EFFECT OF INFLATION RATE, GDP GROWTH AND INTEREST RATES ON STOCK MARKET RETURNS

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This paper analyses the relationship between GDP, inflation, interest rates and the stock returns in India. The objective of the paper is to investigate the impact of the macro economic factors on the stock return. Augmented Dickey Fuller (ADF) test, correlation and regression have been applied on the data of Sensex returns from 1980 to 2019. The data has been taken from world bank website and the Bombay Stock Exchange (BSE). ADF test is used to test the stationarity of the data series while correlation has been applied to find out the relationship between the factors and stock returns. Regression has been used to find out the variable having the maximum impact on the dependent variable. The result shows that none of the factors have a significant impact on the Sensex returns.

Keyword: GDP, Inflation, Interest rate, Stock return

INTRODUCTION

The Indian stock market has performed the worst amongst all the others, in 2019, due to India's slow economic growth and weak corporate earnings.

Sensex had delivered 7% average return in 2018 which dropped to 3.5% as of August 2019

Nifty on the other hand had delivered a 4% return in 2018 which dropped to a modest 1.5% as of August 2019

Interestingly, other developing markets have conveyed far better returns — Brazil (Bovespa Index 17%), and China (Shanghai Composite Index 12%). The US markets have also performed at par— with S&P Index and NASDAQ conveying 15% and 18% respectively.

Other global Indices such as FTSE and DAX have likewise performed superior to the Indian market conveying 7% and 11% return respectively.

Factors affecting Stock Prices are –

- Gross Domestic Product (GDP) - GDP is defined as the total monetary value of all finished goods and services produced within a country's boundary in a specific time period. It includes all public and private consumptions and the foreign balance of trade.
- Inflation - Inflation indicates a decrease in the purchasing power of the consumers.
- Interest Rates - Interest rate is defined as the amount charged for assets borrowed, expressed as a percentage of the principal. The total interest depends on various factors like principal sum, interest rate, the compounding frequency and duration.
- Political development: Government takes various important decisions which have a major role in regulating the industries and affect the overall economy. Some of these decisions include decisions related to taxes, tariffs, trade agreements, federal spending etc
- Public Relations Hits and disasters: Sometimes Volatility isn't market-wide. Stock performance of an individual company can be affected based on whether the company is getting good or bad PR that day. Good news about the company will make people invest in

that company thereby increasing the stock price. Similarly, a negative news about the company may lead to reduction in its stock price.

- Bandwagon effect: People follow the mood and when prices fall, people may feel the need to exit the stock market following the suit.

In this research paper, we analyse the main macro-economic factors –

1. **Gross Domestic Product (GDP)**

India is a developing market economy and is the world's fifth largest economy in terms of nominal GDP.

However, in 2017 India's GDP was slowed down to the shocks of demonetisation which was introduced in 2016 and Goods and Services Tax (GST) in 2017. Currently, the economic growth has come to a six-year low of 4.5% in the July-September quarter. The Reserve Bank (RBI) has recently decreased the GDP forecast for 2019-20 from 6.9% to 6.1%.

2. **Interest Rates**

Currently, RBI has cut the repo rate five times in 2019 which in turn led the banks to cut the interest rates on the loans as well as on the fixed deposits.

3. **Inflation**

The consumer price inflation reached 7.35% in December 2019 which is above market expectations of 6.2%. Inflation is a quantitative measure of the rate at which the average price of goods and services in an economy increases over a period of time.

Numerous researches have been done to test the impact of separate macroeconomic variables on stock returns. However, these studies have conflicting results depending upon the geography and time period.

In this research paper, we test the effect of the most important macro-economic variables (Inflation, GDP, Interest rates) and the extent of their effect on the stock market returns in India.

This research paper can be useful for people investing in the stock markets and can help them asses their returns in case of fluctuations in GDP, Interest Rates and/or Inflation.

REVIEW OF RELATED LITERATURE

Sathyanarayana & Gargesa (2018) analyses the relationship between the stock returns and inflation and gives suggestions based on their analysis to the policy makers and participants. The following countries were taken into account for the analysis - India, Austria, Belgium, Brazil, Canada, Chile, China, France, Indonesia, Ireland, Japan, Mexico, Spain and Turkey. For the purpose of research, the paper made use of secondary sources of data such as capital line and yahoo finance. For the purpose of the study the major index from the selected nation has been selected for example India (Sensex), Austria (ATX), Belgium (BEL20), Brazil (Bo Vespa), Canada (GSPTSE), Chile (IPSA), China (SSEC), France (FCHI), Indonesia (JKSE), Ireland (ISEQ), Japan (Nikkei), Mexico (MXX), Spain (IBEX) and Turkey (XU100.ES) the adjusted closing price for the chosen indices have been collected.

The regression model has been used to determine the effect of inflation on the stock returns in the various countries. This has been carried out by the help of regression equation of y=mx + c where y refers to the dependent variable (in this case stock returns) and x is the independent variable (in this case Inflation rate).

The study has been carried out by defining the following hypothesis:

H0: there is no significant relationship between independent variable (Inflation) and stock returns.

H1: there is a significant relationship between independent variable (Inflation) and stock returns.

The authors initially carried out descriptive statistics of the inflation rate and the stock market indices of individual countries followed by the ADF Test and finally the regression model with the help of correlation co-efficient of the individual countries mentioned in the study.

The results determined from the above-mentioned tests were as follows

Inflation has an inverse relationship with Stock Returns in the following countries – Austria, Belgium, Canada, Chile, China, France, Ireland

Inflation has a direct relationship with Stock Returns in the following countries – Indonesia, Japan, Mexico, Turkey, Spain, Brazil

Kwofie & Richard (2018) analysed the studied the effect of exchange rate and inflation on the stock market returns in Ghana. The objective of the study was to assess the long run and short run relationship of inflation and exchange rate in Ghana.

The paper used secondary source for data collection from the period from January 2000 to December 2013 using monthly observations. The stock prices were obtained from the Ghana Stock Exchange (GSE) and the inflation and exchange rates were obtained from the Bank of Ghana.

Before applying the descriptive statistics, each method was first tested for stationarity using the Augmented Dicker Fully test (ADF Test). The co-integration model was used to analyse the long run and short run relationship between the variables.

The study showed a significant positive long run relationship between the GSE Market Returns and Inflation however the short run relationship was not that significant. The study found that the relationship between exchange rate and GSE market return in the long run as well as the short run was significantly positive.

This result implies that inflation and exchange rate are important macroeconomic variables that influence the movement of investments in Ghana. The variables also showed the presence of long memory among the variables, indicating the long-range dependencies, which provides important information for possible investors in the Ghanaian stock market.

HUSSEIN (2017) examined the effect of inflation on stock market returns in the Uganda Securities Exchange

The research was based on two variables these are inflation rates and stock market return for the period of 2015 to 2017 due to the time availability constraint and constraint of data availability. The independent variable used in the research paper was the inflation which was measured using the consumer price index whereas the dependent variable was the stock market return which was measured using the share index. The paper used Fisher's theory to study the effect.

The hypothesis was defined as follows -

H1: the inflation rate has significant effect on stock market return in USE

Ho: the inflation has no significant effect on stock market returns in USE

The correlation findings concluded that there was a positive correlation between inflation and stock market whereas the direction of relationship found through regression was found to be negative. The conclusion drawn from the findings were that the study found a significant negative relationship between inflation and stock market returns at the USE. Thus, the null hypothesis was rejected and the alternate hypothesis was accepted.

Geetha, Mohidin, Chandran, & Chong (2011) re-examined the long run and short run relationship between inflation and stock market returns based on the economic level development Malaysia, China and the United States. The paper used secondary sources of data from the year 2000 to 2009 to carry out their study. The variables data were obtained from International Financial Statistical (IFS) database except CPI for China which obtain from National Bureau of Statistic of China. All the data are transformed into logarithms for the purpose of carrying out the study.

The methodology carried out was initially the ADF (Augmented Dickey Fuller Test) which is a stationarity test followed by correlation to check the level and strength of relationship between inflation and stock market returns. The paper concluded that these three countries are stationary. The cointegration test found the result that a long run relationship exists between the inflation rates and the stock market returns. The study also found that there is no short run relationship between the two variables for US and Malaysia, however a short run relationship exists for China.

Hamdan Ali (2014) examined the effect of the interest rates on the stock prices in his study on Impact of Interest Rate on Stock Market; Evidence from Pakistani Market. It takes the month end closing stock prices of Karachi Stock Exchange and the interest rates of ten years i.e. from January 2004 to December 2013 and applied correlation, regression analysis and descriptive analysis to find out the effect of the same.

The research objectives include-

- To know the effect of interest rate on stock market and its performance
- To enhance knowledge to take the right decisions if needed

The scope is applicable to the stock market of Pakistan, as the primary data collection due to the limited time and resources. Stock Market has been taken as the dependent variable and interest rate, inflation rate and gross domestic product growth rate as the independent variables. The relationship among these variables are recognised on the basis of preceding literature and confirmed by the means of definite arithmetic tests. The two-hypothesis made are-

- Null hypothesis (H0): there is no significant relationship between interest rate and stock market
- Hypothesis (H1): there is significant relationship between interest rate and stock market

Using the descriptive analysis, it is concluded that there is a negative moderate relation between stock market and interest rate of 0.20. The regression analysis shows that the value of Significance F is less than 0.05 therefore the relation between the two is significant. These tests conclude that there is a negative effect of the interest rate on the stock market i.e. higher the interest rate, lower the efficiency of stock market.

Archana Upadhyay (2016) found out that there is no casualty between interest rate and Sensex in her study Causality Relationship Between Interest Rate and Stock Returns in India- An Analytical Study. Monthly data from January 2015 to December 2015 of interest rate and BSE Sensex was used.

Augmented Dickey Fuller test and Granger Causality test are applied to find out the relationship. The null hypothesis made are-

- H0: there is no significant impact of changes in the interest rate on Indian Stock Market
- H1: there is significant impact of changes in the interest rate on Indian Stock Market

Stock returns has been taken as the dependent variable and interest rates as the independent variable. Augmented Dickey Fuller test rejected the null hypothesis that data has a unit root. After applying the Granger Causality test, it failed to reject the null hypothesis. Therefore, it is concluded that there is no causality between interest rates and stock prices for a selected period of time. It proves that the interest rate has no impact on the stock prices and in turn stock prices has no influence on the interest rates.

Muthukumaran and Somasundaram (2014) implied that the interest rate and stock prices have no relationship in the short run in their study An Analytical Study of Interest Rate and Stock Returns in India. Monthly data from April 1997 to march 2014 has been used. Th objectives of the study are to identify the nature of the relation between interest rate and stock returns in India and to examine the casual nexus between interest rate and stock returns in India. Descriptive statistics, correlation analysis and Granger causality test have been used to find out the short run interdependence. It has also used Augmented Dickey Fuller test, Phillips-Perron test and Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test for finding the unit roots in time series. These tests prove that there is no effect interest rate on stock market and vice versa.

Shuangqun (2017) used data from 2003 to 2014 of the interest rates and the Shanghai stock index in the study Research on the Relationship between Interest rate and Stock price in China. Regression analysis and co integration tests have been used to find out the same. The results of these tests conclude that there very little effect of interest rate on the Shanghai Stock Exchange in the short run while in the long run, there is a linear effect on the relationship between changes in interest rate and the stock prices. This may be because the China's stock market has still not fully developed, the government controls the interest rates in China or because of the macroeconomic situation in China.

Ahmadi (2016)study the impacts both for the entire time frame and the subperiods that we decide in regards to the times of the emergencies utilizing EGARCH-M structure. Our outcomes show that the hazard brings the relationship back and changes as the economy moves to start with one system then onto the next. In addition, the emergencies cause a few changes in the connections between stock returns and macroeconomic factors. The best effect of the emergency is found in the Financial Sector.

Three focuses are significant about this paper. Right off the bat, unique in relation to the greater part of the past contemplates, this paper analyses the impacts of macroeconomic factors on stock returns and unpredictability all the while. Furthermore, by utilizing an EGARCH-M model, it catches the ideas of uneven stuns to the instability of profits, time-varying unpredictability properties of monetary information and furthermore hazard bring the relationship back. At last, by isolating the example time frame into subperiods, by taking the timings of the two significant emergencies that Iranian looked into, the paper gives a few confirmations, which might be considered as nation explicit, how the impacts of macroeconomic factors on securities exchange may change because of emergencies. In writing, there are blended outcomes identified with the hazard and bring relationship back. Our discoveries additionally bolster these outcomes since the sign and criticalness of the relationship contrasts contingent upon the timeframe and list. This outcome shows that the

emergencies have influenced the connection between hazard and return in Turkish Stock Market. The connection between inflation and stock returns is relied upon to be positive. We have discovered confirmations of this positive relationship, which is most grounded in the post-emergency period, for Turkish case additionally however results give no indication of various conduct of the relationship for the emergency time frame. In the event that we think about the impact of inflation on the unpredictability, we can say that emergencies for the most part influence this relationship. The irrelevant outcomes for other subperiods end up being noteworthy negative connections for the period which lies in between two emergencies, aside from the modern area.

Toniok (2015) used the Exponential Generalized Autoregressive Conditional Heteroskedasticity EGARCH and GARCH system of showing course of action with prohibitive heteroskedasticity in solicitation to test for first the stochastic properties of the plan and second to assess the impact of incredible news to the lead of money related trade returns in Nigeria and furthermore investigate the association between protections trade returns and growing. On the association between stock market returns and inflation, the assessment found an immaterial relation among inflation and monetary trade returns, proposing that inflation doesn't affect protections trade returns on the Nigerian stock exchange. The test in any case found that the impact of positive or negative news to the market is short lived anyway tough. Further, the assessment set up that bear and bullish news has a similar impact on the budgetary trade in Nigeria with money related matters reacting to the comparable way. To wrap up, the paper states hints of asymmetry on the Nigerian stock exchange market to its inflation with monetary trades (New York Stock Trade, London Stock Exchange and Tokyo Stock Exchange), managerial establishments and condition.

It is fundamental to demonstrate the course of action to address the nearness of unexpected heteroskedasticity which does not address any similarity. The methodology, in an attempt to test for first, the stochastic properties of the arrangement and second to survey the effect of unimaginable and repulsive news to the lead of cash related exchange returns of Nigeria and moreover examine the relationship between stock exchange returns and inflation. On the relationship between stock returns and inflation, the appraisal found an insignificant relationship among them, recommending that growth/inflation doesn't affect stock exchange returns on the Nigerian stock trade. To wrap up, the paper characterizes the absence of symmetry on the Nigerian stock trade market to its comparable other related exchanges (New York Stock Trade, London Stock Exchange and Tokyo Stock Exchange), administrative foundations and condition.

Iorember, Paul and Sokpo, Joseph and Usar, & Terzungwe (2017) examines the impact of inflation on financial exchange returns on the Nigerian stock trade showcase, utilizing an instability demonstrating approach. Utilizing month to month information on stock showcase returns and buyer value record inflation rate, the paper utilized GARCH and EGARCH instability displaying strategies for testing. The investigation found that CPI rising isn't a significant variable in clarifying securities exchange return instability in Nigeria. The EGARCH model didn't discover the presence of asymmetry in the stock return arrangement; i.e. they have an indistinguishable effect on stock returns in Nigeria. The GARCH model shows high ingenuity in the stock returns arrangement, however, a stun to stock returns has just an impermanent sway.

The paper utilized the Exponential Generalized Autoregressive Conditional Heteroskedasticity EGARCH and GARCH strategy of displaying arrangement with restrictive heteroskedasticity in request to test for first the stochastic properties of the arrangement and second to evaluate the effect shocks to the conduct of financial exchange returns in Nigeria and also inspect the connection between securities exchange returns and inflation. On the connection between stock returns and inflation, the examination found an unsubstantial connection between inflation and financial

exchange returns, suggesting that inflation doesn't impact securities exchange returns on the Nigerian stock trade. The investigation likewise found that the model arrangement shows high steadiness, which is a negative or positive stun to the financial exchange return arrangement occasioned by either great news or terrible news will have a long waiting impact available. Further, the examination set up that bear and bullish news has the same effect on the financial exchange in Nigeria with financial specialists responding to the equivalent way. To finish up, the paper attributes nonattendance of asymmetry on the Nigerian stock trade market to its size comparative with created financial exchanges (New York Stock Trade, London Stock Exchange and Tokyo Stock Exchange), administrative foundations and condition.

Bai (2014) The paper talks about the stock prices and how it is related to inflation. The paper discusses the relationship between prices of the stock market and the capital gains. It is predefined that rate of interest can be equationally represented as ROI = Nominal rate of return – the actual rate of return. We are enlightened about the shanghai composite index of changes in stock prices due to the changes in related factors i.e. inflation rate and CPI index.

In order to prove the findings some statistical techniques are used highlighting the whole scenario. The least square and the trend line is extended to show the future predictions of factors. VAR model, impulse response and variance decomposition, econometric methods, correlation. These methods are used for bringing clarity, purpose and credibility in the data. The data and findings are in line with China's economic conditions and development.

The paper concluded with a solid inference drawn by all the research pointing toward the current inflation rate in China have a very little or limited effect on their stock price index. Even though there is a weak correlation, the effect cannot be ignored completely. There are several other factors also adding on to the change in stock prices but inflation is definitely one of them. As china continuously increases the proportion of stock market in the world economy, the relation of the two will rise continuously. The development of the ripe economic stocks of China will begin to influence the world economy. The government regulations and the control regulations are not done very well in China, the paper states. Also, it is suggested that Chinese overheating economy should be tamed by the 12^{th} 5-year plan suggesting GDP growth in the country should fall to 7.5%. out of all these the major solution or inference would be the low correlation between the stock prices and the CPI Index and the rising correlation over the years which is still anticipated to rise.

The relationship between stock market and various economic factors such as the interest rate, has been and is still being examined by researchers as it plays a key role in influencing a country's economic development. Interest rates are determined by monetary policy of a country. One of the factors that affect stock prices is expected earnings which, in turn, is affected by interest rates prevailing in the economy as most companies operate with a certain amount of borrowings in their balance sheet. When the repo rate goes up, banks raise their lending rates. This leads to a higher loan repayment cost for companies. Rising interest costs, negatively impact the net profit, which is reflected in stock prices.

R, Mahesh, & Sirisha (2016) in their study, "Interest Rate and Stock Prices – Evidence from India", analysed the relation between interest rates and stock prices in the context of the Indian Market. The hypothesis is as following:

H0: Interest rate has no impact on stock prices

H1: Interest rate has an impact on stock prices

Karl Pearson's coefficient of Correlation is the tool used for testing the hypothesis. Linear Regression also has been used to develop a model for forecasting stock prices based on interest rate.

Their results indicated that six sectors out of the eleven sectors, in which they undertook research, were significantly affected by the interest rate. They found that six sectors - Auto, Bank, FMCG, Financial Services, IT, Pharma - out of eleven sectors and one market index (Nifty Fifty) were considerably impacted by the interest rates prevailing in the market. Five sectors which did not show any correlation with interest rate were Energy, Media, Metal, PSU Bank and Realty.

Ramsharan (2019) in their study, "Impacts of Interest Rate on Stock Market: Challenges for Investors", tried to identify the challenges faced by the investors when the interest rate changes.

H0: Stock market is highly volatile and risky.

H1: Interest rates and stock prices are inversely related.

H2: More volatile interest rates generate more challenges in the market.

Their results that the stock market and interest rates are inversely related. A small change in interest rate may cause a substantial change in the stock market.

Uddin & Alam (2010) in their study, "The Impacts of Interest Rate on Stock Market: Empirical Evidence from Dhaka Stock Exchange", examined the efficiency of DSE and effect of interest rate and growth of interest rate on share prices. It was found that Interest Rate has a significant negative relationship with share prices and a change in the rate also has significant impact on the share price. They also suggested that if the interest rate is considerably controlled in Bangladesh than it will be the great benefit of Dhaka Stock Exchange through demand pull way of more investor in share market and supply pull way of more extensional investment of companies.

Hu (2015) used high frequency daily data, for the period of 2009-2014, from the Shanghai Stock Exchange and Shenzhen Stock Exchange. Their results indicated that interest rate and stock price have a significant influence on each other, and there exists a negative and long-term equilibrium relationship. It was also found that in the short term, there is low effect relation between interest rates and stock prices.

Chavda & Kumar S.(2018) examined the impact of Gross domestic product (GDP) on stock market returns in India. Their study uses BSE SENSEX Index of last 10 years, taken as a supportive variable of GDP. Various descriptive tools of statistics, measurements of central tendency, variations, shape etc. are used in the study to define the impact of GDP growth rate on stock market returns.

Descriptive tools of Statistics including the measurement of central tendency, Standard Deviations, Variance, SEM, Range, Inter-quartile Range, Median, Co-Variances, 95% Confidential Limit of mean, Kurtosis, Skewness, etc. are used along with correlation and regression analysis. The hypothesis made is:

H0: There is no significant relationship between GDP Growth Rate and Stock market Returns.

H1: There is Significant relationship between GDP Growth Rate and stock market Returns.

The Karl Pearson Correlation between BSE SENSEX Index and GDP growth rate is 0.094, which is positive. So, it shows a significant relationship between GDP growth rate and BSE SENSEX Index. Spearman's Rank Correlation for the distribution is also positive, indicating a correlation between

the two Variables. Regression Analysis between GDP growth rate and BSE SENSEX Index also shows there is positive significant correlation between these two Variables.

Therefore, the Study on Impact of GDP growth rate on BSE SENSEX Index shows that SENSEX Index of BSE is significantly affected by growth rate of GDP. Specifically, the findings suggest that role of GDP is one of the most important influencing factors of stock market (BSE SENSEX Index) and vice-a-versa. So, the GDP is predictable variable for Indian stock market returns. Conclusively, the government should try to maintain the growth rates of GDP and liquidity in the primary, secondary and derivatives market of stock market.

Shula (2017) examined the effect of GDP on stock market prices in his research paper "Impact of GDP, real interest rate, exchange rate and Inflation rate on the Stock Market in Zambia". The data regarding stock market returns, inflation and GDP was taken for the last 10 to 15 years for the study. The objectives of the study were:

- To study the relationship between stock market returns with respect to inflation, GDP and interest rates.
- To find the strength of the relation between stock market returns with respect to inflation and GDP.

To fulfil these objectives, regression and correlation were used to find out the nature and strength of relationship between these variables. The stock market data was collected from the Lusaka Stock Exchange Index from the year 1997 to 2012.

The regression gave an adjusted R square of 97.5% explaining a substantial portion of movement in the LUSE index. The coefficient of GDP came out to be positive indicating a positive correlation between the GDP and stock market prices. Zambia's GDP growing at a decent pace is one of the reasons of increasing stock market returns. Hence, it is concluded that GDP is an important macro-economic factor for the investor who actively invests in the stock market.

Wu (2012) has determined the impact of GDP growth rate on the stock market in his research paper "The linkage between stock market returns and GDP growth rate in the United States". He has adopted supply-side models to explore the relationship between stock market return and GDP growth rate, which assume that the GDP growth is the original source of stock market returns. The supply-side models are broken down into 3 steps:

- Does GDP Growth translate into aggregate corporate earnings?
- Does aggregate corporate earnings translate into earnings per share?
- Do earnings per share growth convert to stock price appreciation?

Regression was used to find the overview of relationship of stock market return and annual GDP growth rate, which gave a result that there is no significant relationship between these two as the P value for GDP was more than 0.05.

The reasons for not having a relation between these two were explained by using regression between the variables present in the above three steps. After using regression, no significant relationship was found between 'GDP and aggregate corporate earnings', 'aggregate corporate earnings and earnings per share' and earnings per share growth and stock price appreciation'.

Hence, it is concluded that GDP does not have a significant impact on stock market returns and the investors should consider the company and industry first instead of considering the GDP of the country.

Al-abedallat & Al Shabib (2012) studied the effect of GDP on stock market in their research paper "Impact of the investment and gross domestic product on the Amman Stock exchange Index". To test the hypothesis, the study has used statistical analysis (SPSS) and chooses the multiple regression to analyse the relationship between dependent variable (Amman stock exchange index) and independent variables (investment and GDP). The study adopted the descriptive and analytical system and used the information provided by the Central Bank of Jordan and Amman Stock Exchange about the size of investment, gross domestic product (GDP) and Amman Stock Exchange Index. The data were taken for the years 1999-2009 to test hypotheses of the study.

The main hypothesis is that the dimensions of investment and GDP have positive impact on index of Amman Stock Exchange. Two sub-hypotheses are:

H1: The dimensions of investment have positive impact on Amman stock exchange index.

H2: The dimensions of GDP have positive impact on Amman stock exchange index.

To test the second hypothesis a multiple regression was used to analyse the relationship between the dependent variable Amman Stock Exchange index (Y) and the independent variable GDP (X2). It gave a result that there is a relationship between the two variables.

It was concluded that GDP has an impact on the Amman Stock Exchange index, but less than that of the impact of the investments.

OBJECTIVES

- To understand the relationship between Stock market returns and GDP in India
- To understand the relationship between Stock market returns and Inflation in India
- To understand the relationship between Stock market returns and Interest Rates in India
- To determine the direction of change of the Stock market returns when GDP, Inflation and Interest Rate changes
- To find out the variable having the highest contribution in change of Stock Market Returns

DATA AND METHODOLOGY

DATA

The data used for the purpose of carrying out the study is obtained from secondary sources of information. The data is obtained for the years of 1980 to 2019. The data for Interest Rates has been obtained from the world bank website, the data for GDP of India has been obtained from World Bank website and the data for Inflation has been obtained from the world bank website. The data for the stock market returns (Sensex) is obtained from historical data on BSE (Bombay Stock Exchange).

METHODOLOGY

The methodology carried out for the study is the following –

AUGMENTED DICKEY FULLER TEST (ADF TEST)

The initial test used is the ADF test also called the Augmented Dickey-Fuller test. It tests the stationarity of a series of data. It is a part of the unit root test. Unit root is a feature that can cause disputes in statistical interpretations. Since most economical and financial time series have a more complicated and dynamic structure, the ADF test is used. In our paper ADF is implemented by first finding the Durbin- Watson Statistic and then comparing it with the R square value using ADF Model.

CORRELATION

The next test used after checking for stationarity is correlation.

Correlation is a statistical technique applied on quantified data that can show whether and how strongly pairs of variables are related. This technique helps to obtain the first objective of our paper that states the strength of the relationship between each individual variable.

The correlation ranges between -1 to +1, negative 1 indicating perfect negative correlation and +1 indicating a perfectly positive correlation.

Correlation technique in our study will be tested individually for each of the factors (GDP, Inflation, Interest Rates) with the Stock Market Returns using the Data analysis function on Excel.

REGRESSION

Regression analysis is a statistical tool to identify the variables having the maximum impact on the dependent variable (Stock Market returns) and the trend and direction of flow of data. Regression analysis allows to determine the factor that matters the most in the study.

A regression equation is made up of $y = mx + c$, whereby y is the dependent variable (in our case Stock Market Returns), m is the slope of the line, x is the dependent variable (in our case Inflation rates, Interest Rates and GDP), c is the intercept.

Regression analysis helps us to obtain the fourth objective of our paper whereby we use the results of the regression analysis to determine the degree and extent of effect of the independent variable on the dependent variable and also conclude the factor that forms the reason for maximum level of changes in Stock Market Returns.

Regression analysis in our study will be done separately for the three macro-economic variables.

The regression functions are defined below –

REGRESSION EQUATION 1

$y = m_1 x_1 + c$

Y = Stock Market Returns

x1 = Inflation Rates

m1 = slope of x

c = y intercept

REGRESSION EQUATION 2

$y = m_2 x_2 + c$

Y = Stock Market Returns

x2 = GDP

m2 = slope of x

c = y intercept

REGRESSION EQUATION 3

$y = m_3 x_3 + c$

Y = Stock Market Returns

x3 = Interest Rates

m3 = slope of x

c = y intercept

All the three regression equations are solved individually with the help of descriptive statistics on Excel.

After the analysis using the following above methodology, we will accept one of the below defined hypotheses and reject the other hypothesis

HYPOTHESIS TESTING

For the purpose of comprehension of the study being carried out, we define two hypotheses namely the null hypothesis and the alternate hypothesis. These hypotheses will help in a better understanding of the outputs derived from the methodology and will help arrive at a conclusion for the study. The hypothesis will be assigned individually to each independent variable

HYPOTHESIS 1

H_0 (Null Hypothesis) = Inflation has no significant effect on the changes in Stock Market Returns.

H_1 (Alternate Hypothesis) = Inflation has a significant effect on the changes in Stock Market Returns

HYPOTHESIS 2

H_0 (Null Hypothesis) = GDP Growth has no significant effect on the changes in Stock Market Returns.

H_1 (Alternate Hypothesis) = GDP Growth has a significant effect on the changes in Stock Market Returns

HYPOTHESIS 3

H_0 (Null Hypothesis) = Interest Rates has no significant effect on the changes in Stock Market Returns.

H_1 (Alternate Hypothesis) = Interest Rates has a significant effect on the changes in Stock Market Returns

If significance F/ P value is < 0.05 then we reject the null hypothesis

DATA ANALYSIS, FINDINGS AND INTERPRETATIONS

ADF TEST

The ADF Test is carried out by the help of the Durbin Watson Statistic. The Durbin Watson Statistic is calculated by finding the residuals using the regression function on excel. The difference of residuals is calculated which is then squared individually. The sum of the square is calculated followed by the sum of the square of the residuals. To arrive at the Durbin Watson Statistic, we divide the sum of square difference of residuals with sum of squared residuals. If the R Square value is less than the DW Stat value then the data is stationary.

Particulars	DW Stat	R Square
Sensex returns and Inflation Rates (%)	2.4539	0.0006
Sensex returns and GDP Growth (%)	2.2153	0.0569
Sensex returns and Interest Rates (%)	2.4876	0.022

Since the R square for all three variables is less than the DW Stat value therefore the above data is stationary

CORRELATION

Correlation was carried out on each independent factor with the dependent factor. The correlation analysis is as follows -

Sensex Returns and Inflation (%)

	Sensex Returns	*Inflation Rate (%)*
Sensex Returns	1	
Inflation Rate (%)	0.024878535	1

The above table shows the correlation between Sensex Returns and Inflation Rate (%) in India. The analysis shows a 2.48% correlation between Sensex returns and Inflation Rate which indicates a low positive correlation. This basically means that for every unit change in Inflation Rate there is a 2.48% prospect of change in Sensex Returns in India.

Sensex Returns and GDP Growth (%)

	Sensex Returns	*GDP Growth (%)*
Sensex Returns	1	
GDP Growth (%)	0.238556365	1

The above table shows the correlation between Sensex Returns and GDP Growth (%) in India. The analysis shows a 23.85% correlation between Sensex returns and GDP Growth Rate which indicates a significant positive correlation. This basically means that for every unit change in GDP Growth rate there is a 23.85% likelihood of change in Sensex Returns in India.

Sensex Returns and Interest Rates (%)

	Sensex Returns	*Interest Rates (%)*
Sensex Returns	1	
Interest Rates (%)	0.148513981	1

The above table shows the correlation between Sensex Returns and Lending Interest rate (%) in India. The analysis shows a 14.85% correlation between Sensex returns and GDP Growth Rate which indicates a significant positive correlation. This basically means that for every unit change in the lending interest rate there is a 14.85% possibility of change in Sensex Returns in India.

REGRESSION

The regression equation is solved using the data analysis tools on excel. Each regression equation was solved individually to check the extent of effect that each independent variable has on the dependent variable

REGRESSION EQUATION 1

Sensex Returns and Inflation Rate (%)

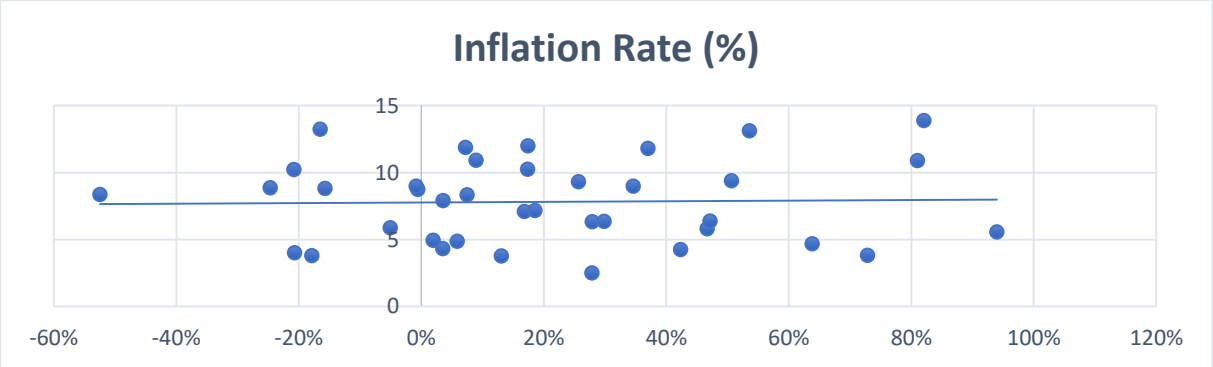
Regression Statistics	
Multiple R	0.024878535
R Square	0.000618941
Adjusted R Square	-0.027141643
Standard Error	0.334099338
Observations	38

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.002488698	0.002488698	0.022295693	0.882136536
Residual	36	4.018405223	0.111622367		
Total	37	4.020893922			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	0.180281745	0.149933313	1.202412866	0.237052956	-0.123797108	0.484360598	-0.123797108	0.484360598
Inflation Rate (%)	0.002669833	0.017880253	0.149317425	0.882136536	-0.033593	0.038932667	-0.033593	0.038932667

The above table shows the regression analysis between Sensex Returns and Inflation Rates (%). The multiple R value is the correlation coefficient which has been calculated separately in the correlation segment. The R square is the coefficient of determination, which helps in measuring how well the values fit in the regression line. In the above case the R square value is 0.06% which means that only 0.06% of the change in Sensex Returns is explained by a change in Inflation rates. The standard error helps to analyse the error component of the equation. The smaller the number the better will be the regression equation. In our case the standard error is significantly high at 33.41%. The significance F is also the P value of F. this value is used to determine the reliability of the results and helps in rejecting or accepting the hypothesis. Since our confidence level taken for calculating regression is 95%, a P-value less than 5% means that we reject the null hypothesis. Since our P value is very high (88.21%) we accept the null hypothesis for this regression equation.



REGRESSION EQUATION 2

Sensex Returns and GDP Growth (%)

Regression Statistics	
Multiple R	0.238556365
R Square	0.056909139
Adjusted R Square	0.030712171
Standard Error	0.324553895
Observations	38

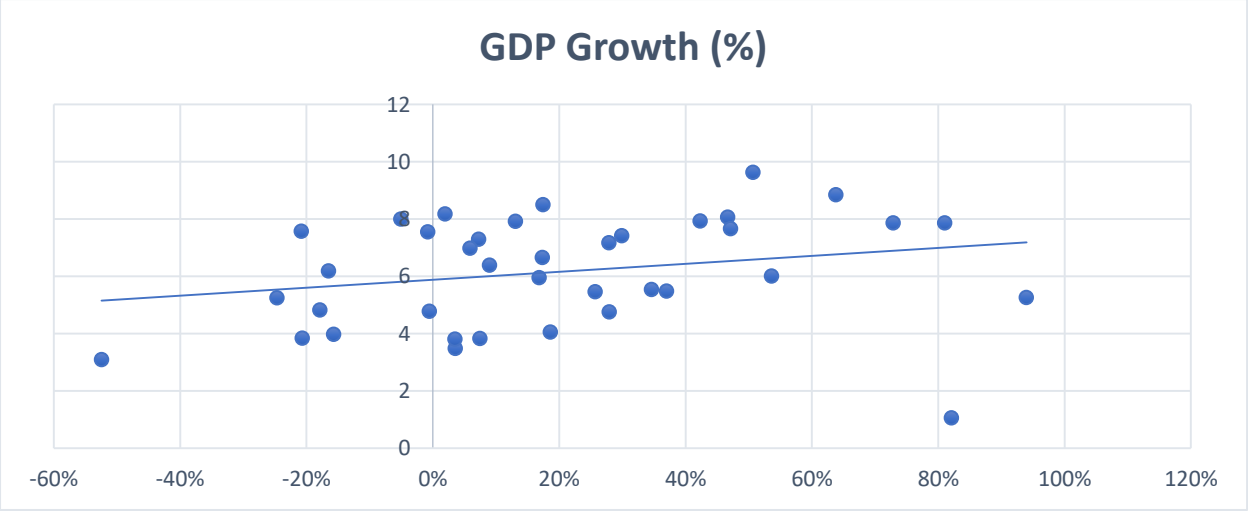
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.228825612	0.228825612	2.172355918	0.149202226
Residual	36	3.79206831	0.105335231		
Total	37	4.020893922			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.051554716	0.179359341	-0.28743814	0.775425021	-0.41531232	0.312202888	-0.41531232	0.312202888
GDP Growth (%)	0.041037943	0.027843261	1.47389142	0.149202226	-0.015430807	0.097506693	-0.015430807	0.097506693

The above table shows the regression analysis between Sensex Returns and GDP Growth (%). The multiple R value is the correlation coefficient which has been calculated separately in the correlation segment. The R square is the coefficient of determination, which helps in measuring how well the values fit in the regression line. In the above case the R square value is 5.69% which means that 5.69% of the change in Sensex Returns is explained by a change in GDP. The standard error helps to analyse the error component of the equation. The smaller the number the better will be the regression equation. In our case the standard error is significantly high at 32.45%.

The significance F is also the P value of F. this value is used to determine the reliability of the results and helps in rejecting or accepting the hypothesis. Since our confidence level taken for calculating regression is 95%, a P-value less than 5% means that we reject the null hypothesis and accept the alternate hypothesis. Since our P value is comparatively higher (14.92%) we accept the null hypothesis for this regression equation.



REGRESSION EQUATION 3

Sensex Returns and Interest Rates (%)

Regression Statistics	
Multiple R	0.148513981
R Square	0.022056402
Adjusted R Square	-0.005108698
Standard Error	0.330496574
Observations	38

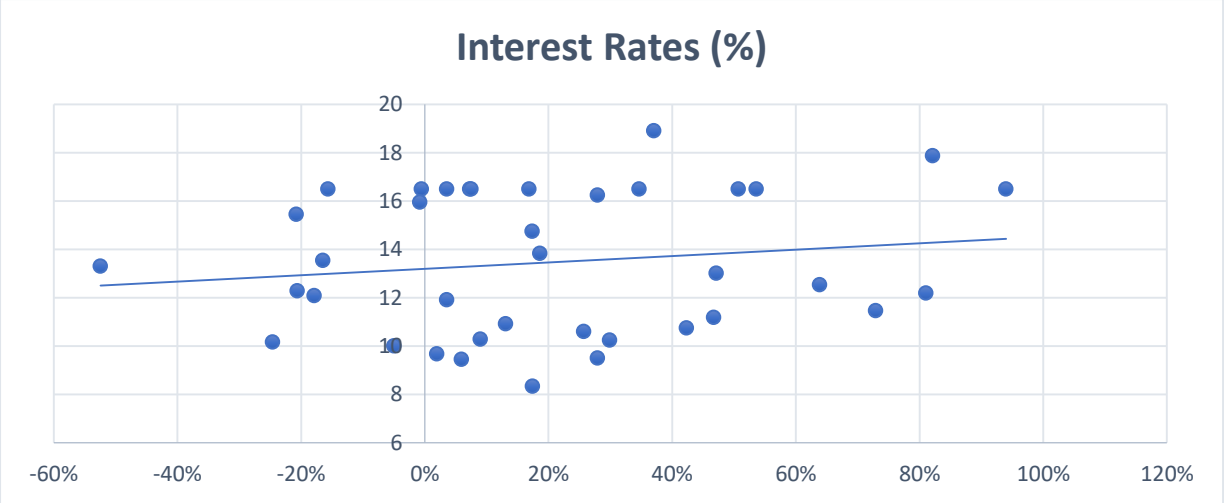
ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.088686454	0.088686454	0.811938939	0.373536568
Residual	36	3.932207467	0.109227985		
Total	37	4.020893922			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.024232366	0.255813095	-0.09472684	0.925057102	-0.543045369	0.494580637	-0.543045369	0.494580637
Interest Rates (%)	0.016743077	0.018581193	0.901076545	0.373536568	-0.020941329	0.054427484	-0.020941329	0.054427484

The above table shows the regression analysis between Sensex Returns and Interest Rates (%). The multiple R value is the correlation coefficient which has been calculated separately in the correlation segment. The R square is the coefficient of determination, which helps in measuring how well the values fit in the regression line. In the above case the R square value is 2.20% which means that 2.20% of the change in Sensex Returns is explained by a change in Interest Rates. The standard error helps to analyse the error component of the equation. The smaller the number the better will be the regression equation. In our case the standard error is significantly high at 33.05%.

The significance F is also the P value of F. this value is used to determine the reliability of the results and helps in rejecting or accepting the hypothesis. Since our confidence level taken for calculating regression is 95%, a P-value less than 5% means that we reject the null hypothesis and accept the alternate hypothesis. Since our P value is significantly higher (37.35%) we accept the null hypothesis for this regression equation.



CONCLUSION

As seen in the above scatter diagram graphs

- Sensex Returns has almost negligible correlation with Inflation Rate as the trendline is almost linear
- Sensex has a positive correlation with the GDP Growth (%) as the trend line is moving upwards
- Sensex has a positive correlation with the Interest Rates (%) as the trend line is moving upwards

According to the findings in the research paper, we conclude that –

- There is a 2.48% possibility that a unit change in Inflation Rate will cause a 0.06% change in Sensex Returns. However, this data has a high significance F / P value hence we accept the null hypothesis for this equation which concludes that changes in inflation rate has no significant effect on the stock market returns.
- There is a 23.85% possibility that a unit change in GDP Growth will lead to a 5.69% change in Sensex returns. Since this data analysis also has a high significance F / P value we accept the null hypothesis which states that changes in GDP Growth has no significant effect on the Sensex returns.
- There is a 14.85% probability that a unit change in GDP Growth will lead to a 2.20% change in Sensex returns. Since this data analysis also has a high significance F / P value we accept the null hypothesis which states that changes in Interest Rates has no significant effect on the Sensex returns.

The paper concludes that all the three independent factors (Inflation rate, GDP Growth and Interest Rates) having a high P – value accept the null hypothesis and hence conclude that none of these factors significantly impact the change in Sensex returns.

This can be held true for returns of Nifty 50 as well since the returns of Sensex and Nifty are at par with each other

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DATA SETS

Years	Sensex Returns	Inflation Rate (%)	Interest Rates (%)	GDP Growth (%)
1981	54%	13.1125	16.5	6.0062
1982	4%	7.8907	16.5	3.4757
1983	7%	11.8681	16.5	7.2889
1984	7%	8.3189	16.5	3.8207
1985	94%	5.5564	16.5	5.2543
1986	-1%	8.7297	16.5	4.7766
1987	-16%	8.8011	16.5	3.9654
1988	51%	9.3835	16.5	9.6278
1989	17%	7.0743	16.5	5.9473
1990	35%	8.9712	16.5	5.5335
1991	82%	13.8702	17.88	1.0568
1992	37%	11.7878	18.92	5.4824
1993	28%	6.3269	16.25	4.7508
1994	17%	10.2479	14.75	6.6589
1995	-21%	10.2249	15.46	7.5745
1996	-1%	8.9772	15.96	7.5495
1997	19%	7.1643	13.83	4.0498
1998	-16%	13.2308	13.54	6.1844
1999	64%	4.6698	12.54	8.8458
2000	-21%	4.0094	12.29	3.841
2001	-18%	3.7793	12.08	4.824
2002	4%	4.2972	11.92	3.804
2003	73%	3.8059	11.46	7.8604
2004	13%	3.7673	10.92	7.9229
2005	42%	4.2463	10.75	7.9234
2006	47%	5.7965	11.19	8.0607
2007	47%	6.3729	13.02	7.6608
2008	-52%	8.3493	13.31	3.0867

2009	81%	10.8824	12.19	7.8619
2010	17%	11.9894	8.33	8.4976
2011	-25%	8.8584	10.17	5.2413
2012	26%	9.3124	10.60	5.4564
2013	9%	10.9076	10.29	6.3861
2014	30%	6.3532	10.25	7.4102
2015	-5%	5.8724	10.01	7.9963
2016	2%	4.941	9.67	8.1695
2017	28%	2.4909	9.51	7.1679
2018	6%	4.8607	9.45	6.9823