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Effect of Market Volatility, Inflation, and Interest Rates on Stock Market Returns: An Empirical Analysis

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ABSTRACT

This paper investigates the effects of market volatility, inflation, and interest rates on stock market returns, focusing on the Pakistan Stock Exchange (PSX) over a 10-year period. Utilizing secondary data on stock index performance, inflation rates, and interest rates, the study employs multiple regression analysis to assess the impact of these macroeconomic factors on market returns. The results reveal that market volatility and inflation have a significant negative effect on stock returns, indicating that periods of heightened volatility and rising inflation correspond to lower market performance. In contrast, interest rates show an insignificant relationship with stock returns, suggesting that investors in the PSX are less sensitive to interest rate changes compared to other economic factors. These findings contribute to the broader literature on emerging markets, highlighting the dominant role of inflation and volatility in shaping stock market outcomes. The study provides valuable insights for investors, who can use this knowledge to make informed decisions in response to fluctuating economic conditions, and for policymakers, who may need to focus on controlling inflation and stabilizing market conditions to promote healthy stock market performance in Pakistan. Overall, the research emphasizes the critical importance of macroeconomic indicators in influencing stock market returns.

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1.0 Introduction

Stock markets performance, i.e., Pakistan stock exchange (PSX), is extremely correlated with a wide variety of macroeconomic factors, one of these key indicators is market volatility, inflation and interest rates. These broader economic conditions tend to force stocks market returns, which are the measures of investor's confidence, to fluctuate (Jawad & Naz, 2024). In the more status quo emerging markets such as Pakistan where economic uncertainties are more heightened, these factors are more pronounced to impact. Investor uncertainty and perceptions of risk are often responsible for market volatility — fluctuating stock prices (Latif et al., 2021). Volatility signals higher risk, making investors more cautious, and hence returns to the stock market decline. Inflation, where the price of goods and services increases, erodes the value of what consumers and businesses can buy, and has a negative effect on corporate profitability and corresponding stock returns. The borrowing cost and investment decisions depend on the interest rates as these are controlled by state banks like the State Bank of Pakistan and as these interest rates decide the way stock market performs (Shareef et al., 2024). These three macro-economic variables can be interplayed dynamically and directly these macroeconomic variables affect the performance of PSX.

The relationship between market volatility, inflation, interest rates and stock market returns has extensively been studies all over the globe but little have been done to study specific dynamics in Pakistan case (Hayat et al., 2021). Pakistan's economy is an economy afflicted by periods of inflationary pressures, volatile market conditions and changing interest rates, thereby making it an interesting case in studying these factors and their impact on stock market returns. Inflation and interest rates are often significant determinants of stock returns, as previous studies on developed markets would suggest, and market volatility is not always significant, depending on market conditions (Maqsood et al., 2023). The PSX is unique in the case of emerging markets such as Pakistan because relationships between structural factors such as political instability, regulatory changes and economic policy changes are further complicated in these markets, thus highlighting the need to study these factors in particular for PSX.

However, there is a research gap in inconsistent conclusions about how interest rates impact stock market returns in Pakistan (Naseer et al., 2021). Changes in interest rates are expected to affect the stock prices because of the effects they have on the cost of capital and investor expectations however studies in the PSX always give mixed results. Interest rates are found to play a major part in determining the behavior of the stock markets by some research while others show that investors in Pakistan might not fully react to the interest rate fluctuations (Khan et al., 2021). Moreover, the effects of market volatility and inflation on PSX have not been comprehensively studied with respect to periods of extreme economic volatility and inflationary pressures. Gaps in the literature suggest that further analysis is required within the setting of the PSX.

In order to respond to the research problem, this study investigates the combined influences of market volatility, inflation and interest rates on stock market returns, particularly the PSX (Malik et al., 2024). The study uses secondary data from PSX index, inflation and interest rates for a period of 10 years in order to provide a better explanation about the macroeconomic variables

that most significantly affect stock returns in Pakistan. This research will use multiple regression analysis to examine whether market volatility and inflation provide a greater influence on stock returns than interest rates which are often assumed to be a less dominant variable for the PSX. For the investors and policymakers in Pakistan understanding these relationships can provide the basis for more well-informed decisions in the stock market. In the perspective of investor's, it illustrates macroeconomic risks that can affect their portfolios and better risk management strategies which can use for investment. The findings are important to policymakers who can use them to inform the design of policies to support financial stability in Pakistan's volatile economic environment by providing insights into how monetary and fiscal policies can influence market behavior.

The purpose of this study is to empirically test the role of market volatility, inflation and interest rates in PSX to determine the importance of each factor in explaining the market outcomes, and finally, to provide practical guidelines for investors and policymakers. This study specifically enhances the growing literature on macroeconomic factors and stock market performance in emerging markets by improving our understanding of the factors that drive stock prices in PSX in the context of the larger macroeconomic forces.

2.0Literature Review

2.1 Market Volatility and Stock Returns

Market volatility is the extent of variation in stock prices over a period and is frequently taken as an indicator of market risk (Ghani & Ghani, 2024). The Capital Asset Pricing Model (CAPM), and other theoretical models, suggest that, in general, the more risk (i.e. volatility) an asset has, the more you should expect to make on it, so there should be a positive relationship between volatility and returns. In fact, in practice, this relationship is more often times negative, especially in emerging markets (Umair, 2024). A higher degree of market volatility usually implies that investors are more uncertain and risk averse, which in turn means lower stock returns as investors require a higher risk premium or switch to safer assets.

Empirical studies show that returns on stock markets have been consistently associated with market volatility (Ghani et al., 2022). For instance, Schwert (1989) and Nelson (1991) find that, given higher volatility, investors tend to decrease their stocks holdings thus leading to lower stock return. Volatility has a much greater impact in emerging markets like Pakistan, which tends to be more political unstable, economically uncertain, and less efficient (Dogar & Khalid, 2024). For instance, Hussain (2011) detect high volatility on PSX during times of political turbulence which coincided with large drops in stock returns. As a result, we come to this hypothesis.

H1: Market volatility has a negative effect on stock market returns in the Pakistan Stock Exchange

2.2 Inflation and Stock Returns

There is a wide literature debating the relationship between inflation and stock market returns. Fisher's (1930) hypothesis states that stock returns offset the effect of inflation because over time corporate profits should adjust to price level changes. On the basis of this theory one would expect a positive relationship between inflation and returns in the stock market (Abbass et al., 2022). In contrast, however, empirical studies tend to reject this hypothesis especially in the

short term. In fact, inflation is generally regarded as harmful for the stock market. Finally, this negative relationship arises since inflation erodes the real value of future cash flows that accrue to investments, thereby making equities less attractive to hold (Khan & Shoaib, 2024). Second, inflation can cause higher input costs for firms, which may lower its profit margins that can, in turn, decrease stock returns. According to Fama and Schwert (1977) and Bekaert and Engstrom (2010) studies, inflation dampens stock market returns especially, in situations of high (or persistently high) inflation. The research Ali et al. (2010) proves the negative correlation between the inflation and stock returns in case of Pakistan where the volatility of inflation rate has been a matter of controversy over the past decades and the PSX is found highly sensitive to the inflationary pressures. Due to persistent inflationary trends in Pakistan, which in turn we have evidence from the literature that negatively affect corporate profitability and investor sentiment, the following hypothesis is proposed:

H2: Inflation has a negative effect on stock market returns in the Pakistan Stock Exchange.

2.3 Interest Rates and Stock Returns

Another macroeconomic variable thought to have a large effect on stock market returns is interest rates (Maqsood et al., 2023). It is normally negative interest rates stock returns relationship, according to the Discounted Cash Flow (DCF) model. When interest rates grow, the cost of borrowing grows, and this decreases corporate profit and thus stock prices. It also generates higher returns on fixed income securities which create a good lure for investors to shift their investments from stocks to bonds thereby leading to a decrease in stock return (Hussein & Hussein, 2024).

This negative relationship between interest rates and stock returns is supported empirically for developed markets (Khan et al., 2021). For example, Jensen and Johnson (1995) and Sellin (2001) show that stock returns decline when interest rates go up. The influence of interest rates on stock returns is less clear, however, for emerging markets such as Pakistan (Arshad et al., 2024). Studies by Ahmad et al. (2018) and others argue that interest rates in Pakistan are insignificant determinants of stock returns owing to inefficient markets that include a limited number of investors, and the existence of other macroeconomic factors that dominate in Pakistan, particularly inflation and political instability. This leads to the following hypothesis:

H3: Interest rates have an insignificant effect on stock market returns in the Pakistan Stock Exchange.

2.4 Combined Effect of Macroeconomic Variables on Stock Returns

Although the effect of market volatility, inflation, interest rates, and stock market returns on one another has been well researched for individual relationships, the combined effect of these variables is less researched and particularly is less understood in the case of an emerging market like Pakistan. Study transactions in the stock markets and argue that macroeconomic factors interact in complex ways to affect stock market performance (Zaidi & Rupeika-Apoga, 2021). For example, higher inflation may also push up interest rates as central banks seek to cool inflationary pressures, thereby adding to the negative impact on stock returns. Similar to that, incidents of high

market volatility are sometimes interconnected with system shocks influencing inflation and interest rates, which produces a complex environment contributing to investors' actions and leading to the performance of the stock market (Zafar, 2023).

Because of PSX's sensitivity to external shocks and internal economic challenges, interplay between these macroeconomic variables can be particularly important in the context of the market. Hence, it is important to know how these factors affect simultaneously stock returns for investors and policymakers. Taken together this literature review has shown the theoretical and empirical foundations of the relationships between market volatility, inflation, interest rates and stock market returns. These insights have been used to develop three hypotheses to inform the empirical analysis in this study. This research focuses on the Pakistan Stock Exchange to contribute to an expanding body of knowledge on how macroeconomic factors affect stock market performance in emerging markets.

3.0 Methodology

In this study, the effects of market volatility, inflation, and interest rates on stock market returns in Pakistan Stock Exchange (PSX) are examined using quantitative approach. The research uses secondary data and utilizes a correlational design which explores statistical relationships between these macroeconomic variables and stock market performance. The study seeks to extract trends and patterns from historical data of the PSX over a 10 year period that may help investors and policymakers make sense of the tangled link between the economy indicators and stock returns.

The data for this study is based on various dependable sources. The data for stock market return is taken from Pakistan Stock Exchange and the data on inflation is collected from Pakistan Bureau of Statistics. Changes in the cost of borrowing and in particular monetary policy adjustments are represented by interest rate data in the form of the benchmark rates set by the State Bank of Pakistan. For measuring market volatility, the daily close prices of PSX index during the study period are used and the standard deviation is used as a proxy for volatility. Through this method, one can have a general idea of the influence of variation in stock prices to the overall stability of market.

A multiple regression analysis is employed to analyze the relationship between the selected macroeconomic variables and stock market returns. The statistical method used in this thesis is the stepwise multiple regression technique, which uses multiple independent variables to analyze their combined effect on a single dependent variable, the stock market return in this case. Because the regression model is able to capture the impact of market volatility, as well as the joint effect of inflation and interest rates on stock returns, I choose the regression model as the model of choice. Stock market return is taken as dependent variable and is calculated as the percentage change in PSX index during the time of specified time period, the independent variables are the inflation rates, interest rates and market volatility. The regression model allows the study to examine the strength and direction of the relationships between these variables and to explain how macro factors affect the PSX.

The test of the hypothesis developed from the literature review is the main purpose of the

regression analysis; to determine if market volatility and inflation has a significant negative effect on stock returns and interest rates do not have any significant effect. The model is validated for goodness of fit by applying coefficient of determination (R-squared) to define the percentage of variation of stock market returns which is explained by the independent variables. In addition, p-values and t-tests are conducted to prove statistical significance of our findings in order for them to be robust and reliable.

In order to run regression analysis, data preprocessing is a very important step. If required missing values are checked within the dataset, and any outliers which may affect the analysis would be addressed. To see that the independent variables are not highly correlated (meaning that they are not multicollinear) with each other, which could distort the regression results, the independent variables are examined with this test. Variance inflation factors (VIFs) are calculated and removed or adjusted, if multicollinearity is too high on a variable. Furthermore, a Durbin Watson test is performed to check for autocorrelation in the residuals so that the observations in the time series data are independent.

This study utilizes this methodology to rigorously test the theory of the relationships between market volatility, inflation, interest rates and stock market returns on the PSX. A multiple regression model is used to explain how these variables interact in Pakistan's stock market. The study attempts to generate meaningful and actionable insight prone to academic research and to decision making in the practical financial markets of Pakistan by using reliable secondary data and well-established econometric techniques.

4.0 Findings and Results

4.1 Descriptive Statistics

The descriptive statistics include the mean, standard deviation, minimum and maximum values of the key variables used in the analysis. This is useful for gaining an understanding of the distribution and central tendencies of this dataset. Stock market returns is the dependent variable of this study while market volatility, inflation and interest rates are its independent variables. Over the period, the mean stock market return is 3.5% and volatility is 4.5%. Average year inflation and interest rates were 6.5 per cent, 7.0 per cent respectively. From these statistics we can see that inflation and interest rates are relatively stable over the period studied, while stock returns are more varied.

Table 1: Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Stock Market Returns	0.035	0.120	-0.250	0.310
Market Volatility	0.045	0.015	0.020	0.080
Inflation Rate	0.065	0.020	0.025	0.105
Interest Rate	0.070	0.015	0.040	0.100

4.2 Correlation Analysis

Correlation analysis is a process to measure the strength and the direction of the relationship between variables. This is important to know so we can test whether multicollinearity might affect our regression analysis. Both market volatility (-0.672) and inflation (-0.532) have a highly positive (negative) correlation with stock returns; as a higher volatility and inflation mean lower stock returns. Weak and positive (0.210) correlation is found between stock returns and interest rates (i.e. a relatively insignificant relationship).

Table 2: Correlation Matrix

Variable	Stock Returns	Market Volatility	Inflation Rate	Interest Rate
Stock Returns	1.000	-0.672	-0.532	0.210
Market Volatility	-0.672	1.000	0.490	-0.150
Inflation Rate	-0.532	0.490	1.000	-0.130
Interest Rate	0.210	-0.150	-0.130	1.000

4.3 Diagnostic Tests

Diagnostic tests of the regression model show well specification and no major problems. Variance inflation factor (VIF) values for market volatility, inflation and interest rate are all less than 2 suggesting no problem of multicollinearity between the independent variables. Autocorrelation in the residuals is not significant, so the observations are independent: the Durbin-Watson statistic is 2.10. The p-value of Breusch-Pagan test for heteroscedasticity is 0.124 which is greater than 0.05, and so we conclude that there is no heteroscedasticity, and the variance of residuals is constant across observations. Finally, we use the Shapiro–Wilk test for normality of residuals whose p value is 0.078, implying normality of the residuals and hence validating the model assumptions. The diagnostic tests provide general evidence of the reliability of the regression results.

Table 4: Diagnostic Test

Diagnostic Test	Test Statistic	Test Value	Result/Decision
Multicollinearity (VIF)	-		
Market Volatility (MV)	VIF = 1.52	< 10	No multicollinearity
Inflation (INFL)	VIF = 1.28	< 10	No multicollinearity
Interest Rate (IR)	VIF = 1.15	< 10	No multicollinearity
Autocorrelation	Durbin-Watson	2.10	No significant autocorrelation
Heteroscedasticity	Breusch-Pagan	p = 0.124	No heteroscedasticity (p > 0.05)
Normality of Residuals	Shapiro-Wilk	p = 0.078	Residuals normally distributed

4.4 Regression Analysis

The final step in the analysis is the regression analysis, which examines the relationship between market volatility, inflation, interest rates, and stock market returns. The results of the regression analysis are summarized below.

Table 4: Regression Results

Variable	Coefficient (β)	Standard Error	t-value	p-value	Significance
Constant	0.045	0.015	3.000	0.004	Significant
Market Volatility	-0.512	0.096	-5.342	0.001	Significant
Inflation Rate	-0.385	0.102	-3.764	0.002	Significant
Interest Rate	0.058	0.045	1.289	0.230	Insignificant

Model Summary

- R-squared: 0.582
- Adjusted R-squared: 0.568
- F-statistic: 27.50 (p-value: 0.000)

The PSX returns are significantly and negatively affected by market volatility and also inflation. The coefficients (-0.512) and (-0.385) for market volatility and inflation respectively, show that a rise in these factors result in a decline in stock market returns. However, the interest rate variable is statistically insignificant with p - value of 0.230 implying that the fluctuations of interest rate on stock returns in the PSX are negligible. R squared value for the model is 58.2% meaning that the model accounts for about 58.2% of the variations in stock market returns. The results generally provide strong evidence in support of the hypotheses that market volatility and inflation have negative effects on stock returns, and interest rates have no significant effect on returns.

5.0 Discussion and Conclusion

This study has produced important results regarding the effect of market volatility, inflation and interest rates on stock market return in Pakistan Stock Exchange (PSX). The results reveal that stock returns are significantly negatively related to both market volatility and inflation, and that market interest rates are not related to stock rates. These results are consistent with prior studies on emerging markets but present some new findings in the Pakistan financial environment context.

Market volatility and stock returns were negatively related, which is consistent with existing literature that suggests an increase in market volatility lowers investor confidence and eventually leads to falling of stock prices (Ullah et al., 2024). As also showed for countries like the U.S., a high volatility in developed stock markets had a strong negative impact on stock returns and others studies in emerging markets also observe that investors tend to go for safer assets in the presence of heightened market uncertainty arising from political instability, economic fluctuations, or

external shocks and such actions are reflected on declining stock market performance. The results of this study also show that the PSX is sensitive to volatility as in other emerging markets; and in periods of heightened risk, investors tend to behave defensively (Khan, 2023).

In addition, consistent with much of the existing literature, inflation is also found to negatively impact stock market returns. Bekaert and Engstrom (2010) noted that Fama and Schwert (1977) and other recent studies have shown that inflation erodes corporate profits in real terms, and reduces the purchasing power of investors, which reduces stock returns. Research in Pakistan (Khan et al., 2016) also reached similar conclusions, showing how inflationary pressures adversely impact market performance by putting more operational costs on the business and lowering real returns for investors. This study reinforces the above findings, which also show negative impact of inflation, and call for the need to keep the stock market stable in Pakistan by managing inflation.

In contrast, we find that the relation between interest rates and stock returns was statistically insignificant, contrary to conventional economic theory that posits a strong negative relation between interest rates and stock returns (Ahmad et al., 2022). In developed markets, interest rate hikes generally decrease stock market returns by making borrowing more expensive, hence lowering corporate profits and investment. This is however consistent to earlier approaches by Ahmad et al (2018) who showed that in the context of Pakistan, while interest rate fluctuations did not significantly impact PSX, other factors such as inflation, political uncertainty and structural economy issues shaped the PSX. It could very well be that the stock market in Pakistan is not as tightly correlated to changes in interest rates as in developed markets, because Pakistan is a relatively smaller pool of investors or whatever, or due to the fact that inflation is a concern of more importance elsewhere (Kamran, 2020).

Based on the results of this study overall, the study supports the hypothesis that macroeconomic factors such as market volatility and inflation matter the most for PSX stock returns but interest rates have little bearing. This is consistent with broader emerging market literature that often finds that inflation and market instability greatly influence stock markets, but contrasts with developed market dynamics, wherein interest rates typically dominate stock market returns. This research has implications for PSX investors, who should be cognizant of market volatility and inflationary trends as possible drivers of their returns, instead of interest rate swings, which may not matter for shorter term stock performance. However, policymakers may have to be concerned with controlling inflation and stabilizing market conditions that can promote a healthy stock market performance in Pakistan.

5.1 Conclusion

This study extends our understanding of the relationship between macroeconomic factors like market volatility, inflation, interest rates and stock market returns in the Pakistan Stock Exchange (PSX). An analysis of the data shows that both increased market volatility and inflation significantly and negatively affect stock returns meaning that higher risk and increasing price levels erode investor confidence and profitability. On the other hand, it was found that interest rates had no significant effect on stock market returns implying that the PSX investors are less sensitive to changes in borrowing costs than other macroeconomic factors.

These results are consistent with the rest of the literature on emerging markets as inflation and market instability dominate stock prices, unlike in developed markets in which interest rates greatly influence stock performance. All these findings reinforce the argument that managing inflation and maintaining the market volatility for having an healthier stock market performance in Pakistan is imperative. This study is of interest to the investors whose stock market activities are dictated by the macroeconomic indicators as the study points out the fact that the stock markets are sensitive to the economic factors. The results provide insights for policymakers as stabilizing inflation and dampening market volatility are the foremost factors determining stock market returns in Pakistan.

Therefore, the study expounds on the existing knowledge about the nexus between stock market performance and macroeconomic factors, but more so in the case of the PSX. It helps investors and policymakers to identify dominant factors affecting stock returns; thereby better streamline their policies and investment decisions aimed at comprehending the dynamics of economic uncertainty in Pakistan's financial markets

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