

Relationship Between Inflation and Stock Market Return in Sri Lanka

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Abstract

This study investigates the relationship between inflation and Stock market return in Sri Lankan stock market using monthly data including 120 monthly observations for the period of ten years starting from June 2008 to May 2018. The Colombo Consumer Price Index was used as the proxy for the Inflation and All share price Index was used as the proxy for the Stock market return. Descriptive analysis, and regression analysis was employed to identify the relationship between the variables under bivariate and multivariate models. According to the analysis, it indicates that inflation has a significant positive impact on stock market return at CSE. The study also established that exchange rate has a positive relationship with stock market returns and negative relationship of interest rates on stock market returns. The variables were also found to be significant determinants of stock market returns. This study recommends that attention should be paid by policy makers to the prevailing rates of these selected independent variables as they can highly affect stock market returns recorded at the CSE. The above results have implications for the domestic and international investors as well as the industries, stock market regulators, investors and stock market analyst.

Key words: Colombo Stock Exchange, Inflation, Exchange rate, Interest rate, Stock Market Return

Introduction

Stock market is today regarded as a very important part of the overall financial system as it boosts growth of all sectors of the economy by channelizing savings from funds-surplus units of the society to funds deficit units and enables optimum allocation and utilization of scarce capital resources thus providing the base for long term sustainable economic growth.

Efficient stock market is now considered crucial for economic progress, focus has therefore shifted to establish factors which determine stock returns. While financial theory provides for company and industry

specific factors, there is a growing conviction among financial researchers that macroeconomic variables do play a crucial role in determining stock market performance. Among the macroeconomic variables, inflation is considered to be one of the most crucial factors impacting stock returns. Inflation is an increase in general level of price of goods and services in an economy resulting in a fall in purchasing power or value of money.

Numerous empirical studies conducted in developed markets providing substantial evidence in support of the argument that stock market return varies with the macro economic variables. Even though the researches have documented that fundamental economic activities in developed countries are strongly linked to stock market performance, it is unclear whether such a relationship exists for emerging stock markets in less developed countries. Since there are different conclusions on this issue, investigation on the result of the relationship between macroeconomic variables and stock market performance should be further enhanced. So, identifying the relationship among macroeconomic variables is very much important for the investors as well as for the companies which is a developing country like Sri Lanka.

Through this study, aims to explore the dynamic relationship between the Inflation based on Colombo Consumer Price Index (CCPI) as a measure of prevailing inflation decided by Central Bank of Sri Lanka and All Share Price Index (ASPI) as a measure of Stock market return using monthly time series data over the period of ten years starting from June 2008 to May 2018.

Literature Review

There are numerous empirical studies both locally and internationally to support the relationship between stock market return and inflation resulting to mixed results effects from these studies. In the past decades, many industry researchers, financial analysts and practitioners have attempted to predict the relationship between inflation and Stock Market Return. There are many empirical studies focused on this. investigated the relationship between stock market returns and inflation rate for Greece over the period 1985 to 2000. This study attempted to investigate the three types of relationship whether firstly the stock market had been a safe place for investors in Greece. The study found that there is a negative relationship between the stock market returns and inflation. (Dimitris et al,2004) Carolin et.al (2011) was finding the relationship between inflation and stock returns on the level of economy development of the three countries which are Malaysia, China and US. The secondary data used in this study consists of monthly time series data from January 2000 to November 2009. The study found long run relationship between inflation. Taofik et al(2013) examined the long-run relationships and dynamic interactions between stock returns and inflation in Nigeria using monthly data of the All Share Price Index from the Nigerian Stock Exchange and Nigerian Consumers Price Index from 1997 to 2010. The analytical technique of Autoregressive Distributed Lag (ARDL) bound test was exploited. From the results, it is evident that there is the existence of a long run relationship between stock returns and inflation. The short run dynamic model also reveals that the speed of convergence to equilibrium is moderate implying that there is a short run relationship between stock returns and inflation.

Vanita & Kumar (2014) examined long term relationship between inflation and stock returns in BRICS markets using panel data for the period from March 2000 to September 2013. Correlation results revealed a significant negative relationship between stock index and inflation rate for Russia and a significantly positive relationship for India & China. ADF, PP and KPSS unit root tests indicate non-stationary characteristic of the data. Further they have investigated no long term co-integrating relationship between stock index values and inflation rates using Pedroni panel co integration test. These findings have important implications for policy makers, regulators and investment community at large. There may seem to be short term contemporaneous relationship between inflation and equity returns but in the long run they do not seem to be significantly integrated. Changes in inflation may bring some short run movement in stock return but certainly equity does not seem to be a good hedge against inflation in long run at least in emerging BRICS markets. Hussain et al(2015) explored the relationship between stock returns volatility and macroeconomic variables in Pakistan. This study has used monthly observations covering the period from 2000 to 2011. Inflation, real exchange rate, Industrial sector output, real supply of money and oil prices were considered as the macro economic variables. First, Exponential Generalized Autoregressive Conditional Heteroscedasticity model is used to analyze the volatility in stock returns. Results from ARDL approach revealed that macroeconomic variables are responsible factors in explaining stock market volatility. Inflation, real exchange rate and oil prices are found encouraging factors of stock market volatility while Industrial sector output and real supply of money affects the volatility negatively.

There are also few numbers of studies in the Sri Lankan context based on the macro economic variables and the stock market. Menike (2006) has investigated the interaction between macroeconomic variables on share prices for a sample of 34 companies which was represented by eight sectors in Sri Lanka. The study has used monthly data for a period from September 1991 to December 2002 by employing multivariate regression analysis for eight macroeconomic variables for each individual stock. The result of the study indicated that majority of the companies report a high R^2 which justifies more explanatory power of macroeconomic variables in explaining stock prices. Findings stated that inflation rate, interest rate and Treasury bill rate are negatively related with the stock prices. The money supply was found to have a positive relationship with the share prices which have a direct impact on the monetary policies in which the changes in the money supply will have an impact on share prices. Wickramasinghe (2011) examined the long run relationship between Sri Lankan capital markets (CSE) and six macroeconomic variables such as three-month fixed deposit rate, consumer price index, US stock market index narrow M1 and GDP of Sri Lanka. They used the monthly data from January 1985 to December 2004 and with the help of unit root test, co integration, variance decomposition and error correction mechanism they found out that short term and long-term relationship between stock prices and macroeconomic variables. Results of this study suggest that there is Bi-directional relationship exist between stock market index and fixed deposit rate stock prices and US Share price and GDP while remaining variables which are Consumer Price Index, M1 and exchange rate casual bi-directional relationship exists. Results of variance decomposition suggest that GDP and M1 play an important role in

longer horizon to forecast variance in stock prices. Shafana (2012) examined the degree and pattern of effect of macroeconomic variables on sectoral share price indices in Sri Lanka over the period from January 2008 to December 2012 from employing macroeconomic factor model for monthly data. The findings from multiple regression analysis reveal that exchange rate, treasury bill rate and inflation rate are common variables to explain the variability of all sectoral share prices for the period of 2008 to 2012 except of Telecom sector which has only R2 less than 50%. The exchange rate and inflation rate have significant effect on all sectoral share prices in line with negative and positive respectively while treasury bill rate has significant negative weak influence on all sectors except of Information Technology and Telecom. Among the selected variables in this study, the exchange rate and inflation have greater importance on most of the sectors further among these two important variables, inflation rate has more powerful variable than exchange rate to explain the variability of share prices of most of the sectors. Badullahewage (2018) revealed that all these factors have an inseparable impact over the performance of the stock market and Sri Lankan stock market performance has eventually over gone through many ups and downs because of them as well. It has been revealed that among all the factors that have been discussed, inflation and exchange rates have comparatively higher effects on the stock market performance. It shows a fluctuation because of the unpredictable nature of these factors. Colombo Stock Exchange has seen a tremendous change in its performance over a period for which these factors have played a prominent as well as a vital role in its functioning. Kulathunga (2015) suggested that all macroeconomic factors influence the stock market development. More precisely, volatile inflation rate and exchange rate together with higher deposit rate have curtailed the stock market development in Sri Lanka. Moreover, positive optimism created by the economic growth and the stock market performance during the previous periods tend to enhance stock market performance.

Methodology

Research design can be defined as an outline of the actual measures, adopted by an investigator for testing the correlation involving dependent variables as well as independent variables (Khan, 2008). The study adopted descriptive design. A descriptive study involves a description of all the elements of the population. It allows estimates of a part of a population that has these attributes. Cross sectional study methods are done once and they represent summary at a given timeframe Regression analysis is used to determine the effect of independent variables to the dependent variable. It is necessary to test classical assumption include in normality test, Multicollinearity, Heteroscedasticity test in order to do regression analysis. Using the collected data, the researcher conducted a regression analysis to establish the relationship extent between inflation and stock market returns. The study applied the following regression model:

$$ASPI = \alpha + \beta_1(CCPI) + \beta_2(IR) + \beta_3(ER) + e$$

Where,

ASPI= Stock market returns as measured by All Share Price Index , α = Intercept, β = Coefficients, CCPI= Inflation rate as measured by monthly Colombo Consumer Price Index, IR= Interest Rate, ER= Exchange Rate , e = Error term. To test the statistical significance the F-test and the t-test were used at 95% confidence level. The F statistic was utilized to establish a statistical significance of regression equation which the t statistic was used to test statistical significance of study coefficients.

Decision-making process in Regression analysis,

- If the value of significance < 0.05 , significant effect of independent variable on the dependent variable
- If the value of significance > 0.05 , the independent variable has no significant effect on the dependent variable

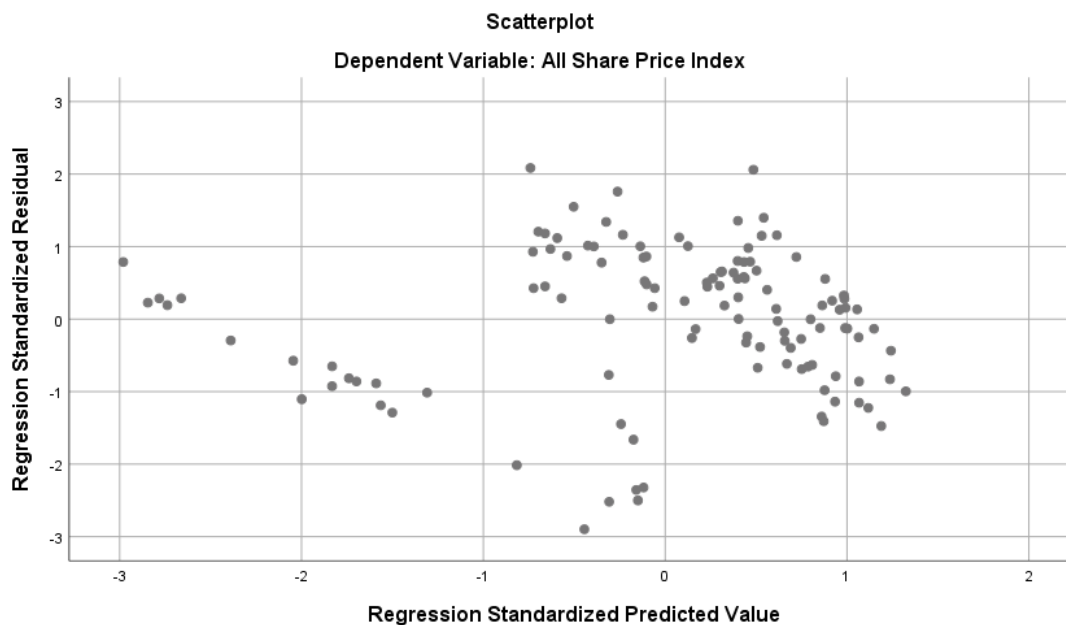
Results and Discussion

Diagnostic Tests

The researcher carried out diagnostic tests on the collected data to test for heteroscedasticity. Scatterplot in Figure 1 shows that the spots are diffused and do not form a clear specific pattern. So, it can be concluded that the regression model does not occur heteroscedasticity problem.

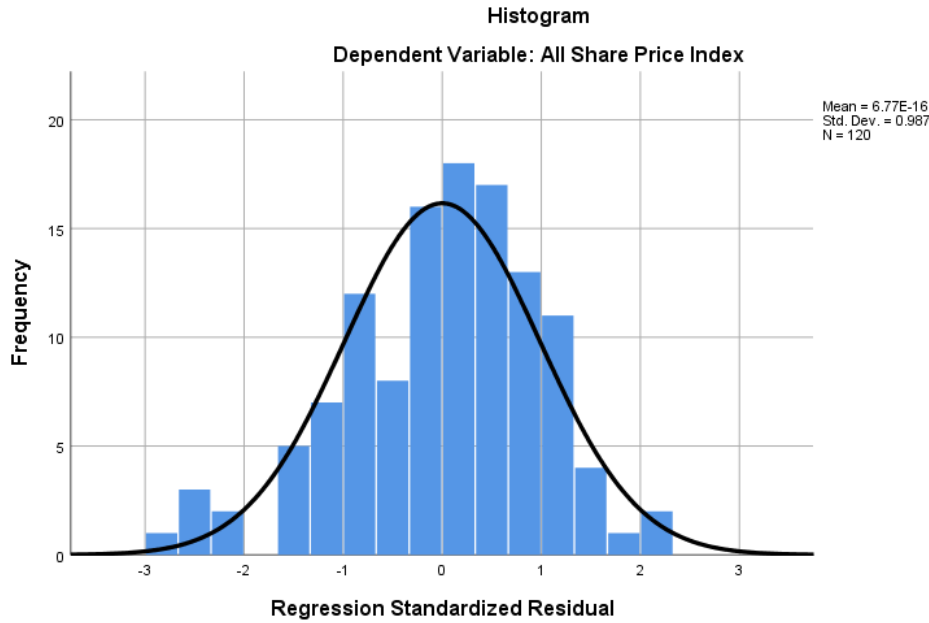
Histogram in Figure 2 shows that bell shape pattern of normal distribution of residuals. So, it also can be concluded that the regression model does not occur heteroscedasticity problem.

Figure 1: Scatterplot for the test of heteroscedasticity



Source: Survey Data

Figure 2: Histogram for the test of heteroscedasticity



Source: Survey Data

Shapiro-walk and Kolmogorov-Simonov test was used in normality test. The null hypothesis for the test was that the secondary data follow a normal distribution. From the output, it shows that p-value < 0.05 implying that it can be rejected the null hypothesis that the data follow a normal distribution. Kolmogorov-Simonov test results recorded was less than 0.05. The test results are as shown in table 1

Table 1: Test of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Interest Rate	.139	120	.000	.867	120	.000
Inflation Rate	.206	120	.000	.732	120	.000
All Share Price Index	.212	120	.000	.821	120	.000
Exchange Rate	.179	120	.000	.915	120	.000

a. Lilliefors Significance Correction

Source: Survey Data

Both Shapiro-walk and Kolmogorov-Simonov tests recorded sig. values less than 0.05 implying that the data used in research was not distributed normally and therefore the null hypothesis was rejected.

But this QQ plots and histograms shows no significant deviation from the normality (as all points lied within the confidence bands and bell shape of the histogram charts). It is important to note that, in practice, normality tests are often considered as too conservative in the sense that for large sample size ($n > 50$), a small deviation from the normality may cause the normality condition to be violated. A normality test is a hypothesis test, so as the sample size increases their capacity of detecting smaller differences increases. So, as the number of observations increases, Shapiro-Wilk test become very sensitive even to a small deviation from normality. As a consequence, it happens that according to the normality test the data do not follow a normal distribution although the departures from the normal distribution are negligible and data in fact follow a normal distribution. For this reason, it is often the case that the normality condition is verified based on a combination of all methods including QQ plots, histograms, stem and leaf plots that is visual inspections. This data was therefore appropriate for use to conduct parametric tests such as Pearson's correlation, regression analysis and analysis of variance.

Statistical Analysis

➤ **Descriptive Analysis**

Descriptive statistic gives a presentation of the mean, maximum and minimum values of variables applied together with their standard deviations in this study. Table below shows the descriptive statistics for the variables applied in the study. An analysis of all variables was obtained using SPSS software for the period of ten years (2008 to 2018) on a monthly basis. Stock market return had a 5620.3222 as mean with a 1655.82547 standard deviation. Inflation had a 6.1375 mean and standard deviation of 4.80656. Foreign exchange rate resulted to a mean of 129.0727 with the standard deviation of 15.17093 while interest rate recorded a 10.0080 mean with the standard deviation of 3.22597.

Table 2: Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
All Share Price Index	120	1503.02	7798.00	5620.3222	1655.82547
Inflation Rate	120	.70	28.20	6.1375	4.80656
Exchange Rate	120	107.53	158.09	129.0727	15.17093
Interest Rate	120	5.89	19.12	10.0080	3.22597
Valid N (listwise)	120				

Source: Survey Data

➤ **Correlation Analysis**

Pearson correlation was employed to analyze the level of association between stock market return at the CSE and independent variables of this study (Inflation, Foreign exchange rate and Interest rate). From correlation

analysis, the inflation and stock market return relationship were found to be weak and negative ($p = -0.452$, $p > 0.000$). This implies the movement in the inflation rate is negatively correlated to stock market returns in a significant manner. The study also showed existence a weak positive correlation between foreign exchange rate and stock market returns ($p = 0.485$, $p < 0.000$). This shows that exchange rate has a weak positive association with stock market returns in a significant manner. The study also showed the existence of a strong negative correlation between interest rate and stock market returns ($p = -0.802$, $p < 0.000$). This shows the prevailing interest rate in the country have a significant association with stock market return. Although the independent variables had an association to each other, the association was not strong to cause multicollinearity as all the r values were less than 0.70. This implies that there was no multicollinearity among the independent variables and therefore they can together be used as determinants of stock market returns at the CSE in regression analysis.

Table 3: Correlation Analysis

		Correlations			
		All Share Price Index	Inflation Rate	Exchange Rate	Interest Rate
All Share Price Index	Pearson Correlation	1	-.452**	.485**	-.802**
	Sig. (2-tailed)		.000	.000	.000
	N	120	120	120	120
Inflation Rate	Pearson Correlation	-.452**	1	-.328**	.720**
	Sig. (2-tailed)	.000		.000	.000
	N	120	120	120	120
Exchange Rate	Pearson Correlation	.485**	-.328**	1	-.209*
	Sig. (2-tailed)	.000	.000		.022
	N	120	120	120	120
Interest Rate	Pearson Correlation	-.802**	.720**	-.209*	1
	Sig. (2-tailed)	.000	.000	.022	
	N	120	120	120	120

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

Source: Survey Data

➤ **Regression Analysis**

Stock market returns was regressed against three predictor variables; inflation rate, foreign exchange rate and interest rate. The study obtained the model summary statistics as illustrated in table 4.

Table 4: Model Summary

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.908 ^a	.824	.820	703.30123	.239

a. Predictors: (Constant), Interest Rate, Exchange Rate, Inflation Rate

b. Dependent Variable: All Share Price Index

Source: Survey Data

➤ **Model Summary**

Basing on the outcome in table 4.6 above, value of R square was 0.824, a discovery that 82.4 percent of the deviation in stock market return at the CSE are caused by changes in inflation rate, exchange rate and interest rate. Other variables not included in the model justified for only 17.6 percent deviations in stock market returns at the CSE, Also, the results revealed that there exists a strong link among the independent variables selected and stock market return as shown by the correlation coefficient (R) equal to 0.908.

Table 5: Analysis of Variance

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	268891814.8	3	89630604.93	181.206	.000 ^b
	Residual	57377384.06	116	494632.621		
	Total	326269198.8	119			

a. Dependent Variable: All Share Price Index

b. Predictors: (Constant), Interest Rate, Exchange Rate, Inflation Rate

Source:

Survey Data

The significant value is 0.000 which is less than $p=0.05$. This implies that the model was statistically significant in predicting how inflation rate, exchange rate and interest rate influence stock market returns at the CSE. Given 5% level of significance, critical value from the table is 2.74, table 5 above illustrate calculated F value as 181.206. This affirms that the multiple regression model in overall is significant statistically, in

essence of it been a proper forecast model for enlightening how inflation rates, exchange rate and interest rate affects stock market returns at the CSE.

Table 6: Model Coefficients

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4205.659	643.015		6.541	.000
	Inflation Rate	141.811	20.036	.412	7.078	.000
	Exchange Rate	44.542	4.502	.408	9.894	.000
	Interest Rate	-520.065	28.839	-1.013	-18.033	.000

a. Dependent Variable: All Share Price Index

Source: Survey Data

The study applied t-test in determining the significance of individual variables applied in this study as predictors of stock market returns at the CSE. The p value under sig. column was used as an indicator of the significance of the relationship between the dependent and the independent variables. At 95% confidence level, a p-value of less than 0.05 was interpreted as a statistical significance measure. As such, a p-value above 0.05 shows a statistically insignificant relationship between the dependent and the independent variables. The results are shown in table 6.

From the above results, it is evident that inflation rate, exchange rate and interest rate are stock market returns significant determinants as indicated by p values less than 0.05.

The following regression equation was estimated:

$$Y = 4205.659 + 141.811X_1 + 44.542X_2 - 520.065X_3$$

Where, Y = Stock market returns at CSE, X₁ = Inflation rate, X₂= Exchange Rate and X₃= Interest Rate

On the estimated regression model above, the constant = 4205.659 shows that if selected dependent variables (foreign exchange rates, inflation rate and interest rate) were rated zero, stock market returns would be 4205.659. A unit rise in rates of inflation would cause an increase in stock market returns by 141.811 while a unit rise in rates of exchange would also lead to an increase in stock market returns by 44.542. An interest rate unit increase would result to a reduction in stock market returns by 520.065.

Summary and Conclusion

This study sought to determine the impact of inflation rate on stock market returns at the CSE. The independent variables for the study were inflation rate, foreign exchange rate and interest rate. The study adopted a descriptive research design. Secondary data was obtained from CSE, CBSL and DCS and was

analyzed using SPSS software version 25. The study used each month data covering 120 months from June 2008 to May 2018.

From the results of correlation analysis, a weak negative correlation was found to exist between inflation rate and stock market returns at CSE. The foreign exchange rate and stock market returns relationship at the CSE was established to be weak and positive while interest rate was concluded to have a strong and negative relationship with stock market returns at the CSE. Inflation rate, Interest rate and exchange rate were concluded to have a relationship that is significant with stock market returns as indicated by p value of less than 0.05. The co-efficient of determination R- Square value was 0.824 meaning that about 82.4 percent of stock market returns variation can be expounded by the three selected independent variables while 17.6 percent in the stock market returns variation is associated with other factors not covered in this research. The study also found that the independent variables had a strong correlation with stock market returns at the CSE ($R=0.908$). ANOVA results show that the F statistic was significant at 5% level with a $p= 181.206$. Therefore, the model was fit to explain the relationship between the selected variables.

The regression results show that when all the selected independent variables (inflation rate, Exchange rate and interest rate) are rated zero, the stock returns would be 4205.659. a unit increase in inflation and exchange rate would result to stock market returns increase by 141.811 and 44.542 respectively while interest rate unit increase would cause a stock market returns decrease by 520.065. Analysis of model coefficients revealed that all the variables (Inflation rate, foreign exchange rate and interest rate) are statistically significant determinants of stock market returns. From the study findings, inflation rate had a positive relationship with stock market returns at the CSE and we can therefore conclude that higher inflation rate tends to encourage performance of firms listed at the CSE leading to high stock market returns. Also, Foreign exchange rate was found to be associated positively with stock market returns at the CSE and therefore when exchange rate increases, the stock market returns also increase at the CSE. The study found a negative effect of interest rates on stock market returns and therefore concludes that stock market returns at the CSE has a negative association with interest rate. The study therefore concludes that higher interest rate lead to discourage stock market returns. This study concludes that independent variables selected for the study of foreign exchange rate, interest rate and inflation rate caused to 82.4 percent of deviation in stock market returns at the CSE. The fact that the three independent variables explain 82.4% of variations in stock market returns imply that variables not included in the model explain 17.6% of the stock market returns changes. The overall model was found to be significant as explained by the F statistic. It is therefore sufficient to conclude that these variables significantly influence stock market returns as shown by the p value in ANOVA summary.

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