



ECONOMIC SENTIMENT AND MARKET RETURN: A CASE STUDY OF INDIAN STOCK MARKET

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Abstract: This paper discovers the relationship between economic sentiment and BSE S&P 500 Index return over a period of 10 years. We have used 12 macroeconomic variables as proxy to the economic sentiment. Further analysis has been done by employing weighted least squares (WLS) method. Results suggest that 3 economic sentiment proxies are positively related and 1 proxy is negatively related to the market return. The results of the study offer new insights helpful for retail investors, policy makers and other decision makers in refining their decision-making process in the Indian stock market. Our study also invalidates the investor rationality as proposed by the classical finance. The results have paved the way to extend the present work in the context of foreign markets.

Index Terms - behavioral finance, principal component analysis, macroeconomic variables, multivariate regression, economic sentiment, economic sentiment proxies, stock market return.

I. INTRODUCTION

Behavioral finance is that branch of finance which aims at predict the market by understanding the sentiments of the investors. Keynes (1936) was first who enshrined the term investor sentiment. He believed that sentiment plays a very important role in economic activities and emphasized that investors have animal spirits which form the basis of their investment decisions.

Gal (1998) reported that the Behavioral Economists are of the view that investors undervalue the public information and overvalue the private information. So, those investors who have reach to the private information may try to earn superior returns. With the increasing number of companies and investors, the reach to the finance is not limited to a few investors.

Now the stock markets are becoming more populated it has been observed that there are systematic patterns in the behavior of the investors (Kumar & Lee, 2006). The traditional theories and models are not able to explain the impact of the behavior of the investors on the stock market. The behavior of investors results in the anomalies and the movements in the stock market which are difficult to explain.

Investors can analyze and predict the stock market using various tools and techniques available to them. These tools and techniques take into consideration the share price patterns, historical financial performance, financial ratios and accounting ratios to predict the stock market movement and return. But these tools and techniques do not take into consideration the behavior of human beings to predict the stock market movement and returns. Kiesler, Collins and Miller (1969) defined the attitude as a learned tendency to respond in a consistent and constantly favorable or unfavorable way with respect to a particular object.

Behavioral finance suggests that investors behave emotionally in the financial markets and such emotional behavior of the investors is termed as the sentiment. There are many factors which affect the emotions of the investors to behave in particular way, by affecting their emotions, for example noise. The emotional behavior of the investors due to the noise, results in the unexpected buying and selling and sometimes results in snowball effect in the market which refers to as market rally. It is the combined behavior of individual investors.

To understand how the economy works, how it is managed, and how to grow it, it is necessary that we understand the decisions making patterns of the investors and the reflection of their thoughts, moods and animal spirits in the financial markets.

A lot of studies have been carried out in the western world to measure the investor sentiment and to predict market return and volatility. In India such studies are in nascent stage. Though these studies have addressed the issue of measurement of investor sentiment and its relationship with market return but no study has tried to measure the economic sentiment and its relationship with market return.

Domian & Reichenstein (1998), Sehgal et al. (2010), Abakah & Abakah (2016), Hassan et al. (2016), Naik and Padhi (2016) and Kumari & Mahakud (2016) have used macroeconomic factors as the proxy to the investor sentiment and combined these factors with other proxies (such as market related proxies) to predict the market return. It would be interesting to know whether market return can be predicted with the help of macroeconomic factors alone if these factors assumed to represent the economic sentiment. To the best of our knowledge, till date, no study has been conducted to predict the market return using macroeconomic factors alone assuming these factors represent the economic sentiment. In the present work, we have tried to analyze the relationship of macroeconomic factors with market return and tried to answer whether the market return can be predicted using these factors alone when these factors assumed to represent the economic sentiment.

Present study is divided in 6 sections. Second section reviews the literature and third section describes objectives and hypotheses. Fourth section discusses the research methodology and section 5 discusses results and data analysis. Section six concludes the study.

II. REVIEW OF LITERATURE

Keynes (1936) was the first one who enshrined the importance of role of sentiment in economic activities. **Chen et al. (1986)** reported that macroeconomic factors are responsible for the changes in the stock market. long- term government bonds, low grade bonds, industrial production, oil prices, equally weighted equities, value weighted equities, treasury bill rates, inflation, *etc.* were some of the important factors. A relationship between non-economic variables and market return was established and some more macroeconomic variables were identified.

Fisher and Statman (2000) measured the sentiment of three groups *viz.* large, medium and small. The research showed that the relationship between the sentiment of the individual investors and sentiment of writers of newsletters is strong. However, the relationship between sentiment of Wall Street strategists and other groups (medium and large investors) is not strong. There was no relationship between the sentiment (large, medium and small investors) and market return so it was concluded that sentiment is of no use in predicting the market return. But when the relationship between combined sentiment of the three groups and market return was analysed and it was found that combined sentiment can be used to predict the market return. The study suggested that there are some indicators of the implied sentiment (proxies) which should also be studied. An idea of studying the relationship between the sentiments measured directly and measured indirectly was also given.

Lee et al. (2002) using the GARCH-in-mean approach and explored the impact of investor sentiment on the association between overall excess market return and conditional volatility. Investors' intelligence index was used as a proxy to the investor sentiment. When the investors are bearish the volatility increases and when the investors are bullish the volatility decreases. The study observed the negative relationship between volatility and sentiment.

Baker and Wurgler (2004) hypothesized that sentiment can be measured using some selected variables which are proxies to it and this sentiment can be used to predict the market. Baker & Wurgler (2006, 2007) provided a conceptual framework for the measurement of sentiment and developed a methodology to construct a sentiment index popularly known as BW approach. Study concluded that shares provide higher (lower) return than bonds when sentiment is low (high). It was also reported the high chances of market crashes after high sentiment period.

Verma et al. (2008) reported that sentiment of the investors contains rational and irrational factors, so, it is possible that MPR (Market Price of Risk) is affected by both *fundamental* and *noise* components both. Study tried to divide the sentiment into rational (based on noise) and irrational (based on fundamental). Study concluded that irrational sentiment has negative relationship with MPR (Market Price Risk) and rational sentiments of the arbitrageurs for DJIA (Dow Jones Industrial Average) and S&P500. Further, when the optimism is irrational then it leads to an increase in the stock market volatility. Further, there is no significant impact of rational investor sentiment on MPR. Rational investors are bearish when noise traders are bullish and vice versa. Risk factors are not responsible for irrationality in the market.

Sehgal et al. (2009) conducted a survey method to get an idea of the factors responsible for the investor sentiment and tried to define the sentiment. Respondents were given with a set of six different readymade definitions of the sentiment and were asked to select a definition which they though could be the most appropriate definition. Maximum respondents selected the definition number 6 according to which sentiment is an understanding of human behavior which affects the market return.

Kuzmina (2010) reported that there are three different types of investors/traders in the market *viz.* (i) rational investors/traders; (ii) noise investors/traders and (iii) emotional investors/traders. Rational investors use past and present information. Study concluded using a theoretical model that in the short run emotional investors can increase their wealth and in the long run their wealth is at par with the rational investors.

Sehgal et al. (2010) using the methodology as developed by Baker & Wurgler (2006) constructed a sentiment index for the Indian stock market. It was concluded that such an index can be used to predict the market. It was also reported that it is difficult to establish a casue and effect relationship between sentiment and return.

Bennet (2011) used market related and stock related factors to measure sentiment in the context of Indian stock market. Survey method was used and the relationship of market specific factors vs. optimism, market specific factors vs. participation, market soecific factors vs. stock market outlook, stock specific factors vs. optimism, stock specific factors

vs. participation and stock specific factors vs. stock market outlook was explored. This relationship was used to gauge the investor sentiment as represented by the investors' optimism, participation and stock market outlook (Shiller, 1999). The study provided mean and standard deviation of the investors' optimism, participation and stock market outlook for the measurement of the investor sentiment.

Dash & Mahakud (2013) tried to analyze the impact sentiment has on industrial returns. The study implicated that fund managers can use the stocks of those industries which are less sensitive to the sentiment.

Bu & Bi (2014) reported that two kinds of sentiments *viz.* optimist or pessimism of fundamentalists and sentiments of noise traders who are either bearish or bullish, are there in the market and these sentiments affect the prices. With an objective of constructing an index for investor sentiment in the context of Chinese stock market, Multivariate regression analysis was used to study the effect of various economic variables like—closed-end fund discount-*CEFD*, number of IPOs-*NIPO*, SSE share turnover-*TURN*, number of Chinese A shares net added accounts-*NAA*, relative degree of active trading in equity market-*RDAT*, the average first-day returns of IPOs-*RIPO*, on the CSI300 return. The relationship between the proxy variables of investor sentiment and stock market index was studied. It was proved that the sentiment index constructed had good projecting power about CSI300 (China Securities Index 300) index.

Kumari & Mahakud (2015) explored the relationship between investor sentiment and stock market return and volatility. The study concluded that sentiment is helpful in predicting stock market return and volatility. The study also validated the theory of noise traders.

Naik & Padhi using the methodology as developed by Baker & Wugler (2006) created positive and negative sentiment indices. It was concluded that negative (positive) sentiment index affects the market negatively (positively). A bi-directional causality between investor sentiment and excess market return was also established.

Yang & Hasuik (2017) reported that as per the efficient market hypothesis all the investors are rational and behave accordingly to the new information, which is being disseminated in the market. But the classical finance theory is unable to explain the reasons for the abnormal increase or decrease in the stock prices. The study was conducted on the China's stock market, as the China is the second fastest developing market of the world and includes a high percentage of individual investors. So, it was assumed that effect of investor sentiment on stock market is larger as compared to the stock market of USA or India. The multifactor model was used to define the provisional investor sentiment index (*tSENT*). Variables with the high absolute value of the coefficients were selected for the formal investor sentiment index. The effectiveness of the investor sentiment index was tested using GARCH a non-linear model (Engle R. F., 1982) and the effectiveness of the *SENT* was proved. Finally, it was concluded that there is a circulation between the investor sentiment and the stock index.

Pandey & Sehgal (2019) using the methodology as developed by Baker & Wurgler (2006) constructed different sentiment indices. Study enshrined the importance of sentiment in the stock market. The study concluded the FF3f and FF5f models prove to be a better asset pricing models when the sentiment factor is incorporated in it.

3.1. Research Objectives

1. To identify the proxies to the economic sentiment.
2. To analyze the relationship between economic sentiment and market return.
3. To identify the significant economic sentiment proxies to predict market return.
4. To suggest the policy implications.

III. OBJECTIVES AND HYPOTHESES OF STUDY

3.2. Research Hypotheses

Whether there is any relationship between macroeconomic factors and market return, to know this, we set the following hypotheses—

H_{0P1}: There is no significant relationship between macroeconomic factors and market return.

H_{1P1}: There is a significant relationship between macroeconomic factors and market return.

For the above primary hypothesis, we have made following secondary hypotheses—

H_{0S1}: There is no significant relationship between foreign direct investment (FDI) and market return.

H_{0S2}: There is no significant relationship between economic risk premium ($R_m - R_f$) (ECORPREM) and market return.

H_{0S3}: There is no significant relationship between oil prices (OILPRICE) and market return.

H_{0S4}: There is no significant relationship between liquidity in the economy (LIQECO) and market return.

H_{0S5}: There is no significant relationship between inflation (INFLAT) and market return.

H_{0S6}: There is no significant relationship between level of interest rate (PLR) and market return.

H_{0S7}: There is no significant relationship between difference between 364 days treasury bills and 91 days treasury bills (Term spread) (TERMSPRE) and market return.

H_{0S8}: There is no significant relationship between industrial production index (IPI) and market return.

H_{0S9}: There is no significant relationship between short-term interest rate (SHORTINT) and market return.

H_{0S10}: There is no significant relationship between exchange rate (EXRATE) and market return.

H_{0S11}: There is no significant relationship between foreign exchange reserves (FEXRES) and market return.

H_{0S12}: There is no significant relationship between Gross domestic product (GDP) and market return.

IV. RESEARCH METHODOLOGY

4.1. Selection of Macroeconomic Factors

The total 12 factors incorporated in the regression equation have been identified after studying the extant literature. These factors are as follows—

1. **Foreign direct investment (FDI):** FDI is the investment made by investors of one country in another country. Under FDI the investment is made by acquiring a foreign business or establishing a new business in another country or acquiring assets of any established business in another country. When FDI increases, it indicates that foreign investors are showing interest as they foresee the potential in the host country. An increasing FDI is generally a good sign for a country. Now the question arises, whether FDI affects the investor sentiment or not. It may affect the sentiment positively in the sense that the host country is preferred destination for the foreign investors, and it promotes the development of the stock market also (Raza et al., 2012). So, we are of the opinion that an increase in the level of FDI may affect the sentiment positively and increase the market return whereas, decrease in the level of FDI may affect the sentiment negatively and decrease the market return (Hassan et al., 2016). Also, Haq (2016) reported that there is positive relationship between FDI and the stock market return.
2. **Economic risk premium ($R_m - R_f$) (ECORPREM):** Economic risk premium refers to the difference between market return and risk-free rate of return. The return on S&P BSE 500 has been considered as a proxy to the market return because S&P BSE 500 represents approximately 93% of the market capitalization. Further, the interest rate on 364 days T-Bill has been considered as the risk-free interest rate. In our study we are taking the difference between return on S&P BSE 500 and interest rate on 364 days T-Bill as the economic risk premium.
3. **Oil prices (OILPRICE):** The prices of oil play a very important role in the global economy. Therefore, it is very important to understand what are the factors that affect the prices of oil. Of course, some research works have given the idea that the sentiment of investors in the financial markets may be potential determinants of the prices of oil, but there have been no experimental researches to answer this question. Experimental research work has proved that the co-movement between equity return and commodity return is due to the increased participation in commodity markets by financial investors. Literature suggests that importance of oil prices is limited only to the stock prices of oil-companies and companies using oil and oil based raw materials (Du et al., 2016). But we think that an increase in oil prices leads to the downfall in the market and vice versa.
4. **Liquidity in the economy (LIQECO):** Liquidity in the economy can be measured through the high-powered money or monetary base of the central bank. In India RBI is the central bank. High-powered money is denoted by M_1 and it is the sum of the currency with the public, cash reserves of commercial banks and other deposits with RBI. Sehgal et al. (2010) used the liquidity in the economy to regress the market related proxies. We also expect that this variable is a proxy to the sentiment.
5. **Inflation (INFLAT):** Inflation is the reduction in the purchasing power of the money and is measured through the WPI and CPI. WPI is used to measure the wholesale price changes and CPI is used to measure the retail price changes. Inflation may affect the sentiment of the investors. Sehgal et al. (2010), Naik and Padhi (2016) and Kumari & Mahakud (2016) also used the inflation in the economy as a variable which affect the sentiment. Inflation affects the market return negatively. The percentage change in the WPI was used as an estimate of the inflation. Welch & Goyal (2008) used the CPI as an estimate of the inflation. The review of literature revealed that WPI has been given importance; therefore, we have decided to use the WPI as an estimate of the inflation. We have used the lagged (2 months) data as there is delay in the release of WPI on the part of the issuing agencies (Huang et al., 2015).
6. **Level of interest rate (PLR):** PLR is the rate at which bank lend money to the most creditworthy and trustworthy customers. PLR is the base for all other interest rates and significantly affect the lending levels of the bank. PLR can be used for the level of interest rate in the economy. In case there is a decrease in the PLR, it increases the money supply in economy and helps in boosting the market. Contrary to it, an increase in the PLR, decreases the money supply in the economy and hinder the market development. It would not be wrong to assume that decrease (increase) in the PLR affect the sentiment in a positive (negative) way.
7. **Difference between 364 days treasury bills and 91 days treasury bills (Term spread) (TERMSPRE):** The treasury bills are the money market debt instruments. T-bills are also issued to control the currency circulation in the country. Difference between interest rate of two securities with different maturities (long-term and short-term) is called term spread. Term spread is negative (positive) when long-term interest rate is lower (higher) than the short-term interest rate (Moffatt, 2019). The difference between 364 days treasury bills and 91 days treasury bills is term spread for our study and we expect that this may affect the investor sentiment and can be an ISP. Domian & Reichenstein (1998) concluded that when term spread is combined with other variable(s) then it can predict the return on stocks. Naik and Padhi (2016) used this to arrest the irrational component of the investor sentiment. A positive (negative) term spread may affect the sentiment negatively (positively).
8. **Industrial production index (IPI):** Industrial production is an indicator which shows the monthly growth rate in the volume of the industrial production in the country. An increase in the IPI indicates the growth in the economy and vice versa. It is an important macroeconomic indicator as well as strength of the demand in a country. The stock market largely depends on the growth in the industrial sector and thus the level of the industrial production may affect the sentiment. We expect that this variable may affect the investor sentiment and. An increase may affect sentiment positively and decrease may affect sentiment negatively. We have used the general IPI with the base year 2011-12. Prior to April 2011, IPI with base year 2004-05 was available, so, we have spliced the IPI with base year 2004-05 to IPI with base year 2011-12. Further, we have used the lagged (2 months) data as there is delay in the release of WPI on the part of the issuing agencies (Huang et al., 2015).
9. **Short-term interest rate (SHORTINT):** Short-term deposit interest rate is the rate on the deposits made by the public with the banks for less than one year. This rate may induce an investor to move money from bank to stock market and vice versa. We expect that the short-term deposit rate may affect the investor sentiment. An increase may affect sentiment negatively as the money will move from market to the banks. A decrease may affect sentiment positively as the money will move from banks to the market.
10. **Exchange rate (EXRATE):** Exchange rate is the value of the currency in terms of the currency of another nation. The exchange rates fluctuate with the increase or decrease in the demand of the currency. The drastic changes in the exchange

rates affect the financial position of the companies also. In case Rupee is becoming weak then it will result in the loss to the Indian importers but will result in profits to the exporters. A weak rupee increases the prices of imported commodities used for manufacturing, increases the trade deficit, increases the CAD, decreases the growth of GDP in short-run, and hurts the sentiment of FPIs (Nair, 2018). In nutshell it can be said that increase (decrease) in the exchange rate of rupee strengthen (weaken) the sentiment of Indian investors. We have used the exchange rate of Indian rupee (₹) to US dollar (\$).

11. **Foreign exchange reserves (FEXRES):** Reserves held by the RBI in the form of foreign currencies are called foreign exchange reserves. This reserve has reached to all time high of 560,532 million US\$ in October 2020. It acts as a cushion for the emergency situations. It also helps in strengthening the rupee value as compared to the US \$. There is a positive impact of higher foreign exchange reserves on the stock market. Ray (2012) reported that foreign exchange reserve has a significant positive impact on stock market capitalization. Abakah & Abakah (2016) also reported that foreign exchange reserve has a positive significant impact on stock market capitalization when combined with the PLR. So, literature has suggested that an increase (decrease) in foreign exchange reserve increase the market capitalization, this means that it also increases (decrease) market return. We expect that it may affect the investor sentiment.
12. **Gross domestic product (GDP):** GDP is the money value of all the final goods and services manufactured in an economy during a given period. We expect that the growth (decline) in the GDP may affect the investor sentiment in a positive (negative) way. Chawda & Kumar S. (2018) concluded that there is positive relationship between GDP and market return, and it is one of the important factors which affect the market return. As the quarterly data on the GDP was available, so, to convert it into monthly series we have used the temporal disaggregation. Temporal disaggregation is used convert lower frequency time series to higher frequency time series. We have used the JDemetra+ software and Chow-Lin method to disaggregate the quarterly series to monthly series (Chow & Lin, 1971).

We have assumed that the above factors represent the economic sentiment of the market. Code used for each factor is given in parentheses.

4.2. Methodology

To test the null hypothesis, macroeconomic factors were used as independent variables and market return as dependent variable. Selected macroeconomic factors are discussed in the following pages. S&P BSE 500 percentage return has been used as a proxy to the market return. We have used stepwise method to fit the regression equation. Under stepwise method variables are selected one by one and enter in to the model. This method gives the best model.

We establish the following regression equation (weighted least squares) and used stepwise method in the IBM SPSS 20 Statistics—

$$S\&P\ BSE\ 500\ Percentage\ Return = \alpha + \beta_1.FDI + \beta_2.ECORPREM + \beta_3.OILPRICE + \beta_4.LIQECO + \beta_5.INFLAT + \beta_6.PLR + \beta_7.TERMSPRE + \beta_8.IPI + \beta_9.SHORTINT + \beta_{10}.EXRATE + \beta_{11}.FEXRES + \beta_{12}.GDP \quad \dots(i)$$

Where,

α	= Constant
FDI	= Foreign direct investment
ECORPREM	= Economic risk premium ($R_m - R_f$)
OILPRICE	= Oil prices
LIQECO	= Liquidity in the economy
INFLAT	= Inflation
PLR	= Level of interest rate
TERMSPRE	= Difference between 364 days treasury bills and 91 days treasury bills (Term spread)
IPI	= Industrial production index
SHORTINT	= Short-term interest rate
EXRATE	= Exchange rate
FEXRES	= Foreign exchange reserves
GDP	= Gross domestic product

All the macroeconomic variables have been taken as independent variables and market return as dependent variable. S&P BSE 500 percentage return has been used as a proxy to the market return.

4.2.1. Collection of Data

The monthly data on all the above factors has been collected from various sources (Table 1). Total 120 monthly observations of each macroeconomic factor ranging from January 2010 to December 2019 have been collected.

Table 1: Sources of Data for the Macroeconomic Factors

Sr. No.	Variable	Description	Source
1	FDI	Foreign direct investment (₹)	Department for Promotion of Industry and Internal Trade website
2	ECORPREM	Difference between market return and risk-free rate of return	BSE website, RBI website
3	OILPRICE	Oil prices (₹)	indexmundi.com
4	LIQECO	Liquidity in the economy as measured through M3 (₹)	RBI website
5	INFLAT	Inflation in the economy as measured through WPI	RBI website
6	PLR	Level of interest rate as measured through prime lending rate	IMF website
7	TERMSPRE	Term spread measured as difference between 364 days treasury bills and 91 days treasury bills	RBI website
8	IPI	Level of industrial production as measured through industrial production index	RBI website
9	SHORTINT	Short-term interest rate as measured through Short-term deposit interest rate	RBI website

10	EXRATE	Exchange rate of the Indian rupee (₹) to US dollar (\$)	OFX website (previously known as OzForex)
11	FEXRES	Foreign exchange reserves of India (₹)	RBI website
12	GDP	Gross domestic product	CSO and RBI website

(Source: Author's own compilation)

4.2.2. Detection of Outliers

Outlier is a value that significantly differs from the other values in a time series. We have detected the outliers in our dataset of 12 proxies using JDemetra+ 2.2.2 software. Following time points have been detected to which these outliers are related (Table 2)—

Table 2: Detection of Outliers

Variable (Codes are in parentheses)	Number of outliers in the series of the given proxy	Time point
Foreign direct investment (FDI)	0	—NA—
Economic risk premium ($R_m - R_f$) (ECORPREM)	0	—NA—
Oil prices (OILPRICE)	0	—NA—
Liquidity in the economy (LIQECO)	4	11-2016, 12-2016
3-2017 and 5-2017		
Inflation (INFLAT)	1	6-2012
Level of interest rate (PLR)	5	12-2010, 1-2012, 1-2013, 5-2015 and 10-2015
Difference between 364 days treasury bills and 91 days treasury bills (Term spread) (TERMSPRE)	3	1-2013, 8-2013 and 9-2013
Industrial production index (IPI)	0	—NA—
Short-term interest rate (SHORTINT)	1	2-2013
Exchange rate (EXRATE)	0	—NA—
Foreign exchange reserves (FEXRES)	0	—NA—
Gross domestic product (GDP)	0	—NA—

(Source: Author's own calculation)

Accordingly, the data points in the dataset of the proxy for the market return (SPBSE500) has also been remove.

4.2.3. Testing for Stationarity

All the time-series were tested for stationarity using Unit Root Test (Fuller, 1976) at 1% level of significance and only 9 out of 12 time series of the proxies were found to be stationary. To make the time series stationary, the first order difference was taken and after losing 1 observation, stationarity was again checked using Unit Root Test at 1% level of significance and 12 out of 12 time series were found to be stationary. Results are summarized in Table 3.

Table 3: τ statistic and τ critical value for proxies

Variable	Standardized data			First order differenced data		
	τ -Statistic	τ -Critical value	Stationary/ Non-stationary	τ -Statistic	τ -Critical value	Stationary/ Non-stationary
FDI	-3.037135576	-2.889758399	Stationary	-8.541762736	-2.890036902	Stationary
ECORPREM	-5.845838371	-2.889758399	Stationary	-11.04629834	-2.890036902	Stationary
OILPRICE	-1.843585513	-2.889758399	Non-Stationary	-5.373056189	-2.890036902	Stationary
LIQECO	0.653310843	-2.889758399	Non-Stationary	-7.648027843	-2.890036902	Stationary
INFLAT	-1.980337496	-2.889758399	Non-Stationary	-5.472786236	-2.890036902	Stationary
PLR	-2.738506995	-2.889758399	Non-Stationary	-5.688954540	-2.890036902	Stationary
TERMSPRE	-2.282565082	-2.889758399	Non-Stationary	-6.824237258	-2.890036902	Stationary
IPI	-1.149489715	-2.889758399	Non-Stationary	-7.484612343	-2.890036902	Stationary
SHORTINT	-1.804804249	-2.889758399	Non-Stationary	-5.150284564	-2.890036902	Stationary
EXRATE	-1.500502141	-2.889758399	Non-Stationary	-6.240187982	-2.890036902	Stationary
FEXRES	0.123242598	-2.889758399	Non-Stationary	-4.50882299	-2.890036902	Stationary
GDP	-0.040453655	-2.889758399	Non-Stationary	-6.415182081	-2.890036902	Stationary

(Source: Author's own calculation)

4.2.4. Standardization of Data

After the removal of outliers and making the series stationary, the Z-scores were calculated to make the data standardized. Z score is calculated as follows—

$$Z = \frac{X - \mu}{\sigma} \quad \dots(ii)$$

Where,

Z= Zenith's score or standardized value

X= Observation or value

μ = Mean of the series

σ = Standard deviation

Z-score improves the compatibility among different variables with different scales.

4.2.5. Problem of Multicollinearity

Multicollinearity is a situation when independent variables are correlated to each other. It can make the model biased, creates problems in fitting the model and interpretations of the results. To identify the presence of multicollinearity in our dataset, we have calculated the Carl Person's coefficient of correlation in the IBM® SPSS® 20 Statistic. The results are in the Table 4.

Table 4: Carl Pearson's Coefficient of Correlation

Variables	1. FDI	2. ECORPREM	3. OILPRICE	4. LIQECO	5. INFLAT	6. PLR	7. TERMSPRE	8. IPI	9. SHORTINT	10. EXRATE	11. FEXRES	12. GDP
1. FDI	—											
2. ECORPREM	-0.073	—										
3. OILPRICE	-0.053	0.008	—									
4. LIQECO	0.162	-0.046	0.105	—								
5. INFLAT	0.056	0.127	-0.098	-0.113	—							
6. PLR	-0.017	-0.088	0.148	-0.024	0.082	—						
7. TERMSPRE	0.01	-0.033	0.102	-0.043	0.065	0.134	—					
8. IPI	-0.093	0.141	0.069	0.002	-0.075	0.004	-0.145	—				
9. SHORTINT	0.002	-0.016	0.123	0.109	0.165	0.534	0.083	-0.105	—			
10. EXRATE	0.132	0.059	-0.124	0.162	-0.082	0.009	-0.124	0.112	0.189	—		
11. FEXRES	-0.013	-0.153	-0.014	0.137	-0.143	-0.092	0.186	-0.074	0.214	0.377	—	
12. GDP	-0.178	0.039	0.014	-0.251	0.086	0.185	-0.313	-0.054	0.113	-0.061	-0.146	—

(Source: Author's own calculation)

From the Table 4 and Figure 1, it can be observed that only SHORINT and PLR are correlated (0.534) and that too moderately. So, it can be concluded that the multicollinearity is almost missing in our dataset. Though, SHORINT and PLR could be removed, but we did not want to afford the loss of information, so these variables were not removed.

V. RESULTS AND DATA ANALYSIS

5.1. Results

We have obtained the following results—

Table 5: Model Summary-S&P BSE 500 Percentage Return and Sentiment

Model	r	r Square	Adjusted r Square	Std. Error of the Estimate
1	0.571	0.325	0.319	2.1279780
2	0.807	0.652	0.645	1.5371742
3	0.835	0.697	0.688	1.4399463
4	0.847	0.717	0.705	1.4000761

(Source: Author's own calculation)

Table 6: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	1.004	0.003		373.615	0.000		
	FEXRES	0.012	0.002	0.571	6.981	0.000	1.000	1.000
2	(Constant)	0.999	0.002		499.353	0.000		
	FEXRES	0.020	0.002	0.936	13.353	0.000	0.710	1.409
	ECORPREM	0.030	0.003	0.678	9.673	0.000	0.710	1.409
3	(Constant)	1.007	0.003		365.326	0.000		
	FEXRES	0.012	0.002	0.577	5.074	0.000	0.237	4.225
	ECORPREM	0.032	0.003	0.734	10.920	0.000	0.676	1.479
	LIQECO	0.003	0.001	0.447	3.868	0.000	0.229	4.364
4	(Constant)	1.008	0.003		374.864	0.000		
	FEXRES	0.012	0.002	0.583	5.273	0.000	0.237	4.227
	ECORPREM	0.033	0.003	0.747	11.397	0.000	0.672	1.488
	LIQECO	0.004	0.001	0.571	4.677	0.000	0.194	5.164
	TERMSPRE	-0.006	0.003	-0.186	-2.592	0.011	0.562	1.780

(Source: Author's own calculation)

The results are in the table 5 and 6. The stepwise regression gives 4 models. Model 4 is the best model and suggests that there is relation of 4 variables viz. FEXRES, ECORPREM, LIQECO and TERMSPRE, with the market return. The value of r^2 is 0.717, which is high, which indicates high degree of relationship. Also, the p values of the coefficients of FEXRES, ECORPREM, LIQECO and TERMSPRE are less than 0.05, which means that we can safely reject the null hypothesis that coefficients are zero. Further, the variance inflation factor (VIF), which is the reciprocal of the tolerance value, is less than 10 for FEXRES, ECORPREM, LIQECO and TERMSPRE, which means that all these factors are not correlated to each other, hence, no multicollinearity is there (Rawlings, Pantula, & Dickey, 1998, pp. 372-373).

1.2. Analysis and Interpretation

A multiple linear regression was calculated to predict percentage return of S&P BSE 500 index based on foreign direct investment (FDI), economic risk premium ($R_m - R_f$) (ECORPREM), oil prices (OILPRICE), liquidity in the economy (LIQECO), Inflation (INFLAT), level of interest rate (PLR), difference between 364 days treasury bills and 91 days treasury bills (Term spread) (TERMSPRE), industrial production index (IPI), short-term interest rate (SHORTINT), exchange rate (EXRATE), foreign exchange reserves (FEXRES) and gross domestic product (GDP). A significant regression equation was found ($F(4, 98) = 61.979, p < .000$), with an R^2 of 0.717. Participants' predicted return of S&P BSE 500 index is equal to $1.008 + 0.012(\text{FEXRES}) + 0.033(\text{ECORPREM}) + 0.004(\text{LIQECO}) - 0.006(\text{TERMSPRE})$. All the variables were significant predictors of percentage return of S&P BSE 500 return.

As per the model 4, there are 4 variables, the p value of which is less than 0.05 viz. FEXRES, ECORPREM, LIQECO and TERMSPRE. So, we reject the H_{0S11} , H_{0S2} , H_{0S4} and H_{0S7} and conclude that there is a significant relationship between market return and FEXRES, ECORPREM, LIQECO and TERMSPRE. Three out of four macroeconomic factors are positively related to the market return except TERMSPRE which is negatively related. Further, the p value of FDI, OILPRICE, INFLAT, PLR, IPI, SHORTINT, FEXRES, GDP is more than 0.05, so there is no reason to reject the H_{0S1} , H_{0S3} , H_{0S5} , H_{0S6} , H_{0S8} , H_{0S9} and H_{0S10} . It implicates that there is no significant relationship between market return and FDI, OILPRICE, INFLAT, PLR, IPI, SHORTINT, FEXRES, GDP. Hence, these factors are irrelevant in predicting the market return.

VI. CONCLUSION

So, 4 macroeconomic factors viz. Foreign exchange reserves of India (₹); Economic risk premium as measured through the difference between market return and risk-free rate of return; Liquidity in the economy as measured through M_3 (₹); and Term spread measured as difference between 364 days treasury bills and 91 days treasury bills represent the economic sentiment and have the explanatory power with respect to the market return.

Small retail investors may decide about buying and selling the stocks by having a look on the macroeconomic factors only. Results are helpful for the fund managers also as they can get an idea of the direction of the market on the basis of economic sentiment. Our study invalidates the rationality theory proposed in the classical finance. The results have paved the way to extend the present work in the context of foreign markets also.

It is suggested that the similar study can be conducted by taking daily data of various macroeconomic factors. PCA can be also be used to reduce the dimensionality of the data.

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