

Impacts of inflation on the Vietnamese stock market in economic turbulence

Nguyen Huu-Dung^{1*}, Le Viet Long²

¹National Economics University, 207 Giai Phong Street, Dong Tam Ward, Hai Ba Trung District, Hanoi, Vietnam

²Department for Investment, Thang Long Tobacco Company, 235 Nguyen Trai Street, Thuong Dinh Ward, Thanh Xuan District, Hanoi, Vietnam

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Abstract:

This study employs the GARCH model to examine how inflation affects the Vietnamese stock market. The analysis uses 2001-2022 data from the General Statistics Office and the Ho Chi Minh Stock Exchange (HoSE). This time frame encompasses various market cycles, including the recent financial crises, which alter the characteristics of stock variance. The findings reveal that inflation has a strong impact on the volatility of stock indexes because the psychological herd of the stock players has a huge impact on market volatility such that it weakens the market, leading to instability due to stock prices being blown up too high or depressed too low. Herd mentality facilitates price manipulation, stock price manipulation, and speculation. When the demand for capital flows into the secondary market, a surge has led to a large amount of money in circulation. This has caused a high level of inflation. The findings indicate that a one percent increase in inflation is associated with a 6.692 percent increase in the VN index, suggesting that Vietnam's stock market returns can hedge against inflation. Yet, the popularity of speculative investments necessitates that the Vietnamese government not only address inflation but also improve financial regulations and stock market oversight.

Keywords: economic crisis, inflation, stock return volatility, Vietnam stock market.

Classification number: 2.1

1. Introduction

The impact of inflation on the stock market often receives great attention from both the government and investors [1]. Investors frequently have a strong desire to utilize inflation as a metric for predicting future trends in the stock market. This has the potential to improve their capacity to properly manage their positions and portfolios, thereby leading to higher returns and/or less risk. Meanwhile, policymakers may pay attention to the situation of the stock market, which can be regarded as a leading indicator of future macroeconomic activity [2]. They perceive that the operation of the stock market may be able to explain some changes in key macroeconomic measures, and they could hold clues for Vietnam's post-pandemic recovery. As such, they can better control the direction, magnitude, and stability of the economy by adjusting macroeconomic variables such as inflation if the relationship between stock returns and inflation has predictive power to stimulate the growth of the economy.

However, the effect of inflation on the stock market,

has never been fully determined. The examination of the relationship between inflation rate and stock market returns in the field of economics is based on two divergent concepts: the I. Fisher's hypothesis and the E.F. Fama's hypothesis [3, 4]. The I. Fisher's hypothesis proposes that equity stocks operate as security interests against a firm's tangible assets, thereby potentially providing protection against inflation [3]. The I. Fisher's hypothesis posits that the stock market is subject to the influence of the inflation rate via three main channels. Firstly, the production of goods and services by firms is impacted, which in turn affects stock market performance. Secondly, investor behavior and the value of investments on the stock market are influenced by inflation. Lastly, monetary policy tightening is implemented to manage inflation, and this has implications for the stock market. In contrast to the I. Fisher's hypothesis, E.F. Fama's hypothesis posits that the apparent correlation between inflation and stock returns is not genuine [4], as it is driven by a positive correlation between stock returns and anticipated economic activity, as well as a negative correlation

*Corresponding author: Email: nguyen.huudung@neu.edu.vn

between anticipated economic activity and inflation [5]. In the statistical association between stock returns and inflation, inflation is functioning just as a proxy for anticipated economic activity.

In empirical analysis, there is also a divergence of findings regarding the impact of economic health on stock market volatility and, consequently, the risk posed by inflation to investors. For instance, J.T. Sokpo, et al. (2017) [6] have provided empirical evidence supporting the notion that inflation has no predictive power in determining conditional stock exchange volatility in Nigeria. In contrast, T.C. Chiang (2023) [7] suggested that there may be a negative correlation between real stock return and anticipated (and unanticipated) inflation in the US. L. Li, et al. (2010) [8] discovered the relationship between inflation and stock returns differs across inflationary regimes. Likewise, within the context of Vietnam, a number of empirical investigations demonstrate a convergence of results. For example, a recent study by T.H. Nguyen, et al. (2009) [9] used OLS regression with data from the VN-Index and each industry sector to examine the impact of inflation on the stock market, demonstrating that inflation was a systemic risk factor that had an effect on the entire stock market. The return on stocks is significantly impacted negatively by inflation. This meant that stock market investments were not a hedge against inflation. On the contrary, L.V. Long (2021) [10] demonstrates that there exists a positive correlation between the inflation rate and the magnitude of the VN-Index, whereby an increase in the former leads to a corresponding increase in the latter. Other studies using Vector Autoregression (VAR) [11, 12], Autoregressive Distributed Lag (ARDL) [13, 14], Error Correction Model (ECM) [15], as well as other approaches such as Autoregressive Integrated Moving Average (ARIMA) yielded a mixed pictures.

During the recent economic instability, a notable argument has emerged on the extent to which the movement of share prices exceeds the level considered reasonable, so exemplifying a phenomenon commonly referred to as “excess volatility”. This phenomenon implies that asset prices exhibit greater volatility than can be rationalized by alterations in the fundamental attributes of the underlying firms, thereby indicating that stock prices may not consistently serve as reliable predictors of future events [8]. The price fluctuations of financial assets in the stock market occasionally appear to be incongruous with the prevailing conditions in the broader

economy, commonly known as the ‘real economy’. This phenomenon has been particularly evident in recent years, characterized by significant fluctuations in prices during periods of economic turbulence. Consequently, the efficiency of the economy has diminished, while the stock market has become increasingly volatile and challenging to navigate [16]. The characteristics of stock variance might be changed through market cycles including financial crises. This leads to two important questions that frequently preoccupy policymakers and investors recently: does inflation really have an effect on the stock market, particularly in light of the recent economic shocks? Is it possible to quantify this impact?

This article will answer these questions by investigating the impact of inflation on the operation of the stock market in Vietnam using a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model. This research diverges from the previous literature by incorporating recent economic shocks and the intrinsic attributes of stock market volatility inside these shocks, which bear noteworthy consequences for policymakers and investors. The findings of this research may provide significant knowledge regarding the fundamental elements influencing the performance of the stock market in Vietnam. Additionally, it may present potential approaches to improve its operational effectiveness, particularly considering the recent economic disruptions.

2. Methodology

2.1. Empirical model

In order to investigate the impact of inflation on the stock market return, time series data will be utilized in this article. We particularly pay attention to heteroskedasticity when performing the time series analysis because the disturbance variances in time-series data usually less stable than usually assumed [17]. Specifically, the uncertainty of stock market returns, which are measured using variance and covariance, changes over time. For this problem, it is necessary to specify the variance dynamics (volatility). R.F. Engle (1982) [17] suggested that the ARCH (Autoregressive Conditional Heteroskedasticity) model can be a standard time series treatment. It is well known that a period of high volatility continues for a while after a period of increased volatility, a phenomenon called volatility clustering. The ARCH model takes the high persistence of volatility into consideration captured by allowing volatility to depend on the lagged values of the innovation terms and q [see equations (1) and (2)],

which are chosen such that the residuals of the variance equation are white noise.

$$Y_t = \beta_1 + \beta_2 X_t + u_t \quad (1)$$

$$u_t \sim N(0, \sigma_t^2) \quad (2)$$

$$\sigma_t^2 = \gamma_0 + \sum_{i=1}^p \delta_i \sigma_{t-i}^2 + \sum_{j=1}^q \gamma_j u_{t-j}^2$$

where: u_t = Error term at time t ; σ_t^2 = Conditional variance for the current time t ; σ_{t-i}^2 = Conditional variance for the current time $t-i$; u_{t-j}^2 = News about volatility from the previous period t to the next period j , measured as the lags of the squared residual from equation; X_t represents a $(k \times 1)$ vector of explanatory variables; β_1, β_2 are the coefficients of the explanatory variables; q is the length of ARCH lags; p is the periods in the series; δ_i is the coefficients of ARCH; γ_0, γ_j are the parameters of the model.

However, this research uses the following extended generalized ARCH (1,1) model to estimate the impact of inflation on the operation of the stock market in Vietnam because Q.H. Vuong (2002) [18] found that there was a generalized ARCH(1,1) effect in the daily stock returns series with Vietnam's market price index. The notation (1,1) between parentheses is a standard symbol in which the first number refers to the order of ARCH terms, while the second number refers to the order of generalized ARCH terms, sometimes referred to as the number of GARCH terms. The GARCH model has greater flexibility in terms of non-negativity constraints, volatility clustering, parsimony, and the ability to account for leptokurtosis. This is seen in Table 1, which demonstrates that the time series are characterized by leptokurtosis.

$$R_t = \beta_1 + \beta_2 R_{t-1} + u_t$$

$$\sigma_t^2 = \gamma_0 + \delta_1 \sigma_{t-1}^2 + \gamma_1 u_{t-1}^2 + \alpha_1 CPI_t$$

Condition for the model: $\delta_1 + \gamma_1 < 1$

where: u_t = Error term at time t ; σ_t^2 = Conditional variance for the current time t ; σ_{t-1}^2 = Conditional variance for the current time $t-1$; u_{t-j}^2 = News about volatility from the previous period, measured as the lags of the squared residual; u_{t-1}^2 = News about volatility from the period $t-1$; CPI_t = Consumer price index; R_t = market return at time t . R_{t-1} = market return at time $t-1$; β_1, β_2 are the coefficients of the explanatory variables; δ_1 is the coefficient of GARCH; α_1 is the coefficient of CPI; γ_0, γ_j are the parameters of the model to ensure that the conditional variance is positive.

2.2. Data

2.2.1. Data collection

The data source for this research was obtained from the General Statistics Office of Vietnam and from the Ho Chi Minh Stock Exchange (HoSE).

The inflation employed in this study is the monthly consumer price index (CPI) data spanning from August 2001 to July 2022. The change in CPI is calculated as follows:

$$IF_t (\%) = 100 \times \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}}$$

where: IF_t = Change in CPI; CPI_t = Consumer price index at month t ; CPI_{t-1} = Consumer price index at month $t-1$.

The stock market return (R_t) is estimated from VN-Index values, which are taken at the last trading session of each month from the stock market index of HoSE. Stock market return is estimated by the formula:

$$R_t (\%) = 100 \times \frac{VNI_t - VNI_{t-1}}{VNI_{t-1}}$$

where R_t = market return at time t ; VNI_t = VN-Index at month t ; VNI_{t-1} = VN-Index at month $t-1$.

The information, such as the number of listing codes, the listed sectors, and market capitalization at HoSE, fully reflects the nature of the Vietnamese stock market; thus, the data can help to ensure that the research results are reliable, objective, and closely reflect the actual operation of the market.

2.2.2. Data description

Description of the data is shown in Table 1.

Table 1. Description of data (August 2001 - July 2022).

Variables	R	CPI
Mean	101.4841	100.5172
Median	100.8154	100.3550
Maximum	138.5171	103.9100
Minimum	65.66302	98.46000
Std. Dev.	9.716498	0.769575
Skewness	0.289238	1.515395
Kurtosis	4.849501	6.372016
Jarque-Bera	39.43052	215.8399
Probability	0.000000	0.000000
Sum	25573.99	25330.33
Sum Sq. Dev.	23697.00	148.6537
Observations	252	252

Source: Authors' calculations based on data provided by GSO and the HoSE.

Table 1 indicates that both variables are skewed towards the right (having positive skewness coefficients of 0.289 & 1.515). The kurtosis of the two variables exceeds 3 (= 4.849 and 6.372), implying that leptokurtic or both series have a distribution with a fatter tail and more peaking at the mean than a normal distribution. This means that we need to test whether there is a unit root.

2.2.3. Unit root test

Augmented Dickey - Fuller (ADF) test is used to test whether inflation contains a unit root or is stationary. The result is reported in Table 2.

Table 2. Augmented Dickey-Fuller unit root test.

For R variable			
Augmented Dickey-Fuller test statistic		t-Statistic	Prob.
-10.93574		0.0000	
Test critical values	1% level	-3.456302	
	5% level	-2.872857	
	10% level	-2.572875	
For CPI variable			
Augmented Dickey-Fuller test statistic		t-Statistic	Prob.
-8.051721		0.0000	
Test critical values	1% level	-3.456302	
	5% level	-2.872857	
	10% level	-2.572875	

Source: Authors' calculations based on data provided by GSO and the HoSE.

Table 2 reveals that the critical values at 1% and 5% were -3.456 and -2.872 respectively, thus the stock return and inflation are all found to be stationary by the Augmented Dickey-Fuller test. This result allows us to further analyze the relationship between inflation and the stock market index using the GARCH model.

3. Results and discussion

The impact of inflation on stock market returns and volatility is investigated through the modified GARCH model. The regression results are reported in Table 3.

Table 3. Regression results of the modified GARCH model.

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	79.19218	7.620809	10.39157	0.0000
R(-1)	0.216486	0.075308	2.874669	0.0040
Variance equation				
C	-661.9713	294.4567	-.248111	0.0246
RESID(-1) ²	0.274304	0.096711	2.836310	0.0046
GARCH(-1)	0.597505	0.108799	5.491836	0.0000
CPI	6.692404	2.950267	2.268406	0.0233
R-squared	0.105347	Mean dependent var		101.4366
Adjusted R-squared	0.101754	S.D. dependent var		9.706621
S.E. of regression	9.199534	Akaike info criterion		7.045838
Sum squared resid	21073.22	Schwarz criterion		7.130111
Log likelihood	-878.2526	Hannan-Quinn criter.		7.079751
Durbin-Watson stat	1.677912			

Source: Authors' calculations based on data provided by GSO and the HoSE.

Table 3 reveals that the coefficient of CPI has a probability equal to 0.0233 which is less than the critical value of 0.05. Hence, this coefficient is statistically significant. The estimated coefficient on the CPI rate is +6.6924, meaning that 1% of an increase in the CPI causes a 6.69% increase in the VN-index. In other words, the higher the rate of inflation, the greater the stock market indexes become. This meant that stock market investment is a hedge against inflation. This result contradicts to the findings of T.H. Nguyen, et al. (2009) [9] who found that the inflation and stock returns have opposite direction. The positive correlation between inflation and stock returns is perhaps due to the existence of two parallel relationships: (1) inflation with real economic activity and (2) real economic activity and equity yield rates. In this case, the rate of profitability of a stock is related in the same direction as real economic activity, and the actual economic activity is related in the same direction as inflation; therefore, the ratio of profitability of a share is positively related to inflation.

Inflation has a relatively strong impact on the volatility of stock indexes, probably because, first, the psychological herd or mob mentality of the stock players is very common in Vietnam and has a huge impact on the volatility of the market. This is a phenomenon that has a negative impact in emerging markets such that it weakens the market, leading to instability due to stock prices being blown up too high or depressed too low, and in some cases, it even causes the stock bubble. Herd mentality facilitates price manipulation, stock price manipulation, and speculation. Vietnam's stock market has gone through periods like that, typically from 2006 to early 2007. When the demand for capital flows into the secondary market, a surge has led to a large amount of money in circulation. This has caused high inflation (in the same direction and at the same tempo or pace).

In addition, Vietnamese investors in securities typically invest with short-term credit financing, which contributes to market and economic instability. The majority of these investors are domestic, while the proportion of foreign investors and foreign portfolio investment is only 15 to 20% of total market capitalization. The internationalization of both the transaction and the market as a whole is quite low. The majority of the capital used by domestic investors to invest in securities comes from bank loans. During periods of robust economic expansion, investors frequently exploit financial leverage for short-term or speculative investments (surfing). Such a substantial quantity of capital does not flow directly into the economy's

production and service requirements. As inflation rises, a substantial portion of the population's capital has migrated from bank deposits to investments in securities. A positive correlation between stock returns and inflation stems from the notion that stocks are inflation hedges because they represent claims on actual assets. This trait explains why the inflation rate has a relatively significant effect on the rate of change of the stock market index.

4. Conclusions

The stock market indexes play a crucial role in providing insights into economic performance and are typically influenced by changes in the inflation rate. Policymakers frequently employ volatility estimation as a method for determining the susceptibility of the stock market, whereas investors and agents view this fluctuation as an indicator of risk. Therefore, the inherent characteristics of stock market volatility have significant implications for policymakers and investors alike. Using the GARCH model, this article investigates the impact of inflation on the Vietnamese stock market. The data for this study was collected from the General Statistics Office of Vietnam and the Ho Chi Minh Stock Exchange (HOSE). The results reveal that a one percent increase in inflation is associated with a 6.692% increase in the VN-index, as indicated by the correlation between stock indexes and the inflation index. This indicates that the returns on Vietnam's stock market are adequate to act as a hedge against inflation during the recent economic turbulence. However, inflation affects stock index volatility because the psychological herd of stock players undermines the market, causing stock prices to rise excessively high or fall too low. Herd mentality aids price manipulation, stock manipulation, and speculation. A spike in secondary market capital demand has put a lot of money in circulation. This created significant inflation. The popularity of short-term or speculative investments (surfing) necessitates that the Vietnamese government not only address inflation, but also improve financial regulations and stock market oversight.

CRedit author statement

Nguyen Huu-Dung: Conceptualisation, Methodology, Data curation, Writing - Original draft preparation; Le Viet Long: Methodology, Software, Validation, Writing-Original draft preparation, Editing.

COMPETING INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this article.

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