



Impact of Macro Economic Variables of India and USA on Indian Stock Market

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ABSTRACT

The key objective of the present study is to investigate the impact of changes in selected macroeconomic variables on Indian stock market (Nifty 50 index). To estimate the relationship, multivariate regression model computed on standard ordinary linear square method have been used. The time period examined is 2001-2016 and all the tests are conducted based on monthly data. Based on estimated regression coefficients and t-statistics, it is found that nifty 50 index is significantly affected by US gross domestic product, S and P index, gold prices, Indian whole sale price index, its fiscal deficit, IPI and exchange rate.

Keywords: Macroeconomics Variables, Stock Prices, Gross Domestic Product, Gold Prices, Whole Sale Price Index

JEL Classifications: A1, E44, E52, I16, J11

1. INTRODUCTION

A stock exchange market is the center of a network of transactions where buyers and sellers of securities meet at a specified price. Stock market plays a key role in the mobilization of capital in emerging and developed countries, leading to the growth of industry and commerce of the country, as a consequence of liberalized and globalized policies adopted by most emerging and developed government (Agrawalla, 2006). Many factors can be a signal to stock market participants to expect a higher or lower return when investing in stock and one of these factors are macroeconomic variables. The change in macroeconomic variables can significantly impact stock price return. The results of this empirical research help the reader to understand whether the movement of stock prices of the nifty 50 index is subject to some macroeconomic variables change like foreign institutional investment (FII), exchange rate, gold price/(10 g), fiscal deficit, industrial production index (IIP) and inflation measured with whole sale price index (WPI). Further USA economic variable like interest rate, inflation and gross domestic product (GDP) also affect the Indian capital market. Investors will find this study as a helpful tool for them to identify some basic economic variables that they should focus on while investing in stock market and will have an advantage to make their own suitable investment decisions (Chong and Koh, 2003).

The rest of the paper is organized as follows. A survey of the existing literature including empirical evidences on the nature of the causal relationship between macroeconomic aggregates and stock prices is conducted in Section II.

Section III discusses the methodology to be employed and presents the variables and data descriptions. Section IV reports the empirical results followed by conclusion and future scope in Section V.

2. REVIEW OF LITERATURE

Economic growth and prosperity is possible only when capital market works efficiently. In other words the stock market is very significant to speed up economic growth through increasing liquidity of financial assets and diversification of global risk easier for investors to make a wiser investment decision. After the globalization international capital markets are integrated rapidly. This integration has positive affects on economic growth, reducing the risk and especially contagion impact on financial crises.

Studies on the relationship between macroeconomic variables and national stock market have been the cornerstone of most economic literature for quite some time. During the last decade and a half, it has been recognized that external sector indicators like exchange

rate, foreign exchange reserves and value of trade balance can have an impact on stock prices.

Early studies (Aggarwal, 1981; Soenen and Hennigar, 1988) in the area of exchange rates - stock prices considered only the correlation between the two variables. Aggarwal (1981) found a significant positive correlation between the US dollar and US stock prices while Soenen and Hennigan (1988) reported a significant negative relationship. Soenen and Aggarwal (1989) found mixed results among industrial countries. Ma and Kao (1990) attributed the differences in results to the nature of the countries i.e., whether the countries were export or import dominant. Morley and Pentecost (2000), in their study on G-7 countries, argue that the reason for the lack of strong relationship between exchange rates and stock prices may be due to the exchange controls that were in effect in the 1980s. Bahmani-Oskooee and Sohrabian (1992) were among the first to use cointegration and Granger causality to explain the direction of movement between exchange rates and stock prices. Since then various other papers analyzing these aspects and using this technique have appeared covering both industrial and developing countries (Granger et al., 2000; Ajayi et al., 1998; Ibrahim, 2000). The direction of causality, similar to earlier correlation studies, appears mixed. For Mok (1993) found that the relationship between stock returns and exchange rates are bidirectional in nature. For the United States, Bahmani-Oskooee and Sohrabian (1992) point out that there is a two-way relationship between the U.S. stock market and the exchange rates. However, Abdalla and Murinde (1997) found out that the results for India, Korea and Pakistan suggest that exchange rates granger cause stock prices, which is consistent with earlier study by Aggarwal (1981). But, for the Philippines, Abdalla and Murinde found out that the stock prices lead the exchange rates. This is consistent with Smith (1992) finding that stock returns have a significant influence on exchange rate in Germany, Japan and the United States. Pethe and Karnik (2000) has investigated the inter - relationships between stock prices and important macroeconomic variables, viz., exchange rate of rupee vis - a - vis the dollar, prime lending rate, narrow money supply, and index of industrial production. The analysis and discussion are situated in the context of macroeconomic changes, especially in the financial sector, that have been taking place in India since then. Used variables investment, GDP and consumption employing granger causality test to define the relationship among the selected variables and stock prices, finding shows at two lags of all variables are highly significantly effect on stock prices.

Ahmed (2008) empirically investigated on SENSEX index price affects due to real and financial sector performance in Indian economy, the data has been chosen from the period 1997 to 2003. The study consists variables export, foreign exchange rate and foreign direct investment. Granger causality test is used to find out the causal relationship between the variables. All the variables are granger cause to stock prices. Speculation in the market was analyzed with the help of AR (auto regressive) which was highly significant according to the result. Nishat (2004) evaluates long term association among macroeconomic variables, stock prices and employed money supply, consumer price index (CPI), IPI,

and foreign exchange rate as explanatory variable. The result shows that there are causal relationships among the stock price and macroeconomics variables. The data used in this study from 1974 to 2004. Most of the time series data is nonstationary therefore unit root technique is used to make data into stationary. The result also indicates that industrial production is significantly affects to macroeconomic variables. Dimitrova (2005) used multivariate model and try to find out link among stock prices, exchange rate and economics policy (fiscal and monetary policy). The study defines the interest parity condition affects on stock prices. The result shows that ambiguous affects of depreciation on stock prices. Shahbaz (2007) investigated the association between stock prices and rate of inflation using AR-distributed lag approach for dynamics analysis. Result of this study depicts that stock hedges are not in favor of inflation in long run as well as in short run and found that black economy effects long run and short run prices of the stock. The study used variables CPI, (inflation) and share of black economy the sample size of the study is 1971-2006. Sharma and Singh (2007) used interest rate, exchange rate and reserve, IIP, monetary growth and inflation as independent variables with AR and MA to nullify the effects of non stationary in the variables. The result shows that lags values are highly connected with current share prices which recommend the speculation in market. Exchange rate and reserve, IIP and monetary growth are significantly associated. The study took data set from 1986 to 2004. Ali et al., (2008) used data from 1971 to 2006 and try to find out the relationship of economic growth with stock market prices and study shows that there are dynamics association between stock prices and economic growth employing Dickey-Fuller- generalized least squares test first time in case of Pakistan.

Shahid (2008) investigates the nature of the causal relationships between stock prices and the key macro economic variables (index of industrial production, exports, foreign direct investment, money supply, exchange rate, interest rate) representing real and financial sector of the Indian economy. The study indicates that stock prices in India lead economic activity except movement in interest rate which seems to lead the stock prices. Robert (2008) evaluated the association among stock prices and macro economics variables in cases of China, India, Brazil and Russia which are emerging economies of the world using oil price, exchange rate, and moving average (MA) lags values as explanatory variables employing MA method with ordinary least square (OLS) and found insignificant results which postulate inefficiency in market. Finally they concluded that in emerging economies the domestic factors influence more than external factors i.e. exchange rate and oil prices. Keshava (2008) analyzes the impact of FDI on growth in India, exports, GDI, FOREX and other macro variables. The paper also compares India's FDI with Chinese FDI and attempts to learn from the Chinese experience. The paper distinguishes between hard factor that affect FDI and soft factors that affect FDI. Hard factors mainly include transportation, telecommunications, energy supply, public utilities and infrastructure. Soft factors include parameters related to political regime and culture. The paper concludes that India is far behind China in becoming an attractive FDI destination as it still suffers from power shortage,

poor infrastructure, security consideration and the absence of an exit policy. If India has to reach its target of attracting more FDI for its development, aggressive third generation reforms are needed along with good planning and intentions. Pal and Mittal (2011) investigated the long run relationship between two Indian capital markets and some such macroeconomic factors as interest rates, inflation, and exchange rate and gross domestic savings using quarterly data from January 1995 to December 2008 and with the help of unit root test, co integration and error correction mechanism. They found that the inflation rate have the significant impact on both capital markets whereas interest rate and foreign exchange rate have an impact on one capital market. It was also found that gross domestic saving was insignificant explaining both markets.

Mohammad (2011) uses multivariate regression model computed on standard OLS formula and Granger causality test to model the impact of changes in selected microeconomic and macroeconomic variables on stock returns in Bangladesh. He examines monthly data for all the variables under study covering the period from July 2002 to December 2009. The study finds a negative relationship between stock returns and inflation as well as foreign remittance while market price/earnings and growth in market capitalization have a positive influence on stock returns. However, no unidirectional granger causality is found between stock returns and any of the independent variables and the lack of granger causality reveals the evidence of an informally inefficient market. Naik and Padhi (2012) also studied the relationships between the Indian stock market index (BSE Sensex) and five macroeconomic variables, namely, IIP, wholesale price index, money supply, treasury bills rates and exchange rates over the period 1994-2011 with application of Johansen’s co-integration and vector error correction model to explore the long-run equilibrium relationship between stock market index and macroeconomic variables. The analysis reveals that macroeconomic variables and the stock market index are co-integrated and, hence, a long-run equilibrium relationship exists between them. It was found that the stock prices positively relate to the money supply and industrial production but negatively relate to inflation. The exchange rate and the short-

term interest rate are found to be insignificant in determining stock prices. Mahedi (2012) examines the long-run relationship and the short-run dynamics among macroeconomic variables and the stock returns of Germany and the United Kingdom. He uses the Johansen Co-integration test to indicate the co-integrating relationship between the stock prices and macroeconomic determinants. And then, he uses error-correction models to investigate both the short- and long-term casual relationships and each case is examined individually. For Germany case, the results show that the short-run causality runs from stock returns to inflation, from money supply to stock returns and from industrial production to stock returns. The long-run causality runs from inflation to stock returns and from exchange rate to stock returns. There is only one short-and long-run relationship, that is from the stock returns to industrial production. For the United Kingdom case, he finds that the short run causality run from stock returns to T bill, from stock returns to money supply, from stock returns to exchange rate, exchange rate to 15 stock returns and stock returns to industrial production. The long run causality runs from inflation to stock returns. The short and long-run causal relationship runs from stock returns to inflation, from money supply to stock returns and from industrial production to stock returns. These results indicate the existence of short-run interactions and long term causal relationship between both Germany and the UK stock markets and the macroeconomic fundamentals.

Sarbapriya (2012) uses a simple linear regression model and Granger causality test to measure the relationship between foreign exchange reserves and stock market capitalization in India. The results show that causality is unidirectional and it runs from foreign exchange reserve to stock market capitalization and that foreign exchange reserves have a positive impact on stock market capitalization in India. Shafana et al. (2013) reinvestigated the behavior of expected stock returns with respect to two popularly known firm level characteristics: Firm size and book-to-market equity in Sri Lankan context. The sample of the study consist of 12 companies out of total 25 companies listed on Milanka price index in base year of 2005 in Colombo stock exchange, financial year ended in December and have positive book values are only

Table 1: Symbol, variables and definition

Symbol	Variable	Definition
Exchange_Rate	Exchange rate	Monthly dollar-rupee rate
FII_India	Foreign institutional investor of India	Monthly data in rupees (Cr.)
Fiscal_Deficit	Fiscal deficit	Monthly data in rupee (Cr.)
Gold_10 g	Gold price/10 g	Monthly data in rupees
S and P_Data	S and P	Monthly S and P data of USA
Int_USA	Interest rate of USA	Monthly interest rate of USA
GDP_USA	Gross domestic product of USA	Monthly gross domestic product of USA
WPI_India	Inflation	Monthly wholesale price index
IP_India	Industrial production index of India	Monthly index of industrial production
Nifty	Nifty 50 index	Monthly nifty 50 data

$$\text{Nifty} = \beta_1 + \beta_2 \text{Exchange_Rate} + \beta_3 \text{FII_India} + \beta_4 \text{Fiscal_Deficit} + \beta_5 \text{Gold_10 g} + \beta_6 \text{S and P_Data} + \beta_7 \text{Int_USA} + \beta_8 \text{GDP_USA} + \beta_9 \text{WPI_India} + \beta_{10} \text{IP_India} + \epsilon$$

Table 2: Variables (entered/removed)

Model 1	Variables entered	Variables removed	Method
	Exchange_Rate, FII_India, Fiscal_Deficit, Gold_10 g, S and P_Data, Int_USA, GDP_USA, IP_India, WPI_India ^a	-	Enter

^aAll requested variables entered, ^bdependent variable: Nifty

taken into consideration. Empirical findings reveal that Book-to-market equity has a significant negative role in expected stock returns while firm size does not have any significant behavior in expected stock returns. Jareno and Negrut (2016) analyzes the relationship between the US stock market and some relevant US macroeconomic factors, such as GDP, the CPI, the IIP, the unemployment rate and long-term interest rates. All the relevant factors show statistically significant relationships with the stock market except for the CPI, and the signs are consistent with the findings of previous literature. Ramadan et al. (2016) tried to shed light on the relationship between the stock market and macroeconomic factors in two emerging economies (Egypt and Tunisia) for the period from January 1998 to January 2014. Results indicated that there is a causal relationship in Egypt between market index and CPI, exchange rate, money supply, and interest rate. The same goes for Tunisia except for CPI, which had no causal relationship with the market index. Results also revealed that the four macroeconomic are co-integrated with the stock market in both countries.

A discussed above, literature reveals differential causal pattern between key macro economic variables and stock prices. This relationship varies in a number of different stock markets and time horizons in the literature. This paper will add to the existing literature by providing robust result, about causal inks for the longer period i.e., 2001-2016 (monthly data).

Table 3: Model summary

Model 1	R	R ²	Adjusted R ²	Standard error of the estimate
	0.859 ^a	0.825	0.836	232.489

^aPredictors: (Constant), Exchange_Rate, FII_India, Fiscal_Deficit, Gold_10 g, S and P_Data, Int_USA, GDP_USA, IP_India, WPI_India, ^bDependent variable: Nifty

Table 4: ANOVA

Model	Sum of squares	df	Mean square	F	Significant
1					
Regression	3.213E8	9	4.33E7	601.598	0.000 ^a
Residual	1.118E7	184	67958.439		
Total	3.458E8	193			

^aPredictors: (Constant), Exchange_Rate, FII_India, Fiscal_Deficit, Gold_10 g, S and P_Data, Int_USA, GDP_USA, IP_India, WPI_India, ^bDependent variable: Nifty

Table 5: Regression analysis

Model 1	Unstandardized coefficients		Standardized coefficients	t	Significant	95% confidence interval for B	
	B	Standard error	Beta			Lower bound	Upper bound
(Constant)	834.589	298.658		2.513	0.005	223.963	1499.364
Exchange_Rate	-103.258	6.599	-0.378	-14.562	0.000	-113.258	-83.147
FII_India	0.0052	0.004	0.019	1.752	0.144	-0.007	0.019
Fiscal_Deficit	-0.006	0.001	-0.056	-2.177	0.006	-0.009	-0.003
Gold_10 g	0.275	0.031	0.652	9.652	0.000	0.253	0.362
S&P_Data	1.582	0.178	0.258	8.897	0.000	1.145	1.288
Int_USA	-9.421	19.564	-0.027	-0.652	0.574	-48.435	26.654
GDP_USA	0.491	0.056	0.752	5.245	0.000	0.254	0.554
IP_India	1.745	2.542	0.047	0.365	0.582	-2.547	6.528
WPI_India	-16.258	4.564	-0.499	-3.528	0.0017	-29.528	-5.456

^aDependent variable: Nifty

3. RESEARCH METHODOLOGY

Economic variables like FII, exchange rate, gold price/(10 g), fiscal deficit, IIP and inflation measured with WPI are the important factor which affect the Indian capital market. In addition to the Indian economic variable, the USA economic variable like interest rate, inflation and GDP also affect the Indian capital market. The current study, using modern non-linear techniques, has resulted in showing that there is a significant causal relationship between the real economic variables and the capital market (Table 1).

All monthly data are taken from Reserve Bank of India, SEBI and Bureau of Economic Analysis website.

4. RESULTS AND ANALYSIS

The empirical result or evidence provided by the various studies mentioned in the section of review literature shows that macroeconomics variables have strong effect the stock market. SPSS 17 software is used for the testing the correlation between the movement of nifty 50 with Indian macroeconomic variable and USA macroeconomic variable. The result is shown in Tables 2-5.

Indian stock market movement is found to be significantly correlated with respect to the most macroeconomics variables. It is shown in Table 3 that R-square is 0.825, which means that macroeconomic variable of India and USA account 82.5% of the variation of nifty 50 movement.

The adjusted R-square is 0.836, which measure of how well our model generalizes and ideally we would like its value to be the same, or very close to, the value of R-square. So, the assumption has certainly been met.

Further analysis also reported in Table 5 exhibits. Exchange rate, USA GDP, S and P, USA interest rate, gold price, WPI, fiscal deficit, IIP is highly significance at 5% level. It is also found that there is a negative relationship of nifty with WPI and USA interest rate. It has been also seen that foreign institutions investment has been also affecting the stock market prices.

5. CONCLUSION AND FUTURE SCOPE

The main objective of this research paper is to study the association between macroeconomics variables and Indian stock market's shares prices. For this purpose the monthly data of foreign exchange rate, USA GDP, S and P, USA interest rate, gold price, WPI, fiscal deficit, IIP, FII and USA interest rate have been taken. The result shows that exchange rate, USA GDP, S and P, USA interest rate, gold price, WPI, fiscal deficit, IIP highly affect the stock prices. It has been observed since the liberalized reforms from 2001 to 2016 of stock markets in India has largely affected by macroeconomic variable.

The present study has further scope for more comprehensive results as several new areas for research could be derived from the results of this work. First a further investigation can be done using the other variables that were commonly used I research to explain changes in stock prices including variables like foreign exchange reserves and oil prices which will help draw a complete picture on the factors that affect the stock market.

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