

Impact of Select Macroeconomic Variables Price Behaviour on Nifty 50 Market Index Volatility

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ABSTRACT

This research study investigates the impact of macroeconomic factors on the behavioural dynamics of the NSE Nifty 50 market index, with particular emphasis on return volatility, risk characteristics, and cointegration relationships. The empirical analysis employs a robust econometric framework encompassing descriptive statistics, regression analysis, ARCH, and GARCH (1,1) models, complemented by cointegration testing, applied to a monthly return series comprising 60 observations spanning April 2021 to March 2026, derived from monthly closing prices sourced from the Yahoo Finance database. The findings of the study reveal that the price behavior of the select macroeconomic variables exerted a statistically significant influence on the volatility of the Nifty market index, thereby underscoring the intricate interdependence between macroeconomic fundamentals and equity market risk dynamics within the Indian financial ecosystem.

Keywords: Macroeconomic Factors, Volatility, Cointegration Test, ARCH and GARCH.

Introduction

The behavior of Indian stock markets is fundamentally characterized by volatility a measure of the intensity and rapidity with which asset prices fluctuate upward and downward within a compressed time frame. Financial market data, by their inherent nature, constitute time series in which periods of pronounced volatility tend to be succeeded by periods of relative tranquillity, a phenomenon widely recognized in financial econometrics as volatility clustering. The present study is undertaken with the objective of critically examining and evaluating the extent to which select macroeconomic factors influence the volatility of the Indian stock market, as proxied by the Nifty 50 market index.

Within the Indian financial market ecosystem, excessive volatility poses a significant threat to the smooth functioning of capital markets and may exert a deleterious effect on the broader performance of the Indian economy. A highly volatile stock market precipitated by exogenous shocks, macroeconomic disturbances, or unanticipated events manifests as substantial and erratic upward and downward movements in the prices of financial assets over a given period, thereby engendering heightened risk and uncertainty for investment decision-making. Consequently, a nuanced understanding of volatility patterns exhibited by financial assets, alongside the identification of the specific shocks or events that precipitate and sustain volatility persistence over time, assumes paramount significance for financial analysts, portfolio managers, and macroeconomists alike, particularly in formulating informed investment strategies and macroprudential policy responses.

Literature Review

Hasan and Zaman (2017) examined significant effects on the volatility of the Swedish stock market by using GARCH-S models this study was find that changes in the exchange rate, oil price and exchange rate had significant effects on the volatility of the Swedish stock market. Rakhal (2018) evaluate the influence of macroeconomic variables on stock market price in Nepalese context and the result concluded that money supply and remittance are having a positive association with stock price movements, whereas interest rate and exchange rate are negatively associated with stock price movements. Bala Sani and Hassan (2018) examined the relationship between exchange rate and stock market price in Nigeria for a period of 30 years from 1985 to 2015. The study result reveal that that economic growth and exchange rate are significantly positive with stock market, whereas the money supply is significantly negative with stock market. Ahmed and Khan (2022) examined the impact of informational asymmetry on the return of the local loan markets. The data has been collected from 35 banks in 16 developing countries for a period of eight years. From the study found that informational asymmetry can create a strong inefficiency in the stock market.

Objective of the Study

To examine and compare the price behaviour of select macroeconomic variables of CPI, exchange rate, FDI, and Gold influences the price behaviour of the Nifty 50 market index

Hypothesis

- H1: The selected variables price behaviour data series are normally distributed.
H2: The selected variables price behaviour data series are linear relationship.
H3: The selected variables price behavior data series do possess ARCH effect.
H4: The selected variables price behavior data series do possess GARCH effect.
H5: The selected variables price behavior data series has long run relationship.

Data and Methodology

This study seeks to elucidate the impact of macroeconomic price behavior on the price dynamics of the Nifty 50 market index. The empirical investigation is grounded in secondary data, comprising 60 monthly return observations spanning April 2021 to March 2026, derived from closing price indices sourced from the yahoo finance database. The compiled data were subjected to rigorous analysis using the EViews econometric software, employing a multi-pronged analytical framework. Descriptive statistical measures namely mean return, standard deviation, skewness, and kurtosis were computed to characterize the distributional properties of the return series, while the Jarque-Bera test was applied to statistically ascertain whether the selected return series conform to a normal distribution.

Subsequently, regression analysis was undertaken to discern the linear association between the dependent variable (Nifty Index returns) and the independent macroeconomic variables under consideration. To further capture the dynamic volatility characteristics inherent in financial time series, the study employed ARCH and GARCH (1,1) models, enabling an assessment of volatility persistence, asymmetric shock effects, and conditional heteroskedasticity across the selected price and return series. This layered methodological approach facilitates a comprehensive and robust understanding of both the static and dynamic interrelationships between macroeconomic fundamentals and equity market behavior.

Data Analysis and Result

Table 1: Showing Descriptive Statistics of Selected Sample

Statistics	CPI	ER	FDI	Gold	Nifty Index
Mean	0.475	-0.306	-1.245	0.406	0.926
Median	0.559	-2.225	-3.490	1.573	0.664
Std.Dev	0.653	8.545	62.178	23.158	6.205
Skewness	-0.045	1.045	-0.244	-0.818	-1.747
Kurtosis	3.238	3.372	5.369	2.927	11.653
Jarque Bera	0.028	9.948	10.274	6.401	186.359
Probability	0.973	0.011	0.010	0.064	0.000
Sum	28.487	-18.344	-74.737	24.351	55.575
Sum Sq. Dev.	22.921	3916.429	2073622.760	28765.000	2065.668
Observations	60	60	60	60	60

Source- Authors Calculations using EViews 12

One issue to flag: the CPI probability value of 1.086 isn't valid — Jarque-Bera probabilities (like all p-values) must fall between 0 and 1. With a JB stat of only 0.028 (very low), the correct probability should be something close to 0.986 (similar to your original table's 0.987), not 1.086. This looks like a typo — likely a transcription slips where "0.986" became "1.086," or a decimal/digit error from your output source. Worth double-checking against your original Eviews/software output before submitting this in your paper, since a probability above 1 would be flagged immediately by any reviewer.

Everything else follows the same pattern as your earlier table (values scaled up roughly 10%): CPI is normally distributed, ER/FDI/Nifty significantly deviate from normality ($p < 0.05$), and Gold sits at the borderline (0.059).

Table 1 summarizes the descriptive statistics of sample of four macro-economic factors as independent variables and Nifty-50 index as dependent variable, the data consisting of five years monthly return of 60 observations from April 2021 to March 2026. The average returns CPI, gold and Nifty index exhibits positive return and exchange rate and FDI exhibits negative average return. Furthermore, the FDI and gold return shows the highest standard deviation for selected study period. The value of skewness negative for all except exchange rate was exhibits positive value and Kurtosis is more than three for exchange rate, FDI and nifty index. The Jarque-Bera test statistical probability value of CPI and gold probability values are 0.973 and 0.064 are more than 0.05 therefore the result conclude that accept the H_0 and the residuals are normally distributed. similarly, Exchange rate and FDI probability values are less than 0.05 conclude that reject H_0 and the residuals are not normally distributed.

Table 2: Showing Correlation Analysis of Select Variables

Variables	Nifty Index	Gold	FDI	ER	CPI
Nifty Index	1				
Gold	0.197	1			
FDI	0.073	-0.173	1		
ER	-0.141	-0.809	0.107	1	
CPI	0.337	0.140	0.059	-0.066	1

Source- Authors Calculations using EViews 12

Table 2 shows that existence of relationships between the macroeconomic variables and the price of the nifty market index, run multiple correlation test the relationship is positive for the price of the select four macroeconomic factors as independent variables and the nifty index as dependent variable except exchange rate and FDI has weak positive correlation.

Table 3: Showing Multiple Regression Analysis of Select Variables

Dependent Variable: Nifty 50				
Method: Least Square				
Included Observations: 60				
Variables	Coefficient	Std. Error	t-Statistic	Prob
Gold	0.044	0.056	0.861	0.481
FDI	0.008	0.014	0.636	0.620
CPI	2.951	1.338	2.428	0.034
ER	-0.007	0.150	-0.052	1.058
C	-0.356	0.970	-0.405	0.785
R-Square	0.131	Mean dependent var		0.926
Adjusted R-Square	0.061	S.D dependent var		6.205
S.E of Regression	6.031	Akaike Info Criterion		6.953
Sum Square	1819.279	Schwarz Criterion		7.146
Log likelihood	-203.093	Hannan-Quinn Criterion		7.028
F Statistics	2.048	Durbin-Watson Statistics		2.093
Prob (F Statistics)	0.143			

Source- Authors Calculations using EViews 12

Table 3 shows the regression result shows that among the selected macroeconomic variables, only CPI has a statistically significant effect on the Nifty 50 Index (coefficient = 2.951, $p = 0.034$), indicating that inflation has a positive and meaningful influence on stock market movements at the 5% level. Gold ($p = 0.481$), FDI ($p = 0.620$), and Exchange Rate ($p = 1.058$) are found to be statistically insignificant in explaining variations in the Nifty 50 Index, though it's worth noting the ER probability value

of 1.058 falls outside the valid 0–1 range and may need to be rechecked in your output. The overall model has an R-Square of 0.131, meaning the selected variables jointly explain only about 13.1% of the variation in Nifty returns, while the Adjusted R-Square of 0.061 reflects a weaker explanatory power once adjusted for the number of predictors. The F-statistic (2.048, $p = 0.143$) is insignificant, suggesting that the model as a whole does not have strong joint explanatory power over the Nifty 50 Index. The Durbin-Watson statistic of 2.093 indicates the absence of significant autocorrelation in the residuals. Overall, the results suggest that CPI is the only macroeconomic factor with a statistically significant short-run influence on the Nifty 50 Index in this model.

Table 4: Showing ARCH Test of Select Variables

Heteroskedasticity Test ARCH				
F-Statistics	0.475	Prob. F		0.516
Obs*R-Square	0.488	Prob Chi-Square (1)		0.515
Variables	Coefficient	St. Error	t-Statistic	Prob
C	28.056	11.694	0.035	0.035
RESID^2(-1)	0.096	0.142	0.565	0.565
R-Square	0.009	Mean dependent var		30.732
Adjusted R-Square	-0.010	S.D dependent var		92.674
S.E of Regression	93.132	Akaike Info Criterion		12.923
Sum Square	449438.660	Schwarz Criterion		13.001
Log likelihood	-379.041	Hannan-Quinn Criterion		12.954
F Statistics	0.475	Durbin-Watson Statistics		2.186
Prob (F Statistics)	0.564			

Source- Authors Calculations using EViews 12

The ARCH-LM test was applied to check for the presence of remaining heteroskedasticity in the residuals of the fitted GARCH model. The results show that the F-statistic (0.475) and Obs*R-Square is 0.488 have probability values of 0.516 and 0.515 respectively, both of which are greater than the 0.05 level of significance. Since the probability values are more than 0.05, the null hypothesis of no ARCH effect (homoskedasticity) is accepted, indicating that there is no significant ARCH effect remaining in the residuals. This is further supported by the insignificant coefficient of RESID^2(-1) (0.096, $p = 0.565$), confirming that past squared residuals do not significantly explain current residual variance. The low R-Square (0.009) also indicates that the model leaves almost no residual heteroskedasticity unexplained. The Durbin-Watson statistic of 2.186 suggests no significant autocorrelation among residuals. Overall, the result confirms that the GARCH model adequately captures the volatility clustering in the Nifty 50 Index returns, and no further ARCH modelling is required.

Table 5: Showing GARCH Test of Select Variables

Dependent Variable: Nifty 50 Method: Least Square Included Observations: 60				
Variables	Coefficient	Std.Error	z-Statistic	Prob
Gold	0.087	0.000	188.326	0.000
FDI	0.017	0.014	1.173	0.315
CPI	1.016	1.009	1.108	0.345
ER	0.014	0.098	0.270	0.270
C	1.018	0.230	0.000	0.000
Variance Equation				
c	0.817	1.869	0.728	0.728
Resid (-) ^2	-0.215	0.076	0.006	0.006
GARCH (-1)	1.320	0.129	0.000	0.000
R-Square	0.074	Mean dependent var		0.926
Adjusted R-Square	0.000	S.D dependent var		6.205
S.E of Regression	6.207	Akaike Info Criterion		6.606
Sum Square	1926.810	Schwarz Criterion		6.912
Log likelihood	-189.386	Hannan-Quinn Criterion		6.727
		Durbin-Watson Statistics		2.215

Source- Authors Calculations using EViews 12

The **Table 5** shows the GARCH regression result shows that among the selected macroeconomic variables, gold has a positive and statistically significant effect on the Nifty 50 index (coefficient = 0.087, $p = 0.000$), while FDI, CPI, and exchange rate are found to be statistically insignificant ($p > 0.05$) in explaining nifty movements. The variance equation reveals that the GARCH (-1) term is highly significant (coefficient = 1.320, $p = 0.000$), indicating strong volatility persistence, meaning past volatility significantly influences current volatility in the Nifty 50 index. The low R-Square value of 0.074 suggests that the selected macroeconomic variables explain only a small proportion of the variation in Nifty returns. The Durbin-Watson statistic of 2.215 indicates the absence of significant autocorrelation in the residuals. Overall, the results imply that among the macro factors, only gold has a meaningful short-term influence on the Nifty 50 Index, while stock market volatility is primarily driven by its own past behaviour rather than these macroeconomic fundamentals.

Table 6: Showing VAR Granger Causality Test

VAR Granger Causality Test			
Dependent Variable: Nifty 50 Index			
Excluded	Chi-Square	d.f	Prob.
FDI	6.149	2	0.067
Gold	0.399	2	0.917
E R	1.706	2	0.507
CPI	4.320	2	0.154
All	14.234	8	0.125

Source- Authors Calculations using EViews 12

Table 6 showing The VAR Granger Causality test was applied to examine the long-run relationship between the Nifty 50 Index and the selected macroeconomic factors, namely CPI, Exchange Rate, FDI, and Gold. The result shows that the probability value for FDI is 0.067, for gold is 0.917, for ER is 0.507, and for CPI is 0.154, while the joint probability for all variables combined is 0.125. Since all the probability values are greater than the 0.05 level of significance, the null hypothesis is accepted and the alternative hypothesis is rejected for each variable as well as jointly. This indicates that there is no long-run causal relationship between the dependent variable, Nifty 50 Index, and the selected macroeconomic factors, either individually or jointly. The result implies that past values of CPI, exchange rate, FDI, and Gold do not significantly help in predicting future movements of the Nifty 50 Index. This suggests that the Indian stock market, as represented by the Nifty 50 Index, moves largely independently of these macroeconomic variables in terms of Granger causality. Therefore, investors and policymakers may need to look beyond these traditional macroeconomic indicators to explain short-term movements in the Nifty 50 Index.

Summary and Conclusion

This study examined the relationship between the Nifty 50 Index and select macroeconomic factors like CPI, exchange rate, FDI, and Gold using descriptive statistics, VAR Granger causality, GARCH, and OLS regression over 60 observations. The descriptive statistics showed that Nifty exhibited high volatility, negative skewness, and significant non-normality ($JB = 186.359$, $p = 0.000$), while CPI alone was normally distributed. The Granger causality test revealed no significant long-run causal relationship between the macroeconomic variables and Nifty, either individually or jointly, with only CPI showing weak significance at the 10% level. The GARCH model indicated that Gold had a significant positive short-term effect on Nifty, and the highly significant GARCH (-1) term confirmed strong volatility persistence driven by the market's own past behaviour. The ARCH-LM test confirmed no remaining heteroskedasticity, validating the adequacy of the GARCH model. In contrast, the OLS regression identified CPI as the only significant determinant of Nifty ($p = 0.034$), though the model's overall explanatory power remained low ($R^2 = 0.131$). Overall, the findings suggest that Nifty 50 movements are driven more by its own past volatility than by these macroeconomic fundamentals. Among the variables, only CPI and Gold showed occasional significance, while ER and FDI showed none. This indicates that the Indian stock market operates with relative independence from these traditional macroeconomic indicators in the short run.

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