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A CAUSAL STUDY OF INFLATION AND ECONOMIC VOLATILITY IN THE INDIAN PERSPECTIVE

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ABSTRACT

The study aims to develop a mechanism to bring economic stability in present volatile market. BSE Sensex is the indicator of Indian economy and inflation rate thereby determines the rise/ fall in prices. The effort has made to establish relationship between the inflation rate and BSE Sensex in order to fetch the investors decision which would be based on inflation rather than the privately available information, as affirmed by Fama(1960) in efficient market hypothesis. The outcome of the study, by employing a battery of statistical test; unit root test, co integration test, causality test, correlation test, in 18 years of data i.e. the yearly average of inflation rate and BSE Sensex reveals that there is long run co integration and bidirectional causal relationship exists between inflation and BSE Sensex. Though there is a low degree of correlation between the two variables, yet the investor can rely over the inflation rate prior to investment decision.

KEYWORDS: *Inflation rate; stock market volatility; economic stability; BSE Sensex*

INTRODUCTION

India is a developing country where investments could be attracted from the foreign-countries. It has a variety of demographical and environmental availability which provides growth opportunities for the industry. With the industrial development the economic augmentation can be attained. For this it is required to curb the economic activity. It is speak worthy here in this context that BSE Sensex is the indicator of Indian economy. The volatile nature of BSE Sensex has a matter of concern, as the steep slope of rise / fall of stock prices lead the investors to commend suicide. The exquisiteness of the economy lies over its volatility. But this volatility leads to such peril that it becomes difficult to compensate. Though the evidence reveal the volatile economy of Indian financial system, yet it has the potential for sustainable development. Economic volatility lies over numerous factors including gross domestic product of the nation, prevailing interest rate, inflation rate, amount of foreign direct investment and institutional investment, monetary and fiscal policy etc. This paper is directed towards establishing the relationship between inflation rate and BSE Sensex and thereby derives the possible outcomes for stable economic development. Inflation is the rise in prices of products and services produced and delivered by the industry respectively. These industries collectively determine the economic status of the country. The

economic stability of the country can be achieved through the sustainable development of the industries.

INFLATION

Inflation is measured in terms of percentage which resembles the general increase in prices of goods and services with the passage of time. It is the percentage change in the value of Wholesale price index on a year to year basis. The change in prices occurs due to variety of reasons, amongst which imbalance between demands and supply of goods and services are prominent. The end customers are the worst hit to the inflation, as they have to pay more for the same goods and services. Inflation is the indicator of full employment of resources. Also it helps in developing the healthy competition among the firms. This paper is an attempt to establish the relationship between inflation and BSE Sensex. With the increase in sales volume of stocks, followed by decrease in share prices the firm becomes unwilling to develop further. The outcome befalls the decline in supply of the said stocks and ultimately leads to Inflation.

Irving Fisher through his researches proved the relationship between the Inflation and Real interest rate, later known as Fisher- Effect, which describes the real interest rate is the difference of nominal interest rate and inflation.

BSE SENSEX

BSE Sensex is an indicator of Indian Economy, as it is a 'Market Capitalization-Weighted' average of 30 component stock prices representing large, well-established and financially sound companies across key sectors. With the movement in BSE Sensex, the economic status of the country can be recognized and thereby it helps in determining the success of the firms. In order to make the BSE Sensex comparable over the time, it is calculated by dividing the free-float market capitalization of 30 companies in the Index by a number called the Index Divisor. The base period of BSE SENSEX is 1978-79 and the base value is 100 index points. This is often indicated by the notation 1978-79=100.

Fama (1970) in the research has investigated the stock movement behaviour and revealed that the market becomes efficient with the strong, semi-strong and weak form. The stock movement largely depends upon the available information based on past prices, public and private news.

Factors Influencing Inflation and Stock market :

Inflation	Stock Market
▪ Supply and Demand	▪ Supply and Demand
▪ Monetary Policy & Fiscal Policy	▪ Monetary Policy & Fiscal Policy
▪ Import Prices	▪ Inflation
	▪ Role of other ASIAN Markets

REVIEW OF LITERATURE

(Sangeeta & Arup, 2013) has made an empirical investigation over the relationship between inflation and stock price movement. The application of co integration test and Granger causality test between the BSE stock price and wholesale price index from 1994 to 2010 reveals the varied results. The nature of relationship is rather negative in the short run. As such, with the decline in stock prices the firms tend to contract their business due to less availability of capital, followed by the dearth of supply with rise in demand and thus cause inflation. Contrary to this, unexpected inflation raises the firm's equity value in the long run and the outcome becomes positive relationship between the two variables. (N.B, 1983) explored the relation between common stock returns and inflation in twenty –six countries for the postwar period, and revealed that there is a consistent lack of positive relation between the two variables.

(Feldstein & Martin, 1980) analysed the inverse relation between higher inflation and lower share prices resulted into the slowdown in productivity growth, the higher cost of energy and the increased international competition. (Kumari & Jitendra, 2014) has empirically examined the relation between stock market volatility and macroeconomic volatility covering the data from 1996-2013 and concluded that inflation do not respond to the shocks in the stock market volatility. Furthermore, the volatility of Inflation rate is invariant to the shocks in the stock market volatility. The empirical results evident from estimates of the GARCH, EGARCH and TGARCH models validate that there is bidirectional causality between stock market volatility and inflation This relation shows the increasing interdependence of financial markets and macroeconomic fundamentals in India.

(Omotor & Douglason, 2010) investigated the relationship between inflation and stock market returns using monthly and quarterly data of Nigeria for the period 1985 to 2008 and revealed that stock market returns may provide an effective hedge against inflation in Nigeria. This is explained by the significant and positive relationship between inflation and stock prices. This also

implies that investors in making good portfolio decisions should perhaps view equities as long-term holdings against inflation's erosion of purchasing power. Also, the monetary and real sectors of the economy may not be independent of each other, as money may also matter in explaining the behaviour of inflationary process. (Tripathi & Arnav, 2015) covered a comprehensive period of 13 years from the year 2000 to 2013 using quarterly data and revealed the regression results as a significant positive relation between changes in inflation and stock return in case of Brazil. With the application of Bi-Variate Correlation, Unit Root Tests and Granger Causality Test the researcher has tried to establish relationship between inflation and stock indices. Simultaneously, the Granger causality results reveal unidirectional causality from stock return to changes in inflation in Russia, India and South Africa and bidirectional causality in China.

Table 1. Summary of Previous Studies

Author (Publication Year)	Research Area	Relationship Outcome Between Inflation and Stock Market Movement
(Eita J. H., 2012)	South Africa	Bilateral Causal & Positive
(Nadeem, 2004)	Pakistan	Bilateral Causal & Positive
(Joseph, Emmanuel, & Sunday, 2009)	Nigeria	Negative
(Omotor D. G., 2010)	Nigeria	Negative
(TRESS, SAUNDERS, & B., 2007)	Australia	Negative
(Muhammad & Ramiz, 2011)	Pakistan	Negative
(Geetha, Mohidin, Chandran, & Chong, 2011)	Malaysia, United States and China	Long Run Relation
(Hall, Rudra, Flavio, & H.John, 2014)	India	Bidirectional and unidirectional causal relation

Source: Author's Compilation

RESEARCH OBJECTIVES

- To understand the relationship between the Inflation rate and BSE Sensex.
- To ensure economic activity in Indian sub-continent.
- To develop a suggestive mechanism using inflation rate as a tool to control economic volatility.

DATA AND METHODOLOGY

Data:-

The relationship between inflation and stock market movement has discovered by taking into consideration the 18 Years of data between January 1997 to December 2015. Frequency of data is yearly. Data used in the study is Inflation rate and BSE Sensex of India. Once, the monthly closing prices of BSE Sensex is collected from www.bseindia.com, yearly average price has derived. Yearly average inflation rate of india has downloaded from www.inflation.eu for the time period from 1997 to 2015. The basic cause behind the selection of 1997 as the starting year is the development and transformation transpired after liberalization and has witnessed the combined result of pre and post globalised economy. There are a total of 19 observations for the study period.

METHODOLOGY

Bi-variate Correlation:-

Bi-variate correlation has been computed for BSE Sensex & inflation to establish the direction and magnitude of short term relationship between Stock returns and Inflation for India.

Unit Root Tests:-

(PHILLIPS & PERRON, 1987) Unit Root Test is a statistical test aimed for measuring the stationarity of the data. It becomes obligatory for the researcher to perform the stationarity test in the time series data. A time series data is stationary if its mean, variance and auto-covariance are independent of time or time invariant. In order to derive the meaningful result and draw acceptable inference Stationarity of a data is a prerequisite in a time series analysis. Augmented Dickey Fuller (ADF) and Phillips–Perron (PP) unit root tests have been applied to test the stationarity of time series data.

Regression Analysis:-

The regression model appropriate for our analysis is given as:

$$Ri = \alpha + \beta i Ii + \varepsilon i$$

where: Ri = stock returns in time period i;

α = Constant term, i.e., that part of stock returns which are independent of inflation;

βi = Sensitivity of stock returns to inflation;

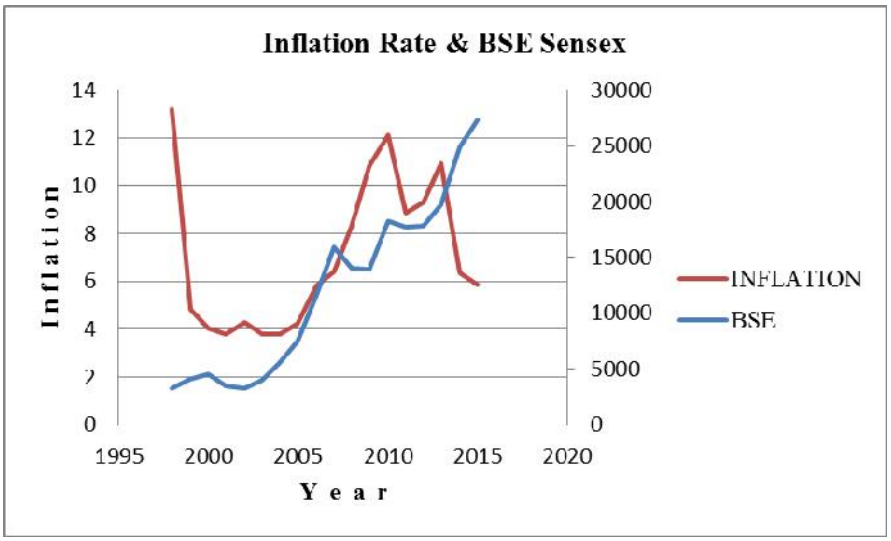
Ii = Rate of Inflation in time period i;

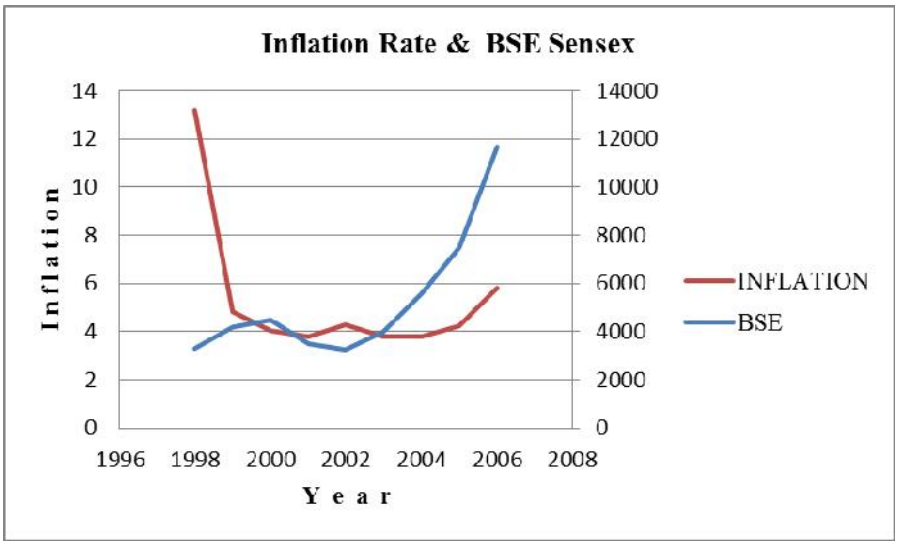
i = Error term or that part of stock returns which cannot be explained by this regression model, i.e., part of stock returns caused by exogeneous factors other than inflation.

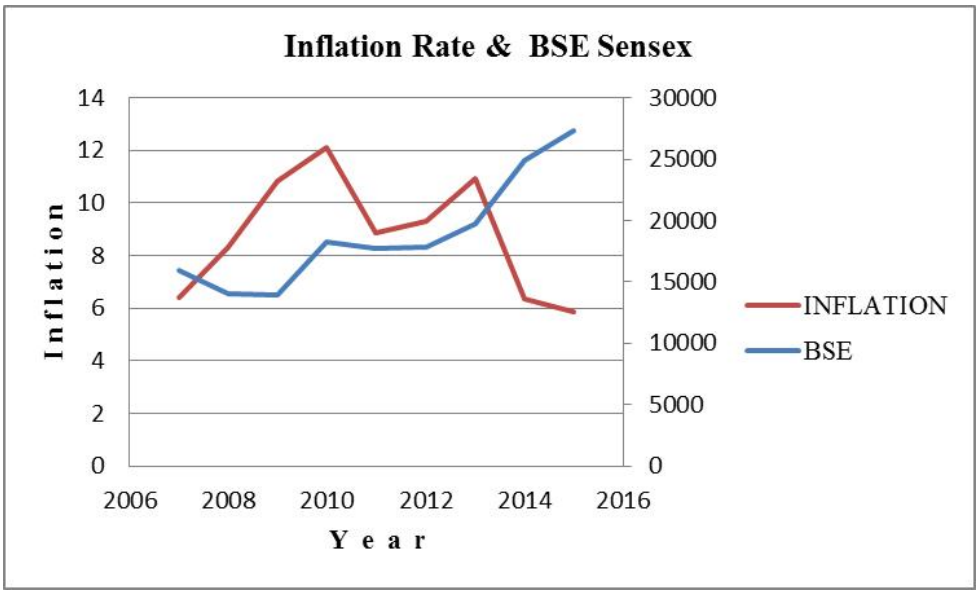
Granger Causality Test:-

(Granger, 1988) measured the relationship between causation and co-integration and thus discovered Causality test tool. Granger causality test is a statistical hypothesis test to measure the linear and non linear, cause and effect relationship between the two variables. It is helpful in determining the cause variable and effect variable. Many a times it becomes difficult to discover the causation factor and effecting factor, in Times Series analysis. Also it is a supportive instrument for forecasting purpose based on the past data series. Granger causality has been used in this study to test for any short term causal relationship between Indian stock market performance and Inflation rate.

GRAPHICAL PRESENTATION OF INFLATION RATE AND BSE SENSEX







Outcome: The above graphical presentation of inflation rate and BSE Sensex are segregated into three time periods i.e. 1997-2003, 2003-2009, 2009-2015. At a glance, it can be revealed that there exists negative relationship between the two variables. With the rise in inflation rate, the BSE Sensex seems to be moving downwards. Also it is speak worthy here in this context that BSE prices are followed by Inflation rate.

EMPIRICAL RESULTS AND DISCUSSION

Descriptive Analysis:-

BSE		INFLATION	
Mean	11833.3972	Mean	6.9547368
Standard Error	1786.56336	Standard Error	0.8869042
Median	11647.6958	Median	6.29
Standard Deviation	7787.44915	Standard Deviation	3.8659257
Sample Variance	60644364.3	Sample Variance	14.945382
Kurtosis	-0.9056117	Kurtosis	0.5278957
Skewness	0.45834497	Skewness	0.8330708
Range	24140.5598	Range	14.85
Minimum	3230.57835	Minimum	0.47
Maximum	27371.1382	Maximum	15.32
Sum	224834.546	Sum	132.14
Count	19	Count	19

CORRELATION BETWEEN BSE AND INFLATION

	BSE	INFLATION
BSE	1	
INFLATION	0.2655167	1

Outcome : The correlation between BSE and Inflation resembles the numerical value of 0.26 which reveals that there is very weak positive relationship exists between the two variables. In fact, the relation between the two is positive yet, of no use to predict the future.

Augmented Dickey-Fuller (ADF) Unit Root Test:-

Unit Root Test is a statistical test aimed for measuring the stationary of the data. It becomes obligatory for the researcher to perform the stationary test in the time series data.

Null Hypothesis: SENSEX has a unit root:-

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.602885	**0.9855**
Test critical values:	1% level	-3.857386	
	5% level	-3.040391	
	10% level	-2.660551	

Outcome : The tabular format of the Augmented Dickey-Fuller (ADF) Unit Root Test accepts the null hypothesis which states that SENSEX has a unit root, as the probability value 0.98 >0.05. Further ADF test statistics 0.60> test critical values at 1%,5% and 10% level. Thus it is required to convert the non stationary data into stationary data with the application of 1st difference of the data.

Augmented Dickey-Fuller (ADF) Unit Root Test for 1st difference of Sensex:-

Null Hypothesis: DSENSEX has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic based on SIC, MAXLAG=3)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.595546	**0.0025**
Test critical values:	1% level	-3.886751	
	5% level	-3.052169	
	10% level	-2.666593	

Outcome : DSENSEX has no unit root, i.e. the available data is stationary and is appropriate to perform time series analysis. As such, probability value 0.0025<0.05 and also ADF test Statistics is less than test critical value at 1%,5% and 10% level. Hence it can be concluded that the data is free from unit root and is stationary.

Johansen Co integration Test:-

Date: 03/19/16 Time: 12:23
Sample (adjusted): 1999 2015
Included observations: 17 after adjustments
Trend assumption: Linear deterministic trend
Series: SENSEX INFLATION
Lags interval (in first differences): 1 to 1

Unrestricted Co integration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen value	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.734504	23.36949	15.49471	**0.0027**
At most 1	0.047364	0.824878	3.841466	**0.3638**

Trace test indicates 1 co integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Co integration Rank Test (Maximum Eigen value)

Hypothesized No. of CE(s)	Eigen value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.734504	22.54462	14.26460	**0.0020**
At most 1	0.047364	0.824878	3.841466	**0.3638**

Max-eigenvalue test indicates 1 co integrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Outcome: The test result of Johansen Co integration Test rejects the null hypothesis that, there is no co integration between Sensex and Inflation. The probability value in both, Trace and Maximum Eigen value lies to 0.0027 which is less than 5%. Thus it accepts the alternative hypothesis stating that there is long run co integration exists between inflation and BSE Sensex.

Granger Causality Tests 1

Date: 03/19/16 Time: 12:59
Sample: 1997 2015
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
DSENSEX does not Granger Cause INFLATION	16	6.89034	**0.0115**
INFLATION does not Granger Cause DSENSEX		0.42654	0.6631

Outcome: Granger causality test is a statistical hypothesis test to measure the linear and non linear, cause and effect relationship between the two variables. The result reveals that the probability value of 0.0115 rejects the null hypothesis and alternatively states that Sensex cause inflation. Contrary to this inflation does not cause Sensex movement as per the Granger Causality test at lag 2

Granger Causality Tests

Date: 03/19/16 Time: 13:06

Sample: 1997 2015

Lags: 3

Null Hypothesis:	Obs	F-Statistic	Prob.
INFLATION does not Granger Cause DSENSEX	15	0.20577	0.8896
DSENSEX does not Granger Cause INFLATION		5.45337	**0.0246**

Outcome: The tabular value of 0.0246<0.05, rejects the null hypothesis that DSENSEX does not Granger Cause INFLATION and thus reveal that Sensex cause Inflation at Lag value of 3.

RECOMMENDATION

BSE Sensex is the performance indicator of the Indian economy. The volatile nature of BSE sensex has both its pros and cons. The volatility nature of the sensex keeps the fascination of investment alive amongst the investors. It is the volatility only that determines the upward and downward movement of the sensex prices. Contrary to this, the steep change in the prices obligates the investor to commend suicide. In order to evade such situation and bring economic stability, certain measures should be adopted taking into concern the movement of BSE Sensex. In this effort the relationship between the Indian inflation rate and BSE Sensex has derived, which states that there is long run co integration exists between inflation and BSE Sensex. Also, there is bidirectional causal relationship exists between both the variables i.e. inflation and BSE Sensex. With the application of the above findings it can articulate that, investors prior to making any investment decision must take into concern the inflation rate. Though, the correlation statistics reveal that there is a low degree of positive relationship exists between the inflation and BSE Sensex. It is apparent from the normally distributed data, that inflation and sensex has negative relationship in the short run. And inflation follows BSE Sensex. Hence, the risk-averse investors who invest for a particular time period has to operate accordingly. With the expectation of price rise the investor has to buy while the inflation rate is less and sell the stocks during high inflation rate anticipating the fall in prices. Similarly, the long run investors have to buy the stocks with the rise in inflation rate and sell the stocks while inflation falls down. As, it is evident from the study that inflation rate and BSE Sensex has positive long run relationship. With the application of above procedure the investor can now rely over the inflation rate to some extent, against investment decision. And thus the steep movement of the stock prices, based on the privately available news (according to efficient market hypothesis), can now be controlled and thereby the economic stability could be achieved.

CONCLUSION

The research paper focuses over determining the relationship between BSE Sensex and Inflation. The motivation behind the research lies over the fact that BSE Sensex is volatile in nature. And it becomes difficult to predict the movement of the BSE Sensex and thereby the investors dejected to make any investment in such uncertain market. An effort has been made to establish the relationship between the Inflation rate and BSE Sensex based on which results can be drawn for investment decisions. The available literature produces variety of results leading to the positive as well as negative relationship between the two variables. The outcome from the cluster of statistical analysis that includes correlation, co integration and causality test states that there exist a long run co integration and positive relationship between them. Also the test results reveal that there is a bidirectional causal relationship exists between the inflation and BSE Sensex. Here we can conclude that it becomes difficult to state that whether BSE Sensex follows the Inflation or vice-versa which is earlier evident from the graphical presentation. Granger causality test at lag value of 2 and 3 states that SENSEX Granger cause inflation and inflation

Granger cause SENSEX respectively. The investor now relies over the inflation rate as well, prior to making any investment decision. Though inflation has very less impact over the BSE Sensex movement, yet there are some common factors which influence the both simultaneously, which is required to be taken into consideration.

WORKS CITED

1. *Eita, & Hinaunye, J. (2012, May). Inflation And Stock Market Returns In South Africa. Retrieved March 05, 2016, from www.researchgate.net.*
2. *Eita, J. H. (2012, May). Inflation And Stock Market Returns In South Africa. Retrieved March 05, 2016, from www.researchgate.net.*
3. *Feldstein, & Martin. (1980). Inflation and the Stock Market. The American Economic Review , 839-847.*
4. *Geetha, C., Mohidin, R., Chandran, V. V., & Chong, V. (2011). THE RELATIONSHIP BETWEEN INFLATION AND STOCK MARKET: EVIDENCE FROM MALAYSIA, UNITED STATES AND CHINA. International Journal of Economics andManagement Sciences , 1-16.*
5. *Granger, C. (1988). Some recent development in a concept of causality. Journal of Econometrics .*
6. *Hall, Rudra, P. P., Flavio, D. S., & H.John. (2014). The impact of stock market development and inflation on economic growth in India: Evidence using the ARDL bounds testing and VECM approaches. International Journal of Economics and Business Research .*
7. *Joseph, J. E., Emmanuel, S. A., & Sunday, N. (2009). Inflation and stock market returns in Nigeria (1985 – 2007). Journal of Management and Entrepreneurship .*
8. *Kumari, J., & Jitendra, M. (2014). Relationship Between Conditional Volatility of Domestic Macroeconomic Factors and Conditional Stock Market Volatility:Some Further Evidence from India. Asia-Pacific Financial Markets .*
9. *Muhammad, A. N., & Ramiz, U. R. (2011, May). Does Inflation Hurt the Stock Market Returns? Lahore, Pkistan.*
10. *N.B, G. (1983). Stock Market Returns and Inflation:Evidence from Other Countries. The Journal of Finance , 49-65.*
11. *Nadeem, K. K. (2004, January). Inflation and stock market performance: A case study for Pakistan. Savings and Development .*
12. *Omotor, & Douglason. (2010). Relationship between Inflation and Stock Market Returns: Evidence from Nigeria. Journal of Applied Statistics .*
13. *Omotor, D. G. (2010). Relationship between Inflation and Stock Market Returns:Evidence from Nigeria. Journal of Applied Statistics .*
14. *PHILLIPS, P. C., & PERRON, P. (1987). Testing for a unit root in time series regression. BIOMETRIKA .*
15. *Sangeeta, C., & Arup, M. (2013). Stock Prices and Inflation: Relationship Revisited. World Journal of Modelling and Simulation , 201-215.*
16. *TRESS, SAUNDERS, A., & B., R. (2007). Inflation and Stock Market Returns:Some Australian Evidence. Economic Record.*
17. *Tripathi, V., & Arnav, K. (2015). Short Run Causal Relationship between Inflation and Stock Returns- An Empirical. Asian Journal of Management Applications and Research .*