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# MONETARY POLICY AND STOCK MARKET RETURNS: EVIDENCE FROM ARDL BOUNDS TESTING APPROACH FOR THE CASE OF VIETNAM

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## *ABSTRACT*

The paper investigates the presence of a cointegrating relationship between monetary policy indicators (namely refinancing rate, money supply, exchange rate, domestic credit, and inflation rate) and VN-Index (the main representative index of Vietnamese stock markets) from August 2000 to December 2018. By using the Autoregressive Distributed-Lag (ARDL) bounds tests, followed by the error correction model for short term dynamics and robustness tests for the stability of the model, the key findings showed that the VN-Index was significantly influenced by all the selected variables in the long term. The outcomes contributed to the current literature by clarifying the determinants of stock prices from monetary policy perspective within the context of an emerging economy and then providing relevant recommendations for enhancing the performance of the Vietnamese stock market. The remaining money supply expansion and the local currency appreciation, while controlling inflation, domestic credit, and reducing refinancing rate can promote the progress of the Vietnamese securities market. Any shock from equilibrium should be adjusted at the considerably high-speed of 48.91% over the next period. It can be considered as a precious reference for policymakers, financial analysts, stock exchange examiners, and any researchers who interested in this field.

**Contribution/ Originality:** This paper contributes to the existing literature by identifying the long term and short term relationship between monetary policy indicators and stock market returns under the context of an emerging market such as Vietnam using the ARDL bound testing approach.

## 1. INTRODUCTION

Being considered as a potential emerging market for all investors, both domestic and international, Vietnam has been developing and becoming one of the most dynamic economy in the region. For five years from 2014, Vietnam's real gross domestic product (GDP) has been experiencing positive growth and is projected to continue this movement through 2024 (GSO Vietnam). GDP reached 6.8% in 2019, while public debt reduced by nearly 8% points of GDP compared to 2016, and a trade balance surplus has been sustained for the fourth continuous year (The World Bank, 2019).

The establishment of stock market in July 2000 marked a new stage of the Vietnamese economy, following the integration economic policy. For nearly twenty years from the first launching day, the Vietnamese stock market (with two exchanges in Hanoi (HNX) and Ho Chi Minh (HOSE or HSX)) has achieved many successes, such as the incredible increase in the number of listed companies, market capitalization, trading volume and trading value. According to State Securities Commission of Vietnam (2019) the trading volume of the whole market reached to 132.15 billion shares at the end of 2018, markedly increased by 23.6% compared to the previous year. The market capitalization was recorded at almost 5,100 thousand billion VND (around 220 billion USD), accounting for 101.50% GDP of Vietnam.

The Vietnamese stock market has been struggled with a high volatility problem as have other emerging economies. Despite politic stability, after the highest jump in 2008, the stock market has been suffering several difficulties, such as the global economic recession after the crisis 2008-2009, inadequate legal framework, insufficient external capital flows and lack of domestic professional investors, etc. Perceiving an increasing importance of monetary policy in achieving macroeconomic targets, especially under the context of emerging markets with relatively high growth rate and large variations in policy instruments (i.e. money supply, credit outstanding, inflation…), a comprehensive study on the impact of monetary policy instruments on stock prices in order to gain further insights into promoting and stabilizing the performance of the Vietnamese stock market is required.

The existing literature has explained stock market returns via different sets of indicators (mainly focusing on macroeconomic factors). Initially, more studies on the determinants of stock returns concentrated on well-developed markets (Flannery & Protopapadakis, 2002; Hamrita & Trifi, 2011; Lee, 1992; Li & Hu, 1998; Ratanapakorn & Sharma, 2007). Academic attention then turned to developing countries, especially emerging economies, acknowledged the rapid development of their capital markets (Bapci & Karaca, 2013; Basher, Haug, & Sadorsky, 2012; Kwon & Shin, 1999; Pilinkus, 2010; Tangjitprom, 2012; Victor & Kuwornu, 2011; Zakaria & Shamsuddin, 2012).

Some research has shown the possibility of connection between monetary policy and stock market (Bissoon, Seetanah, Bhattu-Babajee, Gopy-Ramdhany, & Seetah, 2016; Muroyiwa, Ezeoha, & Mushunje, 2017). Few other studies could not uncover the substantial connection between monetary policy and stock market (Durham, 2003; Hallberg & Ryhage, 2019). In Vietnam's case, the linkage between monetary variables and stock returns have also been analyzed (Hussainey & Le, 2009; Narayan & Narayan, 2010; Vuong & Le, 2017). However, the recent outcomes have been so far not reached a definitive conclusion for emerging markets, particularly for Vietnam - one not fully functioned-market, due to the problem of asymmetric information and insufficient investment regulations.

Conducting research to improve stock market performance, especially for young markets such as Vietnam, has been always encouraged. This paper, therefore, focused on the relationship between monetary indicators and Vietnamese stock market performance. The autoregressive distributed lag (ARDL) bounds testing approach will be used for the monthly data spanning from August 2000 to December 2018.

## 2. THEORETICAL FRAMEWORK AND LITERATURE REVIEW

In theory, the capital asset pricing model (CAPM) is well-known to estimate the required rate of return – that is what an investor expects to receive from an investment, in order to purchase an underlying security (Brigham & Gapenski, 1996; Lintner, 1965; Sharpe, 1964; Treynor, 1962). Briefly, the CAPM provided a benchmark to compute the systematic risk of a security in the market portfolio. A substitution for the CAPM was formulated by Ross (1976) which known as arbitrage pricing theory (APT) or a multi-factor pricing model. It also demonstrates the relations between risk and return in asset pricing; however, the APT differentiates from the CAPM by inserting more explanatory indicators. Under the theory of arbitrage pricing by Ross (1976) several papers have been constructed using different sets of factors to estimate stock returns. The studies that supports for the APT were conducted by Chen, Roll, and Ross (1986); Shanken and Weinstein (2006); Rjoub, Tursoy, and Gunsel (2009) wherein it was found that stock market prices were systematically driven by innovations in economic state indicators.

While attempting to find out the determinants of stock returns, monetary policy instruments have been paid special attention from the literature abound (Bissoon et al., 2016; Bjørnland & Leitemo, 2009; Ioannidis & Kontonikas, 2008; Jansen & Tsai, 2010; Muroyiwa et al., 2017; Okpara, 2010; Tang, Luo, Xiong, Zhao, & Zhang, 2013). However, the empirical results have been varied.

To explore the existence of a linkage between monetary policy and stock market returns, Vector Autoregression (VAR) can be considered as one of the most popular frameworks. For instance, using VAR analysis for the case of Singapore, Wu (2001) found the connection between stock prices and exchange rates. Within the VAR framework, the outcomes of Johansen cointegration and Granger causality in the study of Tang et al. (2013) suggested that the policymakers might recognize the influence of monetary policy changes on stock markets in China – an emerging economy where any changes in the policy could surprise the central bank without a pre-decided plan, which is not consistent with previous studies.

Using the Structural VAR (SVAR) method, Muroyiwa et al. (2017) found a significant link between interest rate (i.e. interbank rate) and South Africa's stock returns using monthly data from July 1990 to Feb 2010. The same framework was applied for the context of the US while Bjørnland and Leitemo (2009) tried to explain the changes in stock prices at the end of the 1990s by non-fundamental shocks. The results implied that the interest rate was significantly associated with S&P 500. In particular, for the data set from 1995 to 2002, an increase of 10 bps in Fed fund rate could lower the stock prices by 150 bps while a rise of 100 bps in stock prices could increase 5 bps in the interest rate.

Using the SVAR model, Abouwafia and Chambers (2015) found different monetary policy frameworks and stock market characters among five stock markets in Kuwait, Oman, Saudi Arabia, Egypt and Jordan. To boost the precision, the contemporaneous interdependence was kept unrestricted, which was different from literature abound. The short term relationship was found between monetary policy and the real exchange rate shocks on the stock prices of the countries that apply a relatively more independent monetary policy and flexible exchange rates.

Taking into account the relationships between the three angles of monetary policy (namely a broad monetary aggregate, short term interest rates and net capital flows) and stock prices in long and short term, Belke and Beckman (2014) utilised the Cointegrated Vector-Autoregressive (CVAR) approach with the inputs from five developed and three emerging markets. The causality links were found from monetary aggregates and capital flows to stock markets for emerging markets more frequently than industrial economies. The paper uncovered the direct long term impact from short term interest rates on stock prices from three out of eight economies.

Recently, to investigate the long and short term impacts of macroeconomic indicators (including money supply, inflation rate, interest rate, and exchange rate) on stock market performance (measured by KSE-100 index) over the period from June 2009 till June 2018, Naseem, Fu, ThiLan, Mohsin, and Rehman (2019) applied Johansen and Juselius (1990) multivariate cointegration and the Vector error correction model (VECM). The cointegration was presented between selected variables, and any monthly change in short termshort term was adjusted at the rate of about 7.22% to get back to the level of equilibrium. Money supply and exchange rate positively linked with stock prices, while reverse associations were exposed for inflation and interest rate.

Along with the VAR approach, the Autoregressive Distributed Lag (ARDL) model has been also used in many research papers when the selected variables integrated with mixed order. For the Nigerian circumstance, Ayopo, Isola, and Olukayode (2015) used the ARDL bounds testing to analyse its stock market performance (the All Share Index – ASI) under the monetary policy impact using the data sample between 1985 to 2013. The paper proposed that stock market can be enhanced by increasing interest rate, remaining money supply growth rate, increasing net credit to the private sector and controlling the exchange rate. However, other impacts from required reserve ratio and fiscal policy instruments on ASI which were not included in the examination should be considered in future studies.

Further analysis for the ASI and policy influences was undertaken by Lawal, Somoye, Babajide, and Nwanji (2018). Under the ARDL approach for monthly intervals from Jan 1985 till Dec 2015, the long term impact was established between the ASI and the linkage between the fiscal and monetary policies. The EGARCH results suggested the volatility of the linkage between the two policy instruments significantly impacted on the volatility of stock prices in Nigeria. Therefore, both fiscal and monetary policies should be careful considered when formulating stock market policy.

For the case of Turkey, Tursoy (2019) applied the ARDL Bounds approach and Johansen cointegration test (under VAR framework) for examining the long term linkage between interest rates and stock prices for the time spanning from Jan 2001 to April 2017. The results consistently showed the negative and significant relationship between two variables of interest. The impulse response and variance decomposition were subsequently used as innovation accounting techniques and confirmed the empirical findings. Within the context of inflation targeting policy implemented by Turkish central bank, the policymakers were advised to lower the domestic interest rates to enhance the stock market performance.

Some other uncommon methods have been also considered. For example, Val, Klotzle, Pinto, and Barbedo (2018) conducted event study analysis for investigating the relationship between the anticipated and unanticipated parts of monetary policies implemented by the Central Bank of Brazil and the stock market returns (which indexed by the IBOVESPA index and 53 stocks). The findings suggested that monetary policy decisions could significantly explain the stock market fluctuations, but only a small proportion. From the sector's perspective, expected returns from the financial sector was the most affected by monetary policy, and industrial goods were also significantly affected. There was no impact from monetary policy to expected returns of individual assets; however, monetary policy influenced a decrease in the intensity and in the number of companies. Some unanticipated variations such as in the unemployment rate, in the Industrial Production Index, in the General Market Price Index, and in the Broad Consumer Price Index could be explained by the shocks in monetary policy.

The event study was combined with VAR in the research (Fausch & Sigonius, 2018) so as to analyse the influences of conventional and unconventional monetary policy (via futures markets information) on German stock excess returns (which was divided into three decompositions, i.e. news, future dividends, future real interest rates). The outcomes advocated that the changes in German excess stock returns were majorly caused by the expected future dividends. Additionally, money policy shocks could impact the stock market via interest rate regime. Under the circumstance of negative real interest rates, a monetary tightening could decrease the excess stock returns as consequences of the news about higher expected excess returns and lower future dividends.

In the existing literature, the long term and short term associations between monetary policy and stock market returns have attracted notice from several researchers, practitioners, and policymakers. However, the linkage between monetary indicators and the stock behaviour has been still inconclusive due to the diversity of monetary instruments which have been tackled and the variation of economic backgrounds, comprising of developed and emerging economies. Emerging markets have witnessed outstanding growth which is considered as great motivation for the global economy. However, there are an unfortunately limited range of studies that have covered this topic for the case of emerging markets with inconsistent conclusions, especially Vietnam.

Hussainey and Le (2009) attempted to find any linkage between two selected macroeconomic variables – interest rate and the industrial production – and Vietnamese stock prices over the period from Jan 2001 to Apr 2008 in both domestic and international perspectives. Applying regression model technique for domestic variables and for both domestic and international variables separately, the research found out three significant conclusions: (i) industrial production can lead to the change of stock prices; (ii) the long term and short term interest rates influenced stock prices in the different direction; (iii) there was a stronger effect on Vietnamese stock prices from the US real production activity than the US money market.

By applying several statistical tests, including cointegration tests, long term elasticity, error correction model and parameter stability test, Narayan and Narayan (2010) investigated the linkage between two global determinants (oil prices and nominal exchange rates) and Vietnam's stock prices using daily data over the span 2000-2008. Both oil prices and exchange rates were found to have statistically substantial positive effect on stock prices in long term. However, there was no evidence of relationship between neither oil prices nor exchange rates and stock prices in short term.

Le and Dang (2015) used ARDL Bounds test and ECM to check the long term cointegration relationship and short term dynamics between macroeconomic indicators (including inflation, money supply, exchange rate, short term interest rates) and VN-Index for the period between Jan 2001 to Dec 2013. The empirical findings suggested that in the short and long term, money supply has a positive impact on the stock price index, while the remaining factors such as exchange rates, inflation, government bond rates and lending rates negatively influenced the stock price index. These outcomes were afterwards used as guidance for Vietnamese authorities while designing solutions to promote the stock market development.

Recently, Vuong and Le (2017) uncovered the strong influences of macroeconomic factors (market price index, consumer price index, money supply, exchange rate) on Vietnam's stock market prices. The findings from VECM model suggested that share price was positively linked with market price index and money supply but negatively linked with inflation and exchange rate.

The empirical findings denoted the efficiency of Vietnamese stock exchange in weak form. It may suggest the arbitrage opportunity for investors in this capital market. To achieve better investment decisions, as well as to provide better indication for policy makers, a comprehensive research on monetary determinants of stock market returns for Vietnam should be highly demanded. To contribute to the existing literature, this paper examined the influences of monetary policy instruments (i.e. interest rate, money supply, exchange rate, domestic credit, and consumer price index) on VN-Index. Excluding selected common monetary factors, the paper added domestic credit as one dependent variable which has not been used in the previous research. The empirical results, therefore, are expected to be valuable for policymakers, financial analysts, stock exchange examiners, and any researchers who interested in the development of the Vietnamese stock market.

## 3. METHODOLOGY

This paper investigated the long term dimension among selected variables using the statistical analysis based on the cointegration testing methods. Amongst a variety of methods for determining cointegration between the multivariate time series, the study usesuses the bounds testing under the Autoregressive Distributed Lag (ARDL) model since the selected variables were latterly found to have mixed order of integration. If equilibrium was established, the Error Correction model (ECM) would be used to find any short term dynamics between variables. The dynamic analysis was constructed afterwards to account for the response of the dependent variable (i.e. Vietnamese stock market index) to a shock in any independent variable (i.e. monetary policy indicators).

### *3.1. Data Sources*

This study explains the relationship between five monetary policy instruments, namely refinancing rate (RR), money supply (MS – measured by broad money M2), foreign exchange rate (EX – represented by USD/VND), domestic credit (DC), and consumer price index (CPI– as a proxy of inflation rate) and stock market returns (VNI) under the context of Vietnam. Stock market returns used in this study were grounded on the key Vietnamese stock market index, the Ho Chi Minh Stock Index or VN-Index (officially denoted as VNI). The index was created on

28th July 2000 with a base index value of 100. Stock return for the period *t* was computed as the percentage change of the stock market index over the period from *(t-1)* to *t*, hence it was formulated as follows:

$$\Delta VNI_t = ln\ (VNI_t) - ln\ (VNI_{t-1})$$

Where *ln* denotes the natural logarithm; $VNI_t$ depicts the average of stock price index at the end of month *t*; and $\Delta VNI_t$ refers to the return on the Vietnamese stock market on month *t*.

While monetary policy series are provided by the General Statistics Office of Vietnam (GSO) and CEIC Data (https://www.ceicdata.com), stock market indices are collected from the official websites of the Ho Chi Minh Stock Exchange – HSX (http://banggia2.ssi.com.vn/) and Bloomberg Market Database (http://www.bloomberg.com/quote/VNINDEX:IND). All series are gathered monthly spanning the period from August 2000 till December 2018.

### *3.2. Unit Root Tests*

To explain why the matter of stationary or non-stationary of the data hassles most statistical analyses, Brooks (2008) and then Gujarati (2011) consistently suggested two main reasons: (i) non-stationary data cannot be generalized to other time periods, hence the study of its behaviour is practical only for the period of consideration; (ii) the regression of two or more non-stationary time series may occur the problem of spurious or nonsense regression. The paper used three different unit roots techniques: Augmented Dickey Fuller (ADF) (Dickey & Fuller, 1979; Dickey. & Fuller, 1981) the Phillips-Perron (PP) (Phillips & Perron, 1988) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) (Kwiatkowski, Phillips, Schmidt, & Shin, 1992).

If a series was found as non-stationary, it was differenced to become stationary to solve the spurious equation issue. The number of times (*d*) the series needs to be differenced before it becomes stationary is referred to as the order of integration, or the number of unit roots.

### *3.3. Cointegration Tests*

If some of the variables in the specified function are integrated processes, it may suggest the existence of cointegration among these variables. The presence of cointegration (which originally introduced by Granger (1981) and broadly extended by Engle and Granger (1987); Engle and Yoo (1987); Johansen (1988); Johansen. (1991); Johansen.. (1995); Stock and Watson (2006) among others) can be interpreted as a long term equilibrium between variables, even though the variables may drift apart in short term (Engle & Granger, 1987). In other words, cointegration describes the presence of a stationary linear combination among non-stationary variables. There must be at least one variable in the model responding by way of correcting the deviation from the long term equilibrium or the equilibrium error (Enders, 2004).

#### *3.3.1. Appraisal of Cointegration Approaches*

In order to select the appropriate method for analysing cointegration between the variables of interest, the following Table 1 summarises the advantages and limitations of different approaches in the literature. Regarding to economic modeling for integrated time series data, Granger and Weiss (1983) were pioneers in conveying the essential role of cointegration analysis. The practical powerful of this concept has been stretched over time while a numerous significant statistic frameworks are henceforth built.

Three sound econometric techniques for testing the existence of cointegration were considered within the context of this research: the single equation method or two-step error correction model (Engle & Granger, 1987); the maximum likelihood cointegration test (Johansen., 1991; Johansen.. 1995) and the bounds test within the Autoregressive Distributed Lag (ARDL) approach (Pesaran & Shin, 1998; Pesaran, Shin, & Smith, 2001; Pesaran. & Pesaran, 2009).

It was noted that these above tests focus only on the lower level of integration of the variables ($0 \leq d \leq 1$). It was fairly rational to apply these to the current research since the empirical evidence has shown that financial time series are rarely integrated at a higher level (i.e. $d \geq 2$). Even though, the practical have uncovered the cointegration between I(2) variables with few studies by Johansen.. (1995); Kitamura and Phillips (1995); Chang and Phillips (1995) etc. Accordingly, two main methods were proposed, including single equation methods and system methods.

**Table-1.** Common cointegration approaches.

| Method | Advantages | Limitations |
|---|---|---|
| Single Equation Method: Residual-Based Tests (Engle & Granger, 1987) | ✓ Easy to understand and to implement.<br>✓ Useful for bivariate analysis. | ✓ Sensitive to the order of the variables<br>✓ Inability to detect more than one cointegrating relationship.<br>✓ Some errors generated from the first step can be carried over into the second step based on this two-step estimator.<br>✓ Require that all the variables be integrated of the same order (i.e. I(1)). |
| Multiple Equation Method based on Canonical Correlations: Johansen Tests (Johansen., 1991; Johansen.. 1995) | ✓ Avoid the problem of normalization that plagues other estimators by using one-step estimation.<br>✓ Able to detect more than one cointegrating relationship by using the multiple-equation approach.<br>✓ Applicable for multiple variables.<br>✓ Allow testing of restrictions on the cointegrating vector. | ✓ Extremely sensitive to the assumption regarding to the underlying distributions of the error terms.<br>✓ Tendency to find spurious cointegration.<br>✓ High variance and high probability of producing outliers.<br>✓ Require that all the variables be I(1). |
| Bounds Test within ARDL Modeling Method | ✓ Simple to implement and interpret.<br>✓ Irrespective to the order of the integration of the variables.<br>✓ Allow for differential lag lengths for the variables, and able to accommodate more variables than in other models (i.e. VAR).<br>✓ Allow for inference on long term estimates. | ✓ Not applicable if there is a presence of I(2) in the system.<br>✓ Highly sensitive to the order of lags. |

**Source:** Asteriou and Hall (2007); Maddala and Kim (1998); Pesaran. and Pesaran (2009); Pesaran et al. (2001); Pesaran. and Pesaran (2009).

With several advantages, the ARDL bounds testing procedure was selected as the main approach for examining the cointegration between monetary indicators and Vietnamese stock market returns over the sample period of 2000 to 2018. It was also practical as the empirical results later found that the selected variables were all purely I(0) and I(1).

### *3.3.2. The ARDL Bounds Testing Approach*

The general autoregressive distributed lags model using *p* lagged values of the dependent variables (AR) and *q* distributed lagged values of explanatory variables (DL) (henceforward called ARDL (p, q) for short) follows the regression representation:

$$Y_t = c + \sum_{i=1}^{p} \beta_i Y_{t-i} + \sum_{i=1}^{n} \sum_{j=0}^{q} \alpha_{ij} X_{i,t-j} + \varepsilon_t \quad (1)$$

Where $\beta_0$ is the intercept, $Y_t$ is the dependent variable (i.e. the Vietnamese stock market index), $X_t$ is the *n*-dimensional variables in which they are not cointegrated among themselves (i.e. five specified monetary policy instruments), and $\varepsilon_t$ is a random error term.

The Equation 1 can be used as a formulation for detecting long term relationship among the variables of interest only if these variables are stationary in levels (i.e. I(0)). However, this traditional ARDL model is no longer valid due to the spurious regression problem once there is a presence of non-stationary variables (i.e. I(1)). In order to re-examine the ARDL approach for the existence of a long term relationship among variables, Pesaran and Shin (1998) and Pesaran et al. (2001) adopted the Equation 2 as an estimation specification for unrestricted error correction model (ECM).

$$\Delta Y_t = \alpha_0 + \pi_0 Y_{t-1} + \sum_{i=1}^{n} \pi_i X_{i,t-1} + \sum_{j=1}^{p-1} \gamma_j \Delta Y_{t-j} + \sum_{i=1}^{n} \sum_{j=0}^{qi-1} \theta_{ij} \Delta X_{i,t-j} + \varepsilon_t \quad (2)$$

Where n is number of independent variables, *p* is the maximum order of lags for dependent variable in its level $(Y_t)$, $q_i$ (i=1,...,n) is the maximum orders of lags for independent variables in their levels $(X_{it})$, and $\Delta$ is the first difference operator.

The ARDL procedure developed by Pesaran et al. (2001) comprises of two main steps: (i) to test the existence of a long term relationship via the bounds testing; (ii) to estimate long term coefficients and associated short term coefficients once a long term relationship has been established.

In particular, the specification of ARDL model used in this paper is expressed by the Equation 3 as follows:

$$\Delta LNVNI_t = \lambda_0 + \sum_{i=1}^{p} \lambda_1 \Delta LNVNI_{t-1} + \sum_{i=0}^{p} \lambda_2 \Delta LNRR_{t-1} + \sum_{i=0}^{p} \lambda_3 \Delta LNMS_{t-1} + \sum_{i=0}^{p} \lambda_4 \Delta LNEX_{t-1} + \sum_{i=0}^{p} \lambda_5 \Delta LNDC_{t-1} + \sum_{i=0}^{p} \lambda_6 \Delta LNCPI_{t-1} + \delta_1 LNVNI_{t-1} + \delta_2 LNRR_{t-1} + \delta_3 LNMS_{t-1} + \delta_4 LNEX_{t-1} + \delta_5 LNDC_{t-1} + \delta_6 LNCPI_{t-1} + \varepsilon_t \quad (3)$$

Where p is the lag length; $\lambda_1, \lambda_2, \lambda_3, \lambda_4, \lambda_5, \lambda_6$ function as the long term multipliers; and $\delta_1, \delta_2, \delta_3, \delta_4, \delta_5, \delta_6$ present for the short term dynamic coefficients.

The appropriate lag length must be specified to avoid the potential serial correlation problem on residuals (as the key assumption under the ARDL bounds testing is that the residuals of the model must be serially independent (Pesaran et al., 2001). Once the maximum number of lags (*k*) of the variables in levels is chosen based on the lowest value of one of the selection criterion models, the ARDL processes $[(k-1)+1]^n$ (hence, $k^n$) number of regressions to select the optimal lag length for each of the variable in the system.

Among different statistical criteria in practice, Akaike Information Criterion (AIC) and Schwarz Information Criterion (SC) are the most used statistical criteria methods for checking the lag order of dependent variable and the regressors.

### *3.3.3. Bounds Testing for Cointegration*

In the first stage of the ARDL procedure, the existence of a long term relationship between variables is determined by performing a bounds procedure via the Wald statistic (or F-test) for the joint significance of the lagged levels of the variables in the unrestricted ECM. The null hypothesis of the F-test for the absence of a long term relationship is set as:

$$H_0: \pi_0 = \pi_1 = \cdots = \pi_n = 0$$

Against the alternative hypothesis for the presence of a long term relationship defined as:

$$H_1: \pi_0 \neq \pi_1 \neq \cdots \neq \pi_n \neq 0$$

However, Pesaran et al. (2001) argued that the asymptotic distribution of computed F-statistic under the null hypothesis of no cointegration is non-standard regardless to the order of integration of the variables (purely I(0), purely I(1), or mutually cointegrated I(0) and I(1)). Consequently, Pesaran et al. (2001) provided two sets of critical values for each of the given significance levels (10%, 5%, 2.5%, and 1%) in the case of including and excluding intercept and trend. In particular, the first critical value set (lower bound) assumes that all the variables are I(1), while the second set (upper bound) assumes that all the variables are I(0).

If the computed F-statistic exceeds the upper bound value, the null hypothesis is rejected, and the variables of interest are cointegrated. If the computed F-statistic falls below the lower bound value, the null hypothesis cannot be rejected, which indicates the absence of cointegrating relationship. In the case that computed F-statistic falls within these two bounds, the result of cointegration is inconclusive.

### *3.3.4. Long term Estimates and Short term Dynamics*

Assuming the bounds test concludes the presence of cointegration, the second stage of the ARDL procedure was to estimate long term coefficients and short term coefficients via the error correction model (ECM) framework. These coefficients derived from ECM implied the speed of adjustment of the short term disequilibrium to the long term equilibrium.

The Error Correction Model (ECM) representation of the ARDL approach can be obtained by the Equation 4 as follows:

$$\Delta LNVNI_t = \lambda_0 + \sum_{i=1}^{p} \lambda_1 \Delta LNVNI_{t-1} + \sum_{i=0}^{p} \lambda_2 \Delta LNRR_{t-1} + \sum_{i=0}^{p} \lambda_3 \Delta LNMS_{t-1} + \sum_{i=0}^{p} \lambda_4 \Delta LNEX_{t-1} + \sum_{i=0}^{p} \lambda_5 \Delta LNDC_{t-1} + \sum_{i=0}^{p} \lambda_6 \Delta LNCPI_{t-1} + \partial ECM_{t-1} \quad (4)$$

Where $\partial$ is the speed of adjustment and $ECM_{t-1}$ is error correction term lagged by one time period.

## 4. EMPIRICAL FINDINGS

### *4.1. Descriptive Statistics and Correlation Matrix*

Tables 2 provides the basic statistic features of the data. These descriptions reflect the historical behaviour of the data being studied, including the mean, minimum and maximum values, standard deviation, kurtosis, skewness, and the Jarque-Bera statistics.

Based on the dispersion levels of series obtained from the standard deviation statistics, the consumer price index (CPI) and the exchange rate (EX) were less volatile in comparison with the remaining variables, while the highest volatilities were recorded in the money supply and domestic credit. To achieve the ultimate goal of growth, the Vietnamese government conducted expansionary fiscal and monetary policies such as implementing low reserve ratios; buying USD to stabilize exchange rates in order to boost exports; expanding public investment and running various support programs for state-owned enterprises (SOE) sector (State Bank of Vietnam, 2019). Since the skewness values were all non-zero and the kurtosis values were all different from three, the p-values of the Jarque-Bera statistics implied the rejection of the null hypothesis of normality for all the variables.

**Table-2.** Descriptive statistics of the data.

| | LNVNI | LNRR | LNMS | LNEX | LNDC | LNCPI |
|---|---|---|---|---|---|---|
| Mean | 6.059098 | 1.931603 | 14.31005 | 9.811036 | 11.24433 | 4.674506 |
| Median | 6.170410 | 1.871802 | 14.51640 | 9.741102 | 11.61957 | 4.669891 |
| Maximum | 7.044158 | 2.708050 | 16.00757 | 10.05814 | 12.75049 | 4.854527 |
| Minimum | 4.723357 | 1.568616 | 12.19081 | 9.553409 | 9.130711 | 4.583947 |
| Std. Dev. | 0.548018 | 0.293440 | 1.162855 | 0.161104 | 1.102442 | 0.054911 |
| Skewness | -0.349154 | 1.228219 | -0.254865 | 0.155596 | -0.406103 | 1.197725 |
| Kurtosis | 2.414726 | 4.089651 | 1.715263 | 1.379878 | 1.812358 | 4.603695 |
| Jarque-Bera | 7.644575 | 66.49732 | 17.59135 | 25.06172 | 19.06282 | 76.52139 |
| Probability | 0.021878 | 0.000000 | 0.000151 | 0.000004 | 0.000073 | 0.000000 |
| Sum Sq. Dev. | 66.07112 | 18.94358 | 297.4909 | 5.710018 | 267.3832 | 0.663345 |

The correlation matrix is a basic, simple test to examine the strength of the linear association between a pair of variables. Table 3 shows the correlation coefficients of all the variables in their log levels. The result reveals that the correlations between the independent variables were mostly statistically significant (except for the correlation between inflation rate and exchange rate). It is a sign of multicollinearity in the system, which causes difficulty estimating model parameters (Brooks, 2008). To detect the possible problem of multicollinearity, the series were replaced into percentage changes by transforming level data into natural log form to their first differences. The correlation coefficients in Table 4 appear to be mostly insignificant.

**Table-3.** Correlation matrix and probability values in log levels.

| Probability | LNVNI | LNRR | LNMS | LNEX | LNDC | LNCPI |
|---|---|---|---|---|---|---|
| LNVNI | 1.000000 | | | | | |
| | ----- | | | | | |
| LNRR | 0.259707* | 1.000000 | | | | |
| | 0.0001 | ----- | | | | |
| LNMS | 0.768066* | 0.423923* | 1.000000 | | | |
| | 0.0000 | 0.0000 | ----- | | | |
| LNEX | 0.646611* | 0.353031* | 0.954855* | 1.000000 | | |
| | 0.0000 | 0.0000 | 0.0000 | ----- | | |
| LNDC | 0.768152* | 0.457218* | 0.997141* | 0.937490* | 1.000000 | |
| | 0.0000 | 0.0000 | 0.0000 | 0.0000 | ----- | |
| LNCPI | 0.178196* | 0.734085* | 0.179332* | 0.062505 | 0.220921* | 1.000000 |
| | 0.0079 | 0.0000 | 0.0075 | 0.3551 | 0.0009 | ----- |

**Note:** * denotes the statistical significance at 5 percent level.

**Table-4.** Correlation matrix and probability values in first differences.

| Probability | DLNVNI | DLNRR | DLNMS | DLNEX | DLNDC | DLNCPI |
|---|---|---|---|---|---|---|
| DLNVNI | 1.000000 | | | | | |
| | ----- | | | | | |
| DLNRR | -0.039051 | 1.000000 | | | | |
| | 0.5645 | ----- | | | | |
| DLNMS | 0.105702 | -0.099045 | 1.000000 | | | |
| | 0.1180 | 0.1431 | ----- | | | |
| DLNEX | 0.008247 | 0.039442 | 0.062270 | 1.000000 | | |
| | 0.9032 | 0.5606 | 0.3580 | ----- | | |
| DLNDC | 0.031744 | -0.069712 | 0.601482* | -0.106966 | 1.000000 | |
| | 0.6396 | 0.3033 | 0.0000 | 0.1136 | ----- | |
| DLNCPI | -0.169220* | 0.443390* | -0.133019* | 0.030471 | -0.047455 | 1.000000 |
| | 0.0119 | 0.0000 | 0.0488 | 0.6531 | 0.4838 | ----- |

**Note:** * denotes the statistical significance at 5 percent level.

### *4.2. Results of Unit Root Tests*

The unit root testing results based on the common methods (comprising of ADF, PP, and KPSS) were summarized in Table 5, following with applicable critical values at the 5% significance level provided in Table 6. Irrespective of these minor dissimilarities, under the ADF and PP tests, the rejection of the null hypothesis of a unit root ere consistently failed for VN-Index, refinancing rate and exchange rate in their natural logarithm transformations at levels, but statistically rejected the null hypothesis for those variables in their first differences. It implied that LNVNI, LNRR, and LNEX were first difference stationary time series, or individually integrated at I(1). However, the results of the ADF and PP tests were not able to confirm the stationary for the remaining variables (including money supply, domestic credit, and inflation) since the null hypothesis of a unit root are accepted at levels with trend but rejected for the cases of trend and intercept and no trend or intercept.

**Table-5.** Unit root results on log levels and first differences.

| ADF Results | At Levels | | | At First Differences | | |
|---|---|---|---|---|---|---|
| Variables | Trend | Trend and Intercept | None | Trend | Trend and Intercept | None |
| LNVNI | -2.4839 | -3.3317** | 0.7117 | -8.1923* | -8.9037* | -8.8657* |
| LNRR | -2.5436 | -2.4876 | -0.1824 | -7.8421* | -7.8527* | -7.8573* |
| LNMS | -3.3037* | 0.3354 | 16.4156 | -12.9979* | -13.6329* | -1.1699* |
| LNEX | -0.5324 | -1.9765 | 3.1959 | -22.6649* | -22.6124* | -21.9704* |
| LNDC | -3.4961* | -0.1645 | 1.8825 | -12.9369* | -13.6237* | -1.2934 |
| LNCPI | -2.6569** | -2.6402 | 0.3264 | -4.0822* | -4.08310* | -4.0831* |

| PP Results | At Levels | | | At First Differences | | |
|---|---|---|---|---|---|---|
| Variables | Trend | Trend and Intercept | None | Trend | Trend and Intercept | None |
| LNVNI | -2.2828 | -2.8784 | 0.9627 | -8.5869* | -8.5882* | -8.5667* |
| LNRR | -2.3364 | -2.2508 | -0.1400 | -12.3126* | -12.3146* | -12.3126* |
| LNMS | -3.0661* | 0.2069 | 12.2304 | -13.2031* | -13.6571* | -8.2085* |
| LNEX | -1.1131 | -6.1238* | 3.9634 | -37.6937* | -37.5437* | -30.8461* |
| LNDC | -3.159* | -0.3066 | 8.1714 | -13.1974* | -13.6928* | -10.5490* |
| LNCPI | -2.8009** | -2.7815 | 0.4036 | -5.6971* | -5.6928* | -5.7003* |

| KPSS Results | Levels | | First Differences | |
|---|---|---|---|---|
| Variables | Trend | Trend and Intercept | Trend | Trend and Intercept |
| LNVNI | 1.2194 | 0.1316** | 0.0762* | 0.0526* |
| LNRR | 0.571 | 0.3187 | 0.0819* | 0.0327* |
| LNMS | 1.9331 | 0.4449 | 0.9081* | 0.1442* |
| LNEX | 1.8945 | 0.208 | 0.1195* | 0.1189* |
| LNDC | 1.9011 | 0.4678 | 0.8960 | 0.0888* |
| LNCPI | 0.2677 | 0.2538 | 0.0575* | 0.0405* |

**Note:** * and ** denotes the statistical significance at 5 and 10 percent levels.

Under the KPSS tests, the rejection of null hypothesis of a unit root were failed for most of indicators in levels (excluding the result of LNVNI with trend and intercept). They all became stationary (i.e. integrated at I(0)) after taking their first differences, being consistent with the ADF and PP outcomes.

**Table-6.** Critical values for unit root tests at 5% significance level.

| Option | ADF(1) | PP(2) | KPSS(3) |
|---|---|---|---|
| With Intercept | -2.879 | -2.879 | 0.463 |
| With Trend and Intercept | -3.438 | -3.438 | 0.146 |
| None | -1.943 | -1.943 | - |

**Note:** (1) and (2) MacKinnon (1996) critical values for rejection of the null hypothesis of a unit root
(3) Kwiatkowski et al. (1992) asymptotic critical values for rejection of the null hypothesis of stationarity.

The mixed order of integration (i.e. both I(0) and I(1)) of selected variables was sufficient to apply the cointegration tests exploiting the ARDL bounds approach (Pesaran et al., 2001; Shrestha & Bhatta, 2018). The error correction model (ECM) was subsequently derived from the selected ARDL model to check the short term dynamics among variables.

### *4.3. Empirical Results of ARDL Bounds Test*

The results of the ARDL (7,12,8,3,11,10) regression model which was selected by AIC represents the relationship between monetary policy factors and stock market returns in long term for the case of Vietnam, in consideration with their lags. Since the paper used the monthly data set based, it was appropriate to set the maximum lag order of 12 to ensure the presence of sufficient lagged explanatory variables in the model.

As presented in the Appendix A., the stock market returns can statistically and significantly be explained by all the designated monetary policy indicators (i.e. refinancing rate, money supply, exchange rate, domestic credit, and inflation) with identified lag numbers. The outcomes illustrate that this dependent variable was influenced by itself with some lags. It was rational since the effectiveness of policies might be recognized only after a specific period (Casu, Girardone, & Molyneux, 2015).

The results found the positive impact of money supply and the negative impact of inflation on stock returns for most case of selected lags, which were rational since an increase in money supply may enhance the incentives of investors while an increase aggregate prices may lead to the hesitation of investors in investing into stock market. The negative impact of domestic credit on stock returns can be explained by distinct character of the Vietnamese investors, as the credit could be attracted into other channels rather than the stock market.

The exchange rate was uncovered to have a dynamic link with stock market returns, in the same line with the previous findings of Tsuji (2011); Liang, Lin, and Hsu (2013) and Fauziah, Moeljadi, and Ratnawati (2015). The appreciation of a domestic currency reduced the competitiveness of exporters in the global market but increases the competitiveness of importers in the domestic market. According to Casu et al. (2015) policy rates typically impact asset prices relatively quickly, approved by the findings of significant relationship between the first lagged refinancing rate and stock prices. An increase in refinancing rate is typically a sign for tightening policy, consequently leading to a decline in stock prices.

**Table-7.** Diagnostic results for the ARDL (7,12,8,3,11,10) model.

| Criteria | Testing Methods | F-statistics | p-values |
|---|---|---|---|
| Serial Correlation | Breusch-Godfrey Serial Correlation LM | 2.0785 | 0.1287 |
| Heteroskedasticity | Breusch-Pagan-Godfrey | 0.8930 | 0.6813 |
| Normality | Jarque-Bera | 2.3544 | 0.3081 |
| Functional Misspecification | Ramsey RESET | 0.4803 | 0.4893 |

The diagnostic and stability tests were run afterwards to check whether the residuals of the system satisfied normal distribution, no serial correlation, no presence of heteroskedasticity, or correct functional form.

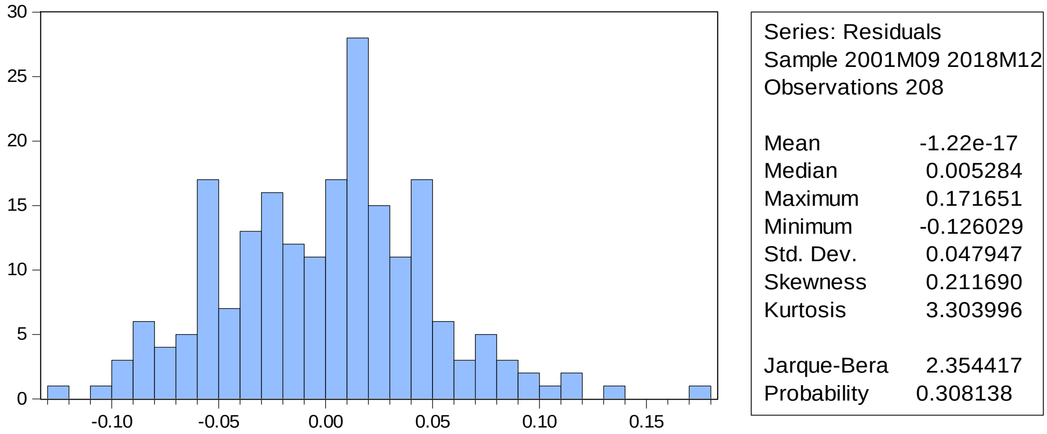

**Figure-1**. Histogram-normality test for the ARDL (7,12,8,3,11,10) model.

The results from Table 7 state that the null hypotheses of a normal distribution, the serial correlation LM test, heteroscedasticity, and Ramsey RESET test could not be rejected. They respectively indicated that the error terms were normally distributed, serial independent, homoscedastic, and the functional form of the model was correctly specified at the 5% significance level. Figure 1 provides further evidence for the normal distribution of the data, since the p-value was 0.308 implying that the null hypothesis can be retained at the 5% level of significance.

Passing all sufficient requirements for a fit model, the ARDL Bounds test – also known as the joint significant F-test at a specified lagged level – was applied to examine the cointegration between underlying factors. Table 8 reports the results of the bounds tests for cointegration and their critical values are provided in the lower part of the table. Accordingly, the F-statistic (with the value of 3.46) was greater than the upper bound at the 10% significance level (with the value of 3.35). This empirical result suggested the existence of cointegration relationship among variables in the model.

**Table-8.** Results of ARDL bounds-test for cointegration.

| Function | F-statistic | |
|---|---|---|
| F (LNVNI\|LNRR, LNMS, LNEX, LNDC, LNCPI) | 3.460451* | |
| Critical Values | Lower Bound | Upper Bound |
| 10% | 2.26 | 3.35 |
| 5% | 2.62 | 3.79 |
| 2.5% | 2.96 | 4.18 |
| 1% | 3.41 | 4.68 |

Note: Asymptotic critical values for bounds tests are obtained from Table CI (iii) Case III: Unrestricted intercept and no trend for k=5 (Pesaran et al., 2001).
*, **, *** denotes statistical significance at 1, 5, and 10 percent levels.
**Source:** Results of ARDL Bounds Test by EViews 10.0.

### *4.4. Estimation of Error Correction Model*

As the long term relationships from the ARDL model has been shown in Appendix A., the estimated coefficients expressed that refinancing rate, money supply, exchange rate, domestic credit, and inflation have a statistically significant impact on stock market returns.

The error correction mechanism of the ARDL (7,12,8,3,11,10) was further obtained as demonstrated in Appendix B. ECT(–1) is one period lag value of error terms that were taken from the long term estimation. The coefficient of ECT(-1) represents the speed of adjustment to return to equilibrium in the elasticity model. If there is a long term relationship between variables, the ECT must be negative signed and statistically significance. The empirical findings suggested that any shock from long term equilibrium could be significantly adjusted by 48.91% over the next period.

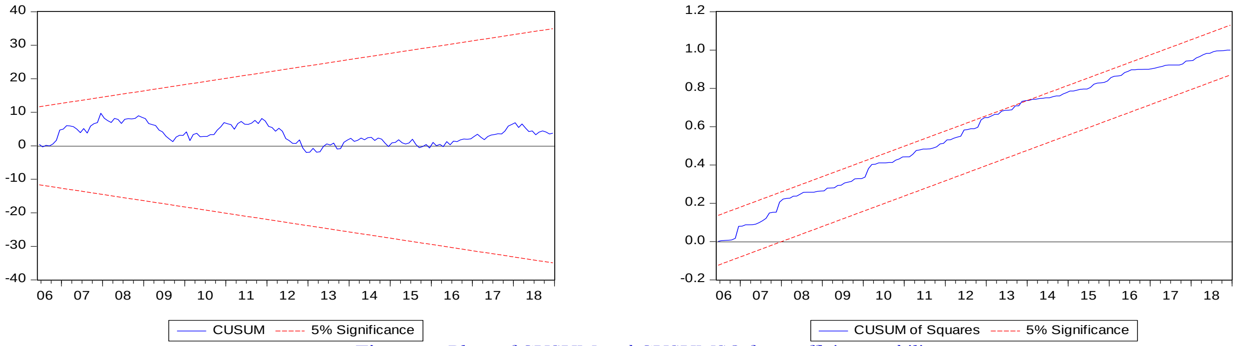


**Figure-2.** Plots of CUSUM and CUSUMSQ for coefficient stability.

Finally, to analyse the stability of the long term coefficients as well as short term dynamics, the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) were plotted (as proposed by Brown *et al.*, 1975). The null hypothesis (i.e. that is the model is correctly specified) could not be rejected if the statistics stood within the critical bounds of the 5% significance level. The Figure 2 demonstrates that the plots of both the CUSUM and CUSUMSQ did not exceed the boundaries, confirming the structural stability of selected ARDL model specification.

## 5. CONCLUSIONS

The paper investigated the long term and short term associations between monetary policy factors and stock market returns under the context of an emerging market such as Vietnam. By using monthly time series data from Aug 2000 to Dec 2018, the empirical results found a cointegration relationship among variables of interest. For the robustness of long term relationship, the ARDL bounds testing technique was applied to capture long term linkage as well short term dynamics among variables. After finding the appropriate order of integration, the empirical findings suggested the existence of a long term equilibrium between stock market returns and monetary policy for Vietnam. However, the interactions can merely be detectable after a certain period of delay, which appear consistent with the facts about transmission lags of monetary policy.

Since the efficiency of legal scheme plays a vital role in respect of the economy's development, the paper attempts to propose policy implications and investment recommendations for benefiting the Vietnamese stock market itself and its various participants, from practitioners (i.e. investors, portfolio managers and financial consultants) to academics (i.e. researchers and financial analysts). It must be taken more judiciously in the case of Vietnam, where the legal framework of this new emerging market seems insufficient regarding transparency, systematic consistency and efficiency.

The significant interactions between the five selected monetary variables and Vietnamese stock market returns in both the long and short term via the presence of cointegrating relationship and error correction terms suggests the necessity of careful consideration before implementing or amending monetary policy to avoid adverse effect on the equity market. The policy-makers are advised to sustain money supply expansion, attempt to appreciate the local currency, while constrain inflation, control domestic credit, and reduce refinancing rate in regarding with promoting the progress of the Vietnamese securities market in the long term. However, these suggestions should be revised as needed in terms of the real time situation of Vietnam's economy, as there are always other external explanatory factors which are excluded from current research, such as global or Asian economic trends or possible changes in Vietnam's political system.

The results suggest that the revision of investment strategies is required when any changes occur within current monetary framework. Investors or financial consultants, hence, must consider all the factors that affect the monetary environment. These factors can be any signals that possibly surge refinancing rate (e.g. to deal with global financial crisis), increase inflation pressure (i.e. the overheating of the economy), devalue local currency (i.e. a trade deficit), or raise domestic credit (i.e. a free trade agreement).

These implications are expected to have a direct impact on the actions of policymakers and investors, which consequently benefit for the strengthening of the legal framework as well as investment environment improvement under the situation of Vietnam. However, this paper has not considered the causality among selected variables as well as the volatility of stock market returns. The study could also consider extending its scope by setting up a cross-country context. Therefore, they may suggest a noteworthy future research.

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## REFERENCES

Abouwafia, H. E., & Chambers, M. J. (2015). Monetary policy, exchange rates and stock prices in the Middle East region. *International Review of Financial Analysis, 37*, 14-28.Available at: https://doi.org/10.1016/j.irfa.2014.11.001.

Asteriou, D., & Hall, S. G. (2007). *Applied econometrics: A modern approach using eviews and microfit* (Revised ed.). New York: Palgrave Macmillan.

Ayopo, B. A., Isola, L. A., & Olukayode, S. R. (2015). Monetary policy dynamics and the stock market movements: Empirical evidence from Nigeria. *Journal of Applied Economic Sciences, 10*(8), 1179-1188.

Bapci, E. S., & Karaca, S. S. (2013). The determinants of stock market index: VAR approach to Turkish stock market. *International Journal of Economics and Financial Issues, 13*(1), 163-171.

Basher, S. A., Haug, A. A., & Sadorsky, P. (2012). Oil prices, exchange rates and emerging stock markets. *Energy Economics, 34*(1), 227-240.

Belke, A., & Beckman, J. (2014). Monetary policy and stock prices – cross-country evidence from cointegrated VAR models. *Journal of Banking & Finance, 54*(C), 254-265.

Bissoon, R., Seetanah, B., Bhattu-Babajee, R., Gopy-Ramdhany, N., & Seetah, K. (2016). Monetary policy impact on stock return: Evidence from growing stock markets. *Theoretical Economics Letters, 6*(05), 1186-1195.Available at: https://doi.org/10.4236/tel.2016.65112.

Bjørnland, H. C., & Leitemo, K. (2009). Identifying the interdependence between US monetary policy and the stock market. *Journal of Monetary Economics, 56*(2), 275-282.Available at: https://doi.org/10.1016/j.jmoneco.2008.12.001.

Brigham, E., & Gapenski, L. (1996). *Intermediate financial management* (5th ed.). New York: The Dryden Press.

Brooks, C. (2008). *Introductory econometrics for finance*. Cambridge: Cambridge University Press.

Casu, B., Girardone, C., & Molyneux, G. (2015). *Introduction to banking* (2nd ed.). Edinburgh: Pearson Education Limited.

Chang, Y., & Phillips, P. C. B. (1995). Symposium issue: Trending multiple time series. *Econometric Theory, 11*(5), 1033-1094.

Chen, N.-F., Roll, R., & Ross, S. A. (1986). Economic forces and the stock market. *The Journal of Business, 59*(3), 383-403.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74*(366a), 427-431.Available at: https://doi.org/10.1080/01621459.1979.10482531.

Dickey., D. A., & Fuller, W. A. (1981). The likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica, 49*(4), 1057-1072.

Durham, J. B. (2003). Monetary policy and stock price returns. *Financial Analysts Journal, 59*(4), 26-35.Available at: https://doi.org/10.2469/faj.v59.n4.2543.

Enders, W. (2004). *Applied econometric time series* (2nd ed.). New York: John Wiley & Sons.

Engle, R. F., & Granger, C. W. (1987). Cointegration and error correction: Representation, estimation, and testing. *Econometrica, 55*(2), 251-276.Available at: https://doi.org/10.2307/1913236.

Engle, R. F., & Yoo, B. S. (1987). Forecasting and testing in co-integrated systems. *Journal of Econometrics, 35*(1), 143-159.Available at: https://doi.org/10.1016/0304-4076(87)90085-6.

Fausch, J., & Sigonius, M. (2018). The impact of ECB monetary policy surprises on the German stock market. *Journal of Macroeconomics, 55*, 46-63.Available at: https://doi.org/10.1016/j.jmacro.2017.09.001.

Fauziah, Moeljadi, & Ratnawati, K. (2015). Dynamic relationship between exchange rates and stock prices in Asia, 2009-2013. *Journal of Economics, Finance and Accounting, 2*(1), 124-134.Available at: https://doi.org/10.17261/pressacademia.201519783.

Flannery, M. J., & Protopapadakis, A. A. (2002). Macroeconomic factors do influence aggregate stock returns. *The Review of Financial Studies, 15*(3), 751-782.Available at: https://doi.org/10.1093/rfs/15.3.751.

Granger, C. W. (1981). Some properties of time series data and their use in econometric model specification. *Journal of Econometrics, 16*(1), 121-130.Available at: https://doi.org/10.1016/0304-4076(81)90079-8.

Granger, C. W., & Weiss, A. A. (1983). Time series analysis of error-correction models. Studies in econometrics, time series, and multivariate statistics (pp. 255-278). New York: Academic Press.

Gujarati, D. (2011). *Econometrics by example*. New York: Palgrave Macmillan.

Hallberg, M., & Ryhage, M. (2019). *Effects of monetary policy on stock market liquidity: Empirical analysis on the Swedish market*. Bachalor Thesis in Economics. UMEA University (Sweden).

Hamrita, M. E., & Trifi, A. (2011). The relationship between interest rate, exchange rate and stock price: A wavelet analysis. *International Journal of Economics and Financial Issues, 1*(4), 220-228.

Hussainey, K., & Le, N. K. (2009). The impact of macroeconomic indicators on Vietnamese stock prices. *The Journal of Risk Finance, 10*(4), 321- 332.Available at: https://doi.org/10.1108/15265940910980632.

Ioannidis, C., & Kontonikas, A. (2008). The impact of monetary policy on stock prices. *Journal of Policy Modeling, 30*(1), 33-53.Available at: https://doi.org/10.1016/j.jpolmod.2007.06.015.

Jansen, D. W., & Tsai, C.-L. (2010). Monetary policy and stock returns: Financing constraints and asymmetries in bull and bear markets. *Journal of Empirical finance, 17*(5), 981-990.Available at: https://doi.org/10.1016/j.jempfin.2010.08.002.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control, 12*(2-3), 231-254.Available at: https://doi.org/10.1016/0165-1889(88)90041-3.

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with applications to the demand for money. *Oxford Bulletin of Economics and Statistics, 52*(2), 169-210.Available at: https://doi.org/10.1111/j.1468-0084.1990.mp52002003.x.

Johansen., S. (1991). Estimation and hypothesis testing of cointegration vectors in gaussian vector autoregressive models. *Econometrica, 59*(6), 1551-1580.Available at: https://doi.org/10.2307/2938278.

Johansen.., S. (1995). *Likelihood-based inference in cointegrated vector autoregressive models*. Oxford: Oxford University Press.

Kitamura, Y., & Phillips, P. C. (1995). Efficient IV estimation in nonstationary regression: An overview and simulation study. *Econometric Theory, 11*(5), 1095-1130.Available at: https://doi.org/10.1017/s026646660000997x.

Kwiatkowski, D., Phillips, P. C., Schmidt, P., & Shin, Y. (1992). Testing the null hypothesis of stationarity against the alternative of a unit root. *Journal of Econometrics, 54*(1-3), 159-178.Available at: https://doi.org/10.1016/0304-4076(92)90104-y.

Kwon, C. S., & Shin, T. S. (1999). Cointegration and causality between macroeconomic variables and stock market returns. *Global Finance Journal, 10*(1), 71-81.Available at: https://doi.org/10.1016/s1044-0283(99)00006-x.

Lawal, A. I., Somoye, R. O., Babajide, A. A., & Nwanji, T. I. (2018). The effect of fiscal and monetary policies interaction on stock market performance: Evidence from Nigeria. *Future Business Journal, 4*(1), 16-33.Available at: https://doi.org/10.1016/j.fbj.2017.11.004.

Le, H. P., & Dang, T. B. V. (2015). Verifying the impact of macroeconomic factors to the Vietnam's stock index by the ARDL model" (Check the ARDL model with the effects of each of them to a number of locations in Vietnam). *Journal of Development and Integration, University of Economics and Finance (Vietnam)*, *20*(30), 61-66.

Lee, B. S. (1992). Causal relations among stock returns, interest rates, real activity, and inflation. *The Journal of Finance*, *47*(4), 1591-1603.Available at: https://doi.org/10.1111/j.1540-6261.1992.tb04673.x.

Li, L., & Hu, Z. F. (1998). Responses of the stock market to macroeconomic announcements across economic states. *IMF Working Papers 98/79*.

Liang, C.-C., Lin, J.-B., & Hsu, H.-C. (2013). Reexamining the relationships between stock prices and exchange rates in ASEAN-5 using panel Granger causality approach. *Economic Modelling*, *32*, 560-563.Available at: https://doi.org/10.1016/j.econmod.2013.03.001.

Lintner, J. (1965). The Valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Review of Economics and Statistics*, *47*(1), 13-37.Available at: https://doi.org/10.2307/1924119.

MacKinnon, J. G. (1996). Numerical distribution functions for unit root and cointegration tests. *Journal of Applied Econometrics*, *11*(6), 601-618.Available at: https://doi.org/10.1002/(sici)1099-1255(199611)11:6<601::aid-jae417>3.0.co;2-t.

Maddala, G. S., & Kim, I. M. (1998). *Unit roots, cointegration and structural change*. Cambridge: Cambridge University Press.

Muroyiwa, B., Ezeoha, A., & Mushunje, A. (2017). Identifying the interdependence between South Africa's monetary policy and the stock market. *International Journal of Sciences and Research*, *73*(9), 214-233.

Narayan, P. K., & Narayan, S. (2010). Modelling the impact of oil prices on Vietnam's stock prices. *Applied Energy*, *87*(1), 356-361.Available at: https://doi.org/10.1016/j.apenergy.2009.05.037.

Naseem, S., Fu, G., ThiLan, V., Mohsin, M., & Rehman, M. (2019). Macroeconomic variables and the Pakistan stock market: Exploring long and short-run relationships. *Pacific Business Review International*, *11*(7), 621-672.

Okpara, G. C. (2010). Monetary policy and stock market returns: Evidence from Nigeria. *Journal of Economics*, *1*(1), 13-21.Available at: https://doi.org/10.1080/09765239.2010.11884920.

Pesaran, M. H., & Shin, Y. (1998). An autoregressive distributed-lag modelling approach to cointegration analysis. Econometric Society Monographs. In Steinar Strom (Ed.), Econometrics and Economic Theory in the 20th century: The Ragnar Frish Centennial Symposium (pp. 371-413). Cambridge: Cambridge University Press.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289-326.Available at: https://doi.org/10.1002/jae.616.

Pesaran., M. H., & Pesaran, B. (2009). *Time series econometrics using microfit 5.0* (1st ed.). New York: Oxford University Press Inc.

Phillips, P. C., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, *75*(2), 335-346.Available at: https://doi.org/10.1093/biomet/75.2.335.

Pilinkus, D. (2010). Macroeconomic indicators and their impact on stock market performance in the short and long run: The case of the baltic states. *Technological and Economic Development of Economy*, *16*(2), 291-304.Available at: https://doi.org/10.3846/tede.2010.19.

Ratanapakorn, O., & Sharma, S. C. (2007). Dynamic analysis between the US stock returns and the macroeconomic variables. *Applied Financial Economics*, *17*(5), 369-377.Available at: https://doi.org/10.1080/09603100600638944.

Rjoub, H., Tursoy, T., & Gunsel, N. (2009). The effects of macroeconomic factors on stock returns: Instanbul stock market. *Studies in Economics and Finance*, *26*(1), 36-45.

Ross, S. (1976). The arbitrage theory of capital asset pricing. *Journal of Economic Theory*, *13*(3), 1073.

Shanken, J., & Weinstein, M. I. (2006). Economic forces and the stock market revisited. *Journal of Empirical finance*, *13*(2), 129-144.Available at: https://doi.org/10.1016/j.jempfin.2005.09.001.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance*, *19*(3), 425-442.Available at: https://doi.org/10.2307/2977928.

Shrestha, M. B., & Bhatta, G. R. (2018). Selecting appropriate methodological framework for time series data analysis. *The Journal of Finance and Data Science*, *4*(2), 71-89.Available at: https://doi.org/10.1016/j.jfds.2017.11.001.

State Bank of Vietnam. (2019). History and development of the central bank. Retrieved from https://www.sbv.gov.vn/webcenter/portal/en/home/rm/museum/hadotcb?_afrLoop=8711736240281326#%40%3F_afrLoop%3D8711736240281326%26centerWidth%3D80%2525%26leftWidth%3D20%2525%26rightWidth%3D0%2525%26showFooter%3Dfalse%26showHeader%3Dfalse%26_adf.ctrl-state%3Dv0ksmbke2_58. [Accessed 5 Dec 2019]

State Securities Commission of Vietnam. (2019). Data and Statistics. Retrieved from http://ssc.gov.vn/ssc/faces/en/enmenu/enpages_das?_afrLoop=32739170106434874&_afrWindowMode=0&_afrWindowId=x5nzkc6ef_119#%40%3F_afrWindowId%3Dx5nzkc6ef_119%26_afrLoop%3D32739170106434874%26_afrWindowMode%3D0%26_adf.ctrl-state%3Dx5nzkc6ef_139. [Accessed 5 Dec 2019].

Stock, J. H., & Watson, M. W. (2006). *Introduction to econometrics* (2nd ed.). Boston: Addison-Wesley.

Tang, Y., Luo, Y., Xiong, J., Zhao, F., & Zhang, Y.-C. (2013). Impact of monetary policy changes on the Chinese monetary and stock markets. *Physica A: Statistical Mechanics and its Applications*, *392*(19), 4435-4449.

Tangjitprom, N. (2012). Macroeconomic factors of emerging stock market: The evidence of Thailand. *International Journal of Financial Research*, *3*(2), 105-114.

The World Bank. (2019). Vietnam's economy expanded by 6.8 percent in 2019 but reforms are needed to unleash the potential of capital markets, press release. Retrieved from https://www.worldbank.org/en/news/press-release/2019/12/17/vietnams-economy-expanded-by-68-percent-in-2019-but-reforms-are-needed-to-unleash-the-potential-of-capital-markets. [Accessed 5 Jan 2020].

Treynor, J. L. (1962). Toward a theory of market value of risky assets, Unpublished manuscript, "Rough Draft" dated by Mr. Treynor to the fall of 1962. A final version was published in 1999, in Asset Pricing and Portfolio Performance. Robert A. Korajczyk (Editor) (pp. 15-22). London: Risk Books.

Tsuji, C. (2011). An investigation on the dynamics of industry stock prices and exchange rates in Japan. *Business and Management Review*, *1*(3), 01-04.

Tursoy, T. (2019). The interaction between stock prices and interest rates in Turkey: Empirical evidence from ARDL bounds test cointegration. *Financial Innovation*, *5*(1), 1-12.Available at: https://doi.org/10.1186/s40854-019-0124-6.

Val, F. D. F., Klotzle, M. C., Pinto, A. C. F., & Barbedo, C. H. d. S. (2018). Stock market reaction to monetary policy: An event study analysis of the Brazilian case. *Emerging Markets Finance and Trade*, *54*(11), 2577-2595.Available at: https://doi.org/10.1080/1540496x.2017.1364622.

Victor, O.-N., & Kuwornu, J. K. (2011). Analyzing the effect of macroeconomic variables on stock market returns: Evidence from Ghana. *Journal of Economics and International Finance*, *3*(11), 605-615.

Vuong, D., & Le, L. H. (2017). Impact of macroeconomic factors on share price index in Vietnam's stock market. *The International Journal of Engineering and Science*, *6*(1), 52-59.Available at: https://doi.org/10.9790/1813-0601025259.

Wu, Y. (2001). Exchange rates, stock prices, and money markets: Evidence from Singapore. *Journal of Asian Economics*, *12*(3), 445-458.Available at: https://doi.org/10.1016/s1049-0078(01)00107-5.

Zakaria, Z., & Shamsuddin, S. (2012). Empirical evidence on the relationship between stock market volatility and macroeconomics volatility in Malaysia. *Journal of Business Studies Quarterly*, *4*(2), 61-71.

**Appendix-A.** Long term estimation of the ARDL (7,12,8,3,11,10) regression model

| Variable | Coefficient | Std. Error | t-Statistic | Probability |
|---|---|---|---|---|
| LNVNI(-1) | 0.484271* | 0.073845 | 6.557948 | 0.0000 |
| LNVNI(-2) | -0.018448 | 0.076895 | -0.239915 | 0.8107 |
| LNVNI(-3) | -0.118061 | 0.072140 | -1.636541 | 0.1038 |
| LNVNI(-4) | 0.088521 | 0.073715 | 1.200865 | 0.2317 |
| LNVNI(-5) | 0.169489** | 0.072168 | 2.348554 | 0.0201 |
| LNVNI(-6) | -0.215970* | 0.073120 | -2.953630 | 0.0036 |
| LNVNI(-7) | 0.121021*** | 0.065121 | 1.858406 | 0.0651 |
| LNRR | -0.094659 | 0.085298 | -1.109739 | 0.2689 |
| LNRR(-1) | -0.159986** | 0.084902 | -1.884353 | 0.0614 |

| | | | | |
|---|---|---|---|---|
| LNRR(-2) | 0.225639* | 0.085457 | 2.640392 | 0.0092 |
| LNRR(-3) | 0.151008*** | 0.087020 | 1.735332 | 0.0847 |
| LNRR(-4) | -0.207391** | 0.086583 | -2.395299 | 0.0178 |
| LNRR(-5) | -0.149110 | 0.090602 | -1.645766 | 0.1019 |
| LNRR(-6) | -0.042279 | 0.087879 | -0.481105 | 0.6311 |
| LNRR(-7) | -0.128371 | 0.089274 | -1.437935 | 0.1525 |
| LNRR(-8) | 0.098120 | 0.087824 | 1.117237 | 0.2657 |
| LNRR(-9) | -0.036641 | 0.089527 | -0.409275 | 0.6829 |
| LNRR(-10) | -0.064288 | 0.083707 | -0.768007 | 0.4437 |
| LNRR(-11) | 0.203100** | 0.080651 | 2.518272 | 0.0128 |
| LNRR(-12) | 0.209932** | 0.082624 | 2.540810 | 0.0121 |
| LNMS | 0.564397 | 0.412316 | 1.368847 | 0.1731 |
| LNMS(-1) | 1.097323* | 0.410695 | 2.671866 | 0.0084 |
| LNMS(-2) | 0.304950 | 0.418469 | 0.728727 | 0.4673 |
| LNMS(-3) | -1.097461** | 0.428201 | -2.562956 | 0.0114 |
| LNMS(-4) | 0.177609 | 0.413725 | 0.429292 | 0.6683 |
| LNMS(-5) | -0.543090 | 0.399966 | -1.357838 | 0.1765 |
| LNMS(-6) | 0.130789 | 0.408884 | 0.319868 | 0.7495 |
| LNMS(-7) | 0.549600 | 0.403947 | 1.360574 | 0.1757 |
| LNMS(-8) | -0.933416** | 0.401891 | -2.322559 | 0.0215 |
| LNEX | 0.014303 | 0.202136 | 0.070760 | 0.9437 |
| LNEX(-1) | 0.152720 | 0.259338 | 0.588882 | 0.5568 |
| LNEX(-2) | 0.126560 | 0.255001 | 0.496311 | 0.6204 |
| LNEX(-3) | 0.400341** | 0.197680 | 2.025203 | 0.0446 |
| LNDC | -0.358482 | 0.320271 | -1.119310 | 0.2648 |
| LNDC(-1) | -0.705878** | 0.318589 | -2.215642 | 0.0282 |
| LNDC(-2) | -0.474314 | 0.321344 | -1.476030 | 0.1420 |
| LNDC(-3) | 1.136254* | 0.334674 | 3.395111 | 0.0009 |
| LNDC(-4) | -0.342162 | 0.327772 | -1.043901 | 0.2982 |
| LNDC(-5) | 0.644226** | 0.315565 | 2.041504 | 0.0429 |
| LNDC(-6) | -0.120359 | 0.324099 | -0.371366 | 0.7109 |
| LNDC(-7) | -0.512400 | 0.315462 | -1.624281 | 0.1064 |
| LNDC(-8) | 0.847352* | 0.309553 | 2.737342 | 0.0069 |
| LNDC(-9) | -0.119931 | 0.239464 | -0.500830 | 0.6172 |
| LNDC(-10) | 0.236943 | 0.227351 | 1.042191 | 0.2990 |
| LNDC(-11) | -0.671698* | 0.227952 | -2.946660 | 0.0037 |
| LNCPI | -1.895620** | 0.878411 | -2.158011 | 0.0325 |
| LNCPI(-1) | 0.439599 | 1.028116 | 0.427578 | 0.6696 |
| LNCPI(-2) | 2.205923** | 1.017515 | 2.167951 | 0.0317 |
| LNCPI(-3) | -2.624998** | 1.058586 | -2.479722 | 0.0142 |
| LNCPI(-4) | 2.762949** | 1.068305 | 2.586292 | 0.0106 |
| LNCPI(-5) | -2.994335* | 1.086538 | -2.755850 | 0.0066 |
| LNCPI(-6) | 2.998208* | 1.065413 | 2.814127 | 0.0055 |
| LNCPI(-7) | -0.788323 | 0.994502 | -0.792681 | 0.4292 |
| LNCPI(-8) | 0.813397 | 0.963564 | 0.844155 | 0.3999 |
| LNCPI(-9) | -3.754149* | 0.990914 | -3.788574 | 0.0002 |
| LNCPI(-10) | 1.800716** | 0.842984 | 2.136121 | 0.0343 |
| C | 0.004983 | 0.014159 | 0.351894 | 0.7254 |

**Note:** $R^2$ = 0.6576; Adjusted $R^2$ = 0.5306; F-stat = 5.1787 (0.000); and DW = 1.8941.
*, **, *** denotes statistical significance at 1, 5, and 10 percent levels.
**Source:** Results of the ARDL (7,12,8,3,11,10) Model from EViews 10.0.

**Appendix-B.** Short term estimation of the ARDL (7,12,8,3,11,10) model.

| Variable | Coefficient | Std. Error | t-Statistic | Probability |
|---|---|---|---|---|
| DLNVNI(-1) | -0.026553 | 0.102973 | -0.257863 | 0.7969 |
| DLNVNI(-2) | -0.045001 | 0.094827 | -0.474561 | 0.6358 |
| DLNVNI(-3) | -0.163062** | 0.086037 | -1.895259 | 0.0600 |
| DLNVNI(-4) | -0.074541 | 0.074784 | -0.996748 | 0.3205 |
| DLNVNI(-5) | 0.094949 | 0.067263 | 1.411597 | 0.1601 |
| DLNVNI(-6) | -0.121021*** | 0.061886 | -1.955558 | 0.0524 |
| DLNRR | -0.094659 | 0.079783 | -1.186459 | 0.2373 |

| | | | | |
|---|---|---|---|---|
| DLNRR(-1) | -0.259720** | 0.105345 | -2.465425 | 0.0148 |
| DLNRR(-2) | -0.034080 | 0.123322 | -0.276354 | 0.7827 |
| DLNRR(-3) | 0.116928 | 0.129823 | 0.900671 | 0.3692 |
| DLNRR(-4) | -0.090464 | 0.131218 | -0.689413 | 0.4916 |
| DLNRR(-5) | -0.239574*** | 0.135843 | -1.763615 | 0.0798 |
| DLNRR(-6) | -0.281853** | 0.136448 | -2.065640 | 0.0406 |
| DLNRR(-7) | -0.410223* | 0.129352 | -3.171382 | 0.0018 |
| DLNRR(-8) | -0.312103** | 0.123226 | -2.532775 | 0.0123 |
| DLNRR(-9) | -0.348745* | 0.110664 | -3.151379 | 0.0020 |
| DLNRR(-10) | -0.413032* | 0.097673 | -4.228748 | 0.0000 |
| DLNRR(-11) | -0.209932* | 0.076381 | -2.748497 | 0.0067 |
| DLNMS | 0.564397 | 0.372471 | 1.515280 | 0.1318 |
| DLNMS(-1) | 1.411019* | 0.485979 | 2.903456 | 0.0042 |
| DLNMS(-2) | 1.715968* | 0.573666 | 2.991233 | 0.0032 |
| DLNMS(-3) | 0.618507 | 0.612825 | 1.009272 | 0.3145 |
| DLNMS(-4) | 0.796116 | 0.620291 | 1.283455 | 0.2013 |
| DLNMS(-5) | 0.253027 | 0.585733 | 0.431983 | 0.6664 |
| DLNMS(-6) | 0.383816 | 0.501725 | 0.764992 | 0.4455 |
| DLNMS(-7) | 0.933416** | 0.373683 | 2.497880 | 0.0136 |
| DLNEX | 0.014303 | 0.145505 | 0.098301 | 0.9218 |
| DLNEX(-1) | -0.526901* | 0.188484 | -2.795469 | 0.0059 |
| DLNEX(-2) | -0.400341* | 0.138419 | -2.892246 | 0.0044 |
| DLNDC | -0.358482 | 0.293432 | -1.221688 | 0.2237 |
| DLNDC(-1) | -0.623912 | 0.389336 | -1.602502 | 0.1111 |
| DLNDC(-2) | -1.098226** | 0.430321 | -2.552112 | 0.0117 |
| DLNDC(-3) | 0.038028 | 0.448140 | 0.084857 | 0.9325 |
| DLNDC(-4) | -0.304134 | 0.452530 | -0.672075 | 0.5026 |
| DLNDC(-5) | 0.340092 | 0.459846 | 0.739579 | 0.4607 |
| DLNDC(-6) | 0.219733 | 0.451721 | 0.486435 | 0.6274 |
| DLNDC(-7) | -0.292666 | 0.419373 | -0.697867 | 0.4863 |
| DLNDC(-8) | 0.554686 | 0.338102 | 1.640585 | 0.1030 |
| DLNDC(-9) | 0.434755 | 0.278057 | 1.563546 | 0.1200 |
| DLNDC(-10) | 0.671698* | 0.215554 | 3.116149 | 0.0022 |
| DLNCPI | -1.895620** | 0.790809 | -2.397064 | 0.0177 |
| DLNCPI(-1) | -0.419388 | 0.828370 | -0.506281 | 0.6134 |
| DLNCPI(-2) | 1.786535** | 0.873415 | 2.045461 | 0.0425 |
| DLNCPI(-3) | -0.838463 | 0.872403 | -0.961096 | 0.3380 |
| DLNCPI(-4) | 1.924486** | 0.840395 | 2.289978 | 0.0234 |
| DLNCPI(-5) | -1.069849 | 0.891198 | -1.200462 | 0.2318 |
| DLNCPI(-6) | 1.928359** | 0.858468 | 2.246280 | 0.0261 |
| DLNCPI(-7) | 1.140036 | 0.833646 | 1.367530 | 0.1735 |
| DLNCPI(-8) | 1.953434** | 0.775999 | 2.517314 | 0.0129 |
| DLNCPI(-9) | -1.800716** | 0.775495 | -2.322020 | 0.0216 |
| C | 0.004983 | 0.003959 | 1.258580 | 0.2101 |
| ECM(-1) | -0.489176* | 0.105621 | -4.631437 | 0.0000 |

**Note:** R2 = 0.7086; Adjusted R2 = 0.56134; F-stat = 7.4404 (0.000); and DW = 1.8941.
*, **, *** denotes statistical significance at 1, 5, and 10 percent levels.
**Source:** Results of ECM Estimation by EViews 10.0.