earnings, political news, and general market sentiment can all move the market. But economic factors have the most influence on long-term market performance. Of all the economic indicators, the three most significant for the overall stock market are inflation, gross domestic product (GDP), and labor market data.

Various researchers have worked on stock market and macroeconomic variables on various aspects. Various study related to this helps to know the relationship between macroeconomic variable and stock market.

In 2009 Chang and Liang applied various switching GJR-GARCH models to analyze the effect of macroeconomic variables (interest rate, dividend yield, and default premium) on stock market movements (including conditional mean, conditional variance, and transition probabilities) in stock market. The empirical result showed that macro factors can affect the stock return dynamics through two different channels, and that the magnitude of their influences on returns and volatility is not constant.

Harvey (1995) a study has been done on the relationship between macroeconomic variables and stock prices has been extensively studied in developed capital markets. With the rapid transformation of economic structure, policy and institution on a global scale in the recent past, the role of capital markets as intermediary between investor an entrepreneur is getting increasing importance in developing economies.

Earliest studies was conducted by Nelson (1976) to provide an assessment of monthly stock market returns and inflation in the post war period from 1953 to 1974 using US data, and found a negative relationship between stock returns, in both expected and unexpected inflation.

Chen, Roll and Ross (1986) test the multifactor model in the USA by employing seven macroeconomic variables. They find that consumption, oil prices, and the market index are not priced by the financial market. However, industrial production, changes in risk premium, and twist in the yield curve are found to be significant in explaining stock returns.

Chen (1991) performed the second study covering the USA. Findings suggest that future market stock returns could be forecasted by interpreting some macroeconomic variables. Research in Business Vol.1, Issue.5, May 2011.

Second group of studies investigate the relationship between stock returns and macroeconomic variables for some developing countries like Eastern Asia. Bailey and Chung (1996) examine the impact of macroeconomic risks on the equity market of Philippines. Findings of the study show that, financial fluctuations, exchange rate movements and political changes of owners of Philippine equities affect stock returns.

Mukherjee and Yu (1997) investigate the effect of macroeconomic variables on Singapore stock market. Results suggest that stock prices are co integrated with both measures of money supply (M1 and M2) and aggregate foreign exchange reserves.

John K. M. Kuwornu, Victor Owusu-Nantwi undertaken the study which examines the relationship between macroeconomic variables and stock market returns using monthly data over period January 1992 to December, 2008. Macroeconomic variables used in this study are consumer price index (as a proxy for inflation), crude oil price, exchange rate and 91 day Treasury bill rate (as a proxy for interest rate).

IV. OBJECTIVE OF STUDY

The purpose of research is to discover answer to questions through the application of scientific procedures. The objective of research study is to test hypothesis of a casual relationship between variables. Each and every research work has its own specific purpose; the main objective of our research is described as under.

- To analyze the relationship of macroeconomic variables like reverse repo rate, CRR, SLR, Repo rate, inflation rate, CPI, FII, Index of industrial production, gold rate, oil rate, exchange rate.
- To analyze the impact of most significant macroeconomic variables on the stock market indices.
- To develop a model that helps in showing the relationship between dependent and independent variables.

Hypothesis

Ho: There is no correlation between stock market indices and macroeconomic variables.

H1: there is a correlation between stock market indices and macroeconomic variables.

Period of Study

The yearly data of the various chosen macroeconomic variables were collected for the period from January 2004 to December 2012.

Sample Design

Sample design is a definite plan for obtaining a sample from a given population.

Type of Universe:

The universe can be finite or infinite. In finite universe no. of items is certain. In our research work we take selected macroeconomic variable like reverse repo rate, CRR, SLR, Repo rate, inflation rate, CPI, Index of industrial production, gold rate, oil rate, exchange rate to identify its relationship with stock market. So our universe was finite.

Sampling Unit:

A decision has to be taken by concerning a sampling unit before selecting sample. In our study our sampling unit was various macroeconomic variable like reverse repo rate, CRR, SLR, Repo rate, inflation rate, CPI, Index of industrial production, gold rate, oil rate, exchange rate which reflects the overall impact on economy and its effect on the stock market.

Sampling Frame/Source List:

The list is the representative of the population. In our study the source list include various economical and financial macroeconomic variable like….search

Size of Sample:

This refers to the number of items to be selected from the universe to constitute a sample. Optimum sample is one which fulfills the requirements of efficiency, representativeness, reliability and flexibility. In our study we select some macroeconomic variable which reflect the economic situation as a whole. So our size of sample is limited to reverse repo rate, CRR, SLR, Repo rate, inflation rate, CPI, Index of industrial production, gold rate, oil rate, and exchange rate.

Sampling Technique:

In our research we use convenience and judgmental sampling technique. We have taken the most of macroeconomic variables as per the contingency of its availability and frequency of changes made on it and also considering the various studies undertaken by most researchers on macroeconomic variable and its impact on the stock market.

V. TYPES OF RESEARCH

In our research we use **Analytical Research** because we use facts and information already available, and analyze these to make a critical evaluation of the material.

VI. DATA COLLECTION METHOD

For data collection generally two type of method are available primary and secondary method. In our research we use secondary method for collecting and interpreting the information which is already available from different sources. The analysis is done in two parts. In the first part, the correlation is used to analyze the relationship of different macroeconomic variables like Reverse repo, CRR, SLR, Repo rate, Inflation rate, CPI, Index of Industrial Production, Gold, Oil rate, Exchange rate and the stock market indices i.e. Sensex. And in second part regression is used to analyze the impact of most significant macroeconomic variables on the stock market indices.

Analysis Using Correlation:

The correlation is used to find out the strength of relation between the macroeconomic variables and the Sensex. Although a high degree of correlation (a value close to +1 or -1) indicates a good mathematical fit to a linear model. Although a correlation coefficient close to 0 indicates a poor fit to a linear model, it does not mean that there is no correlation between the two sample populations. It is possible that the relationship between X and Y is accurately described by a nonlinear model.

The fundamental principles of correlation that apply to the linear model of two sample populations may be extended to the multiple-linear model. The degree of relationship between three or more sample populations may be quantified using the multiple correlation coefficients. A value close to +1 indicates a high degree of linear relationship between populations; whereas a value close to 0 indicates a poor linear relationship between populations. (Although a value of 0 indicates no linear relationship between populations, that there may be a nonlinear relationship.)

Following table clearly shows the correlation between different macroeconomic variable Analysis:

Each variable is checked one by one to find out the significant relationship between the macroeconomic variable and Sensex. It can be seen from above table that significant relationship with Sensex is shown by correlation matrix. The result reveals that there is significant difference between selected economic variables; there have been positive as well as negative impact on stock market movement. If comparison highest positive correlation between Gold and Consumer Price Index and lowest in positive correlation is on Oil Rate, Inflation Rate, Reverse Repo Rate, Consumer Price Index. If comparison on the side of negative, highest negative correlation matrix between Salutatory Liquidity Ratio with Gold and lowest negative correlation is on Inflation Rate with Exchange Rate.

Econometric Regression analysis

Dependent variable: Sensex				
Model	R	R2	Adjusted R2	Std. Error Of Estimate
1	0.9885	0.9771	0.9391	1128.61
2	0.9885	0.9771	0.9543	977.40
3	0.9864	0.9730	0.9460	1062.69
4	0.9719	0.9446	0.9115	1361.21

Multiple Correlation Between All Macroeconomic Variables and Sensex

		REVERSE RAPO RATE	SLR	CRR	RAPO RATE	INFLATION RATE	IIP	CPI	EXCHANGE RATE	GOLD	OIL RATE	SENSEX
REVERSE REPO RATE	Pearson Correlation	1	-0.677	0.173	0.881	0.533	-0.622	0.426	0.385	0.523	0.556	0.438
	Sig.(2-Tailed)	_	0	0.24	0	0	0	0	0.01	0	0	0
	N	9	9	9	9	9	9	9	9	9	9	9
SLR	Pearson Correlation	-0.677	1	0.183	-0.454	-0.106	0.754	-0.842	-0.824	-0.885	-0.9	-0.687
	Sig.(2-Tailed)	0.000	_	0.21	0	0.47	0	0	0	0	0	0
	N	9	9	9	9	9	9	9	9	9	9	9
CRR	Pearson Correlation	0.173	0.183	1	-0.044	0.217	0.458	-0.028	-0.658	-0.235	-0.111	0.313
	Sig.(2-Tailed)	0.240	0.210	_	0.76	0.14	0	0.84	0	0.11	0.45	0.04
	N	9	9	9	9	9	9	9	9	9	9	9
REPO RATE	Pearson Correlation	0.881	-0.454	-0.04	1	0.410	-0.460	0.172	0.311	0.360	0.246	0.152
	Sig.(2-Tailed)	0.000	0.000	0.760	_	0.000	0.000	0.250	0.030	0.020	0.100	0.300
	N	9	9	9	9	9	9	9	9	9	9	9
INFLATION RATE	Pearson Correlation	0.533	-0.106	0.217	0.410	1	-0.281	-0.259	-0.01	-0.278	0.172	-0.24
	Sig.(2-Tailed)	0.000	0.470	0.140	0.000	_	0.060	0.080	0.950	0.060	0.240	0.110
	N	9	9	9	9	9	9	9	9	9	9	9
IIP	Pearson Correlation	-0.622	0.754	0.458	-0.460	-0.28	1	-0.541	-0.83	-0.695	-0.74	-0.29
	Sig.(2-Tailed)	0.000	0.000	0.000	0.000	0.060	_	0.000	0.000	0.000	0.000	0.050
	N	9	9	9	9	9	9	9	9	9	9	9
CPI	Pearson Correlation	0.426	-0.842	-0.03	0.172	-0.26	-0.541	1	0.662	0.931	0.878	0.922
	Sig.(2-Tailed)	0.000	0.000	0.840	0.250	0.080	0.000	_	0.000	0.000	0.000	0.000
	N	9	9	9	9	9	9	9	9	9	9	9
EXCHANGE RATE	Pearson Correlation	0.385	-0.824	-0.66	0.311	-0.01	-0.830	0.662	1	0.766	0.783	0.339
	Sig.(2-Tailed)	0.010	0.000	0.000	0.030	0.950	0.000	0.000	_	0.000	0.000	0.020
	N	9	9	9	9	9	9	9	9	9	9	9
GOLD	Pearson Correlation	0.523	-0.885	-0.23	0.360	-0.28	-0.695	0.931	0.766	1	0.803	0.790
	Sig.(2-Tailed)	0.000	0.000	0.110	0.020	0.060	0.000	0.000	0.000	_	0.000	0.000
	N	9	9	9	9	9	9	9	9	9	9	9
OIL RATE	Pearson Correlation	0.556	-0.900	-0.11	0.246	0.172	-0.742	0.878	0.783	0.803	1	0.733
	Sig.(2-Tailed)	0.000	0.000	0.450	0.100	0.240	0.000	0.000	0.000	0.000	_	0.000
	N	9	9	9	9	9	9	9	9	9	9	9
SENSEX	Pearson Correlation	0.438	-0.687	0.313	0.152	-0.24	-0.293	0.922	0.339	0.790	0.733	1
	Sig.(2-Tailed)	0.000	0.000	0.040	0.300	0.110	0.050	0.000	0.020	0.000	0	_
	N	9	9	9	9	9	9	9	9	9	9	9

The regression equation Yi = β0 + β1 Xi + ui where Yi is the dependent variable, Xi is the independent variable, β0 is the constant (or intercept), β1 is the slope of the regression line which represent the strength and direction of the relationship between the independent and dependent variables and ui is random error term. Here, in our study we carried out this method to see and interpret the effect of macroeconomic variables on stock market. R-square: also known as the coefficient of determination is commonly used to evaluate the model fit of a regression equation. Table shows highest correlation among variables.

Results of ANOVA Tests for Different Models

Dependent Variable : Sensex

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	163706015.9	5	32741203.18	25.70428	0.011458
	Residual	3821294.368	3	1273764.789		
	Total	167527310.3	8			
2	Regression	163706015.9	4	40926503.97	42.84046	0.001537
	Residual	3821294.377	4	955323.5942		
	Total	167527310.3	8			
3	Regression	163010046.5	4	40752511.63	36.08601	0.002142
	Residual	4517263.727	4	1129315.932		
	Total	167527310.3	8			
4	Regression	158262866.1	3	52754288.7	28.47137	0.001436
	Residual	9264444.17	5	1852888.834		
	Total	167527310.3	8			

The table above shows granger interconnection and macroeconomic variables. IIP and BSE auto, Call rate and BSE auto shows a unidirectional relation. It was found from the above table that these four models had been rejected null hypothesis. So in detail observation of the all models there is significant difference between variable movements with negative or positive impact on stock market movement.

Coefficients of Different Models

Dependent Variable : Sensex

Model		**Unstandardized Coefficients**		**t Stat**	**Sig/P**
		B	**Standard Error**		
1	**Constant**	-134161.77	42727.63	-3.14	0.05
	REVERSE REPO RATE	1239.75	464.38	2.67	0.08
	SLR	0.14	1684.97	0.00	1.00
	CPI	748.04	123.05	6.08	0.01
	GOLD	-0.55	0.21	-2.61	0.08
	OIL RATE	-2.56	1.13	-2.27	0.11
2	**Constant**	-134158.76	18540.91	-7.24	0.00
	REVERSE REPO RATE	1239.73	376.19	3.30	0.03
	CPI	748.04	99.08	7.55	0.00
	GOLD	-0.55	0.14	-3.89	0.02
	OIL RATE	-2.56	0.70	-3.63	0.02
3	**Constant**	-60666.96	6623.91	-9.16	0.00
	REPO RATE	212.37	339.34	0.63	0.57

	INFLATION RATE	-398.00	364.31	-1.09	0.34
	CRR	1812.28	423.48	4.28	0.01
	CPI	303.01	30.49	9.94	0.00
4	**Constant**	43175.59	7576.94	5.70	0.00
	GOLD	0.56	0.11	4.89	0.00
	OIL RATE	2.79	0.76	3.67	0.01
	EXCHANGE RATE	-1010.97	196.47	-5.15	0.00

Table shows the how standard error of each of the model, here, in model second represented RRP, CPI, Gold, Oil Rate, so its indicated highest error compared to other models had also generated the high standard error. It also found that highest impact on Consumer Price Index in all other economic variables.

VII. CONCLUSION

In this paper, the study performed necessary analyses to answer the research question of whether some of the identified macroeconomic factors can influence the Indian stock market. The macroeconomic variables are represented by the industrial production index, consumer price index, interest rate (call rate), exchange rate, gold price, oil price…This simply concludes that in long term the Indian stock market is more driven by domestic macroeconomic factors rather than global factors. The results of this analysis should not be treated as conclusive for an investment. Apart from understanding Indian stock market based on the contributions of the significant variables, there remain other important issues that affect the return generating process. These issues are the cost of equity capital, asset valuation, industry analysis, a firm's management and operational efficiency analysis, and so on. Any investor should consider all relevant sources of information when making an investment decision.

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Data source links:

28. http://mospi.nic.in/Mospi_New/site/home.aspx

Monthly data of call money rate, exchange rate (dollar price), gold price and Foreign Institutional Investments in the capital market was extracted from RBI database site.

29. http://dbie.rbi.org.in/ Monthly crude oil (petroleum) was taken index mundi site.

