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Macro-Economic Factors Affecting the Vietnam Stock Price Index: An Application of the ARDL Model

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Abstract

Using the ARDL approach, this study examined the impact of macro factors on Vietnam's stock market in the short and long run from 2010 to 2021. The State Bank of Vietnam and the International Monetary Fund provided time series data for this study. Research results show that in the long run, money supply and exchange rate respectively affect the stock market. The money supply had a positive effect on the VN-Index, while the exchange rate showed the opposite effect. However, the study did not find a relationship between world oil price and interest rates on VN-Index in the long run. On the other hand, in the short term, there are relationships between variables; specifically, interest rates and exchange rates have a negative impact on the VN-Index, while the world oil price and the fluctuation of money supply M2 of the previous one and two months showed an impact in the same direction on this index. The differences in the regression results on the impact of exchange rate and oil price on the VN-Index compared to previous studies come from the characteristics of Vietnam's stock market, with the large capitalization of companies in the oil and gas sector, and the structure of Vietnam's economy with export heavily depends on FDI sector.

Keywords: VN-Index, Money Supply, M2, Oil Prices, Interest Rates, Exchange Rates

JEL Classification Code: C32, G10, G14

1. Introduction

The financial market plays an important role in attracting and mobilizing domestic and foreign financial sources, simultaneously encouraging saving and investment, which contributes to promoting and improving the efficiency of financial use. Several domestic and international macro factors that directly promoted the stock market's fluctuations have been researched and studied by many authors before. Most studies stated that the stock markets were affected by macro

variables such as inflation, exchange rate, money supply, and industrial production index. In particular, the results of that effect may vary from country to country. Currently, Vietnam's stock market has been gradually perfecting its structure, developing into an important capital mobilization channel for the economy, with the scale of capital mobilization through the stock market in the period 2011–2020 reaching nearly 2.9 million billion dongs, almost 10 times as much as that in the 2001–2010 period, contributing 19.5% of total social investment capital on average; contributing to restructuring Vietnam's financial system towards a more balanced and sustainable direction. Studying how macroeconomic variables affect the market will help policymakers thoroughly understand and appropriately adjust policy tools, avoiding shocks to the market. Simultaneously, from the perspective of investors, domestic and foreign investors also want to know how much their assets would be affected by the sudden movements of changing economic variables.

Although the stock market, in general, or the stock price index, in particular, is affected by endogenous factors as well as exogenous factors and many others, this study only focuses on clarifying the impact of several exogenous factors on the VN-Index in both the short-term and long-term.

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2. Literature Review

2.1. Theoretical Basis

There have been many studies analyzing the impact of macro variables on the stock market or stock prices. For example, Chen et al. (1986) researched the impact of six macro variables on the NYSE index. A simple asset pricing model, according to Chen et al. (1986), could be written as:

$$p = \frac{E[c]}{k}$$

In which, p is the value of the asset or security, $E[c]$ is the market's expectation of future dividend flows, and k is the discount rate. Macro variables that change the market's expectations for the right side of the equation will affect the stock prices.

For the numerator, macroeconomic variables that change the market's expectations of future dividend flows will change the value of the stock. High oil prices, for example, will increase the business costs in the future, erode profits and future dividend flows, and therefore are expected to negatively affect the stock prices. However, for countries whose economies are based on oil exports, oil prices can positively affect stock indexes. Degiannakis et al. (2018) fully summarized the results of theoretical and experimental studies on the relationship between oil prices and stock prices. The money supply had a two-way effect on stock prices. Firstly, an increase in money supply raised expectations of future inflation, increased business costs, and negatively impacted corporate profits and stock prices. On the other hand, an increase in money supply raised the liquidity effect for the financial market and the stock market in particular. Abundant cash flows had a positive impact on stock value. The study by Aspren (1989) on the impact of macro variables on stock indexes of 10 European countries showed that the impact of money supply on stock indexes in most countries is positive, showing that the liquidity effect was more important in the relationship between money supply and stocks. The study also found the impact of exchange rates on stocks in 6 of the 10 countries researched. When the exchange rate rose, or the value of the domestic currency fell, a country's exported goods would become more competitive. Increased export turnover had a positive impact on the economy in general and stock values in particular. In international macroeconomic theories, this is the beggar-thy-neighbor effect, firstly shown in the Mundell-Fleming-Dornbusch model. Obstfeld and Rogoff (1995) showed that an increase in the domestic money supply could have a positive effect on both the domestic economy and the foreign economy, not only the domestic economy as in Mundell-Fleming-Dornbusch. Complementing the empirical

evidence, Mukherjee and Naka (1995) found a positive effect of the Japanese Yen/USD exchange rate on Japan's stock indexes.

In the denominator, variables that change the discount rate will also change the value of the stock. Empirical studies often found an inverse relationship between interest rates and stock prices. Aspren (1989) showed this opposite effect in 5/10 European countries researched. Mukherjee and Naka (1995) found the opposite effect as expected between long-term interest rates and Japan's stock indexes. However, the relationship between short-term interest rates and Japan's stock indexes was positive. The reason could be that short-term interest rates decreased when the money supply increased. Therefore, the positive effect of money supply on stocks through increasing market liquidity (liquidity effect) was partly reflected in the estimated coefficient of short-term interest rates.

Research by Adam and Tweneboah (2008) examined the role of macroeconomic variables in stock price movements in Ghana. The author analyzed the long-run and short-run relationships between the Ghana stock market indexes and foreign direct investment, the Treasury bill rate (as a measure of interest rates), the consumer price index (which measures inflation), and exchange rates as macroeconomic variables from January 1991 to April 2006 using Johansen's multivariable cointegration test and innovative accounting techniques. Research results showed that the identified macroeconomic variables significantly influence stock price fluctuations in Ghana.

Richards et al. (2009) analyzed the relationship between the exchange rate (AUD/USD) and the All Ordinaries stock price index in Australia from January 2, 2003, to June 30, 2006. The authors used the OLS regression method to estimate the relationship between the 2 variables based on the original data series and the first differences. Then, the author used the VAR model and Granger causality test to estimate the relationship between the selected variables. Research results showed a positive cointegrating relationship between the two variables. Granger causality confirmed the existence of a causal impact of stock price indexes on exchange rates.

Ahmet (2010) used the OLS model to analyze the impact of 7 macroeconomic variables including consumer price index, interest rates, gold prices, industrial production index, oil prices, exchange rates, and money supply to the Turkish stock market (via the ISE-100 index). Using monthly data, from January 2003 to March 2010, the results showed that interest rates, industrial production index, oil prices, and exchange rates had a negative impact on the ISE-100 index, while money supply positively affected the ISE-100 index. On the other hand, the inflation rate and gold prices were found not to have any significant effect on the Turkish ISE-100 index.

Bekhet and Mugableh (2012) analyzed the long-run and short-run equilibrium relationships between macroeconomic

variables and the Malaysian stock market indexes for the period 1977-to 2011. Using the ARDL model, the study showed that in the long run, the exchange rates, inflation, producer price index, and money supply M3 had a negative impact on the stock indexes, while GDP had a positive impact. On the other hand, in the short term, inflation and money supply M3 positively affected the stock indexes, while the exchange rates, producer price index, and GDP negatively impacted the stock indexes. In addition, this paper had an important role for policymakers, financial economists, and domestic and international investors in the Malaysian stock market.

In Vietnam, there have been some authors approaching to build different research models to examine and evaluate the impact of several macroeconomic factors on the stock market. There, the study by Kieu and Diep (2013) measured the relationship of macroeconomic factors with the fluctuation of Vietnam's stock market (through the VN-Index stock price). There are four factors including the consumer price index CPI (a measure of inflation), the USD/VND exchange rate, and the money supply M2. The study showed that the VN-Index stock price had positive relationships with money supply M2 and domestic gold prices in the long run. On the contrary, it showed a negative relationship with inflation, while there was no relationship between exchange rates and stock price indexes. In the short term, the current stock price indexes were directly proportional to the previous month's stock price indexes and inversely proportional to the exchange rates.

Phong and Bach Van (2015) used the monthly time series from January 2001 to December 2013 to study the effects of macro factors on the Vietnam stock index. By using the ARDL model to study short-run and long-run relationships between variables. The research results showed that, in both the short and long term, the money supply had positive effects on the stock index, while factors such as exchange rates, lending interest rate, government bond interest rate, and inflation had negative effects on stock indexes. In addition, the study also provided some policies and sustainable development orientations for the Vietnam stock market.

The research by Nhu Quynh and Huong Linh (2019) measured the impact of 6 macroeconomic factors, including oil prices, consumer price index (which represents inflation), money supply M2, interest rates, exchange rates, and gold prices on the Vietnam stock market (via the VN-Index stock price) in the period 2000–2018 using the VECM model. The research results showed that in the long-term, inflation had a positive impact on the VN-Index, and interest rates had a negative impact on this index. In the short term, the VN-Index was mainly affected by the VN-Index of the previous month. Besides, VN-Index showed positive relationships with interest rates, money supply, and oil prices and negative relationships with inflation and exchange rates.

The gold price was a factor that did not significantly affect the VN-Index in both the short and long term.

The research by Trinh and Linh Dan (2020) examined the asymmetric influence of oil price fluctuations on the Vietnam stock market in the short and long term since the 2008 financial crisis. The authors used a non-linear ARDL model in the direction of bounds testing on monthly frequency data of VN-Index, Brent oil prices, industrial production index, and money supply. The research results showed that: (1) In the long term, oil price fluctuations had a negative effect on Vietnam's stock market, an increase in oil prices made the stock market worse, and a decrease in oil prices caused the market to prosper. Rising oil prices had a stronger effect on the stock market than falling oil prices, reflecting the asymmetry of oil price effects on the market in the long run; (2) In the short term, the market showed an opposite reaction compared to the long term.

Based on the above empirical evidence, most studies showed that oil prices, gold prices, interest rates, inflation, exchange rates, money supply all affect the stock markets (Sujit & Kumar, 2011; Nandha & Singh, 2011; Akbar et al., 2019; Alqattan & Alhaky, 2016; González et al., 2018; Geetha et al., 2011; Lee & Brahmairene, 2018, 2020). The studies used different models, such as OLS, ARDL, and VECM, with different data types to evaluate the relationship among variables.

3. Data and Research Methods

3.1. Variables and Research Hypothesis

Oil prices and the stock market

Oil is an important source of fuel, an essential transport input that cannot be replaced in the production process. Besides, oil is also a popular trading commodity in the world. Therefore, the fluctuation of rising oil prices affects macroeconomic variables such as inflation rates, monetary policy, national income, production costs, profits of the business sector, etc., affecting asset values and financial markets in general. Therefore, the change in oil price is expected to have a certain influence on the stock market. Rising oil prices will put pressure on increasing business costs and energy-dependent industries. As a result, it increases expected future costs, reduces cash flows, and therefore reduces the value of securities. When considering a particular type of security, the fluctuation of oil prices will raise income if the company is a net producer of oil; and decrease it if that company is a net consumer of oil. Specifically, for a net importing country, an increase in oil prices will create pressure that reduces the exchange rates and increases the domestic inflation rate; the expected inflation rate rising leads to an increase in discount rate accordingly. Hence, rising oil will have a negative impact on earnings from stocks. In contrast, for a net oil exporter,

an increase in oil prices will create a positive impact on the stock market. So the relationship between oil prices and stock prices can be positive or negative. Vietnam is now gradually turning into a crude oil importer. However, the scale of the oil industry on the Vietnam stock market is relatively large. In the list of 45 companies listed on HOSE with a market capitalization of over 1 billion USD, there are a series of enterprises in the oil and gas sector, such as PV GAS, PetroVietnam Power Corporation, PetroVietnam Technical Services Corporation, and PetroVietnam Technical Services Corporation, PetroVietnam Drilling, and Well Service Corporation, and PetroVietnam Ca Mau Fertiliser JSC. Especially, as of October 2021, PV GAS's market capitalization reached 10 billion USD, being in the top 5 largest enterprises on the HOSE. Expected results on the impact of oil prices on Vietnam's stock index, therefore, will be positive.

Interest rates and the stock market

Interest rates and the stock market have an inverse relationship, meaning that when interest rates rise, stock prices fall and vice versa. In addition, when interest rates go up, the interest rates of credit institutions and government interest rates rise to compete, leading to the volume of idle cash of people and organizations tending to flow into the banking system or be invested in government bonds. This causes the cash flows to decrease in the stock market and the stock price index to decrease. On the other hand, rising interest rates also affect a business, which can lead to a narrowing of the scope of activities, and business results will not be as effective as expected. Consequently, it negatively impacts the psychology of investors, leading to a decline in investment and the stock market. Therefore, it can be seen that interest rates have a negative effect on the stock index. We expect interest rates to have a negative impact on the stock index.

The impact of exchange rates on the stock market

When the exchange rates increase, the local currency will depreciate, which will attract a lot of capital from abroad to invest in the country to find profits and gain from price differences in the stable investment environment. An undervalued local currency also has a positive effect on exports, through which a positive impact on the stock market is shown. As Vietnam is a highly open economy in terms of trade, we expect the exchange rates to have a positive impact on the stock index.

The impact of money supply on the stock market

Money supply M2 and the stock market have a positive relationship, which is shown through monetary policy. When implementing an expansionary monetary policy, more money is put into circulation, so more money will flow into the production and consumption of goods and also increase

the use of financial assets such as securities. In addition, an expansionary monetary policy reduces interest rates and high credit growth rates; reduces the cost of capital of enterprises, thereby increasing investors' expectations as well as earnings. This will stimulate cash flow into the stock market, increasing stock prices.

3.2. Data

This study uses monthly time series data from January 2010 to December 2021, with 144 observations. Description of data source includes the variables of VN-Index (VNI) was taken from cophieu68.com; world oil prices (OP) were obtained from Federal Reserve, interest rates (IR) and money supply M2 (M2) were both obtained from the State Bank of Vietnam, exchange rates (E) were collected from the International Monetary Fund. In which the variables VNI, OP, and IR were calculated according to the data series from daily data to monthly data according to the average method.

Table 1 of descriptive statistics shows that the mean and standard deviation of the money supply variable M2 was the largest, explaining that the dispersion of the data of this variable compared to the mean value is very large. In addition, the maximum value of money supply is more than 12 million billion VND, and the smallest value of money supply is 2 million billion VND. For the VN-Index, the mean of this index is about 713 points, of which the maximum value and the minimum value respectively are 1,472.196 points and 356.8194 points.

Regarding the matrix of correlation coefficients (Table 2), most pairs of variables have correlation coefficients (>0.5) except for the world oil price variable and the VN-Index, in which, the VN-Index and money supply M2 has a positive correlation and a very strong correlation (0.92917).

3.3. Empirical Model

To analyze the impact of macroeconomic variables on the VN-Index (Table 3), this study uses the Autoregressive

Table 1: Descriptive Statistics

	VNI	OP	IR	M2	E
Mean	713.41	75.671	4.0017	6,534,532	21,860
Standard deviation	273.25	26.38	3.6064	3,229,451	1.254,2
Minimum value	356.82	18.379	0.1027	2,044,501	18,474
Maximum value	1,472.2	125.45	14.503	12,907,567	23,616

distributed lag model (ARDL), so the research model has the form of:

$$\log \text{VNI}_t = f(\log \text{OP}_t, \log E_t, \text{IR}_t, \log \text{M2}_t, \varepsilon_t)$$

In which, ε_t : Random error
 t : time variable by quarter, from January 2010 to December 2021

Table 2: Correlation Coefficient Matrix

	VNI	OP	IR	M2	E
VNI	1				
OP	-0.451	1			
IR	-0.58	0.5238	1		
M2	0.9292	-0.622	-0.651	1	
E	0.7463	-0.618	-0.613	0.891579	1

Table 3: Description of Variables in the Model

Variable Type	Variable Name	Unit	Measurement Method	Symbol
Dependent variable	VN-Index	Point	The natural logarithm of the VN-Index	$\log \text{VNI}_t$
Independent variables	World oil prices	USD/barrel	The natural logarithm of world oil prices	$\log \text{OP}_t$
	Interest rates	%		IR_t
	Exchange rate	VND/USD	The natural logarithm of the exchange rates	$\log E_t$
	Money Supply M2	billion dong	The natural logarithm of the money supply M2	$\log \text{M2}_t$

Table 4: Result of Unit Root Test of Variables

Variables	ADF test	Critical Value		Conclusion	Order of Integration
		1%	5%		
$\log \text{VNI}$	0.034794	-3.476805	-2.881830	Non-stationary series	
$D(\log \text{VNI})$	-9.409727***	-3.476805	-2.881830	Stationary series	I(1)
$\log \text{OP}$	-1.849328	-3.477144	-2.881978	Non-stationary series	
$D(\log \text{OP})$	-9.377064***	-3.477144	-2.881978	Stationary series	I(1)
IR	-1.750752	-3.476472	-2.881685	Non-stationary series	
$D(\text{IR})$	-10.75214***	-3.476805	-2.881830	Stationary series	I(1)
$\log E$	-2.844038	-3.477144	-2.881978	Non-stationary series	
$D(\log E)$	-10.27421***	-3.477144	-2.881978	Stationary series	I(1)
$\log \text{M2}$	-2.373185	-3.481623	-2.883930	Non-stationary series	
$D(\log \text{M2})$	-4.500277***	-3.481623	-2.883930	Stationary series	I(1)

Note: *** Correspond to 1% significance level.

4. Empirical Results

4.1. Unit Root Test

Unit root testing is an important first step in model estimation. In this study, the commonly used unit test method is ADF of Dickey and Fuller (1979) to test the unit-roots for the variables in the model. Based on hypothetical H0: the series of researched variables has a unit root (non-stationary) and H1: The series of researched variables has no unit root (stationary). If the absolute value of the statistical test is greater than the critical value or the p -value $< \alpha$, with the significance level $\alpha = 5\%$ or $\alpha = 10\%$ or $\alpha = 1\%$, the series of researched variables is stationary (Table 4).

The test results show that the variables $\log \text{VNI}$, $\log \text{OP}$, $\log E$, IR , and $\log \text{M2}$ were cointegrated of order 1.

4.2. Bound Test

The bound testing is the first step of the ARDL procedure to determine whether a cointegration relationship exists

among variables, which means deciding whether a long-run relationship exists among the variables.

- H0 : The model does not have a long – run relationship among the variables
- H1 : The model has a long – run relationship among the variables

According to the results in Table 5, we can see that the statistic (3.241882) is greater than the upper bound limit value at the significance level of 10% (3.09). Therefore, hypothesis H0 is rejected. So, at the 10% significance level, the model has a long-run relationship among the variables.

4.3. Optimal Lag Selection

This is an important step before estimating the ARDL model. Finding the optimal lag for time series in the ARDL model is very important to have normally distributed noise with no autocorrelation and no heteroskedasticity. When choosing a model, the most effective criterion commonly used is AIC. The results show that the lag of the ARDL model based on the AIC criterion was ARDL (2, 1, 1, 1, 3). This lag is the best suitable, satisfying the assumption of optimal lag of the ARDL model (Figure 1).

In the ARDL model, the adjusted R^2 is 0.988092, which means that the model explains 98.8% of the variation of the VN-Index variable according to the variables of world oil prices, interest rates, exchange rates, and money supply M2.

4.4. Estimation of Long-Run Coefficients

The results of the long-run coefficient estimation of the ARDL model (2, 1, 1, 1, 3) are shown in Table 6.

The world oil prices have a positive impact on the VN-Index. Specifically, when the world oil prices increased by 1%, the average VN-Index increased by 0.1649%, with other factors unchanged. But this coefficient is not statistically significant. Therefore, there is no relationship between world oil prices and VN-Index in the long run.

In contrast, a negative relationship exists between the exchange rate and the VN-Index in the long run. This coefficient

is statistically significant at the 10% significance level. In particular, when the exchange rate increased by 1%, the average VN-Index decreased by 4.322%, with other factors unchanged. This result is consistent with previous studies by Ahmet (2010), Bekhet and Mugableh (2012), Tran (2017), and Thanh Long and Thu Trang (2008). On the other hand, interest rates show a positive impact on the VN-Index, but this coefficient is not statistically significant. Therefore, there is no relationship between interest rates and VN-Index in the long run.

Finally, money supply M2 was found to have a positive impact on the VN-Index and this coefficient is statistically

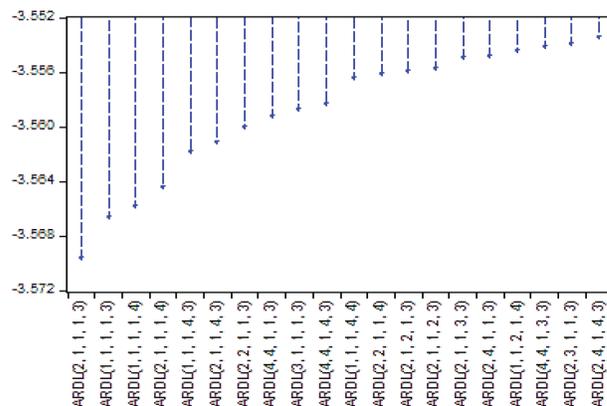


Figure 1: Illustration of the AIC Criterion for the Best 20 Models

Table 6: Estimation of Long-Run Coefficients of the ARDL Model

Dependent Variable: LOG(VNI)		
Independent Variables	Coefficient	Prob.
LOG(OP)	0.164872	0.1875
LOG(E)	-4.322567*	0.0579
IR	0.004260	0.7780
LOG(M2)	1.313205***	0.0000
C	7.926293	0.0000

Note: ***, *Correspond to the significance level of 1%, 10%.

Table 5: Bound Test Results

No. of Order	Statistical Value F	The Critical Values of the Bounds							
		I(0): Lower Bounds; I(1): Upper Bounds							
		90%		95%		97.5%		99%	
k	F-statistics	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
		4	3.241882	2.2	3.09	2.56	3.49	2.88	3.87

significant at the significance level of 1%, showing that M2 money supply has an important influence on the sustainable development of the Vietnam stock market. Specifically, when the money supply M2 increased by 1%, the average VN-Index increased by 1.313%, with other factors unchanged. This finding is consistent with the studies of Rahman et al. (2009), Kieu and Diep (2013), and Nhu Quynh and Huong Linh (2019).

From the model's estimation results, it shows that, in the long run, the VN-Index is affected by the exchange rates and the money supply M2. Specifically, the exchange rates positively affect the VN-Index, while the money supply M2 has a negative impact on the VN-Index. However, world oil prices and interest rates were found to not affect the Vietnam stock market index.

4.5. Estimation of Short-Run Coefficients

To analyze the effect of short-run changing trends on equilibrium, in the long run, this study uses the error correction model (ECM). Table 7 presents the short-term coefficient estimation results from the ARDL model with the selected lag.

The estimation results show that, in the short term, the VN-Index is affected by its past and the changes of the remaining variables to different degrees. In which the VN-Index was affected by itself in the previous month. Specifically, when the VN-Index of the previous month

Table 7: Estimation of Short-Run Coefficients of the ARDL Model (2, 1, 1, 1, 3)

Variables	Coefficient	Prob.
D(LOGVNI(-1))	0.117441	0.1072
D(LOGOP)	0.125724***	0.0000
D(LOGE)	-1.742690***	0.0002
D(IR)	-0.008697**	0.0122
D(LOGM2)	0.154142	0.4790
D(LOGM2(-1))	0.804451***	0.0003
D(LOG M2 (-2))	0.725940***	0.0027
ECM(-1) *	-0.098527***	0.0000

Note: ***, ** correspond to the significance level of 1%, 5%.

increased by 1%, the current VN-Index increased by 0.117%. But this coefficient is not statistically significant. Besides, the world oil prices have a positive impact on the VN-Index in the short term and this is statistically significant at 1%. In particular, when the world oil price increased by 1%, the average VN-Index increased by 0.1258% with all other factors unchanged. This finding is consistent with the studies of Thuy (2018) and Nhu Quynh and Huong Linh (2019). On the other hand, VN-Index is negatively affected by the exchange rate in the short run, which is consistent with the negative impact in the long run. This coefficient is statistically significant at the 1% level. Specifically, if the exchange rate increases by 1%, the average VN-Index will decrease by 1.7427% with other factors unchanged. In addition, money supply M2 was found to have a positive effect on the VN-Index, but this coefficient is not statistically significant. On the other hand, when money supply M2 of the previous 1 month and 2 months increased by 1%, the current VN-Index increased by 0.8045% and 0.7259% respectively, with other factors unchanged.

Finally, interest rates negatively affect the VN-Index in the short run. This coefficient is statistically significant at 5%; specifically, when interest rates increased by 1%, the average VN-Index decreased by 0.0087%. This result is consistent with previous studies by Alam and Uddin (2009), Ahmet (2010), and Nhu Quynh and Huong Linh (2019).

In summary, in the short term, there are relationships among variables, specifically interest rates and exchange rates have negative impacts on the VN-Index, while world oil prices and money supply M2's fluctuations over the previous 1 month and 2 months have a positive impact on this index. In addition, the ECM error correction coefficient (-1) is statistically significant at 1% with the corrected error in the range of $[-1 < -0.098527 < 0]$, which shows the degree of adjusting at 9.853% of the deviation between the short-run values to reach the long-run equilibrium.

4.6. Diagnostic Tests

After examining the impacts of the variables in the short and long run, the study tested the accuracy of the model; the tests used in this study include testing the fit of the model, Heteroskedasticity testing, normal distribution testing, autocorrelation testing, and stability testing (Table 8).

Table 8: Summary of the Model's Tests

Tests	Prob.	Conclusion
Ramsey RESET	0.1799	The model has the correct functional form
Jarque-Bera	0.4973	The residuals are normally distributed
Breusch-Godfrey LM	0.8902	The model does not have autocorrelation
Heteroskedasticity Test: Breusch - Pagan - Godfrey	0.1300	There is no Heteroskedasticity for the model

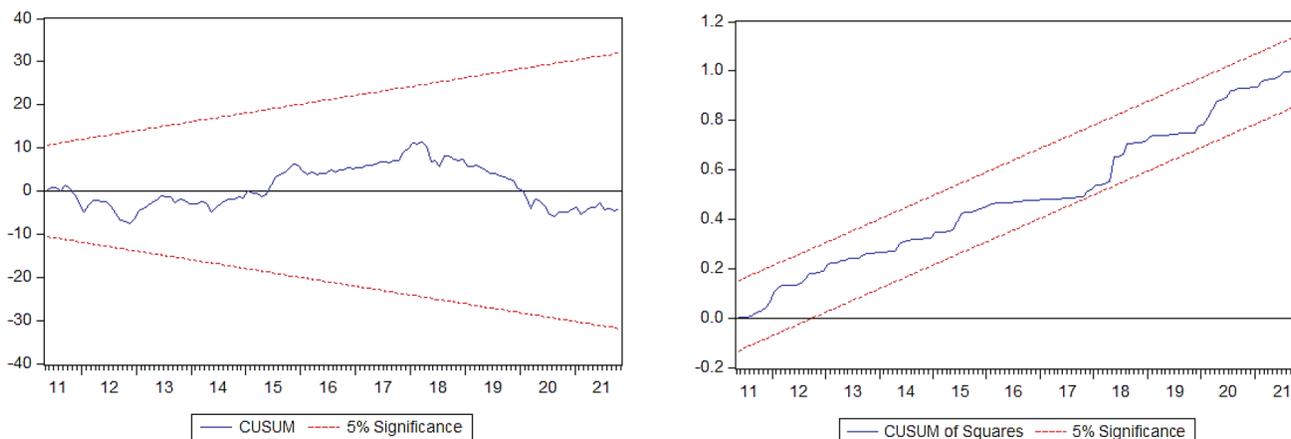


Figure 2: The CUSUM and CUSUMSQ Test Results

To confirm the stability of the model, Figure 2 presents the results of testing the cumulative sum of the residuals (CUSUM Test) and the modified cumulative sum of the residuals (CUSUMSQ Test).

The results show that the cumulative sum of the residuals and the modified cumulative sum of the residuals were in the standard range at the 5% significance level. So the residual is stable. Hence, through testing the diagnoses, the model is fit and reliable.

5. Discussion and Conclusion

This study has been conducted to review the macro factors that can affect the Vietnam stock market in the short term and the long term by applying the ARDL method.

According to the regression results of the ARDL model, the oil price variable has a positive impact on the VN-Index in the short term. This is not a surprising result because the oil and gas industry accounts for a relatively large proportion of the Vietnam stock exchange. Rising oil prices increased profit expectations for oil and gas companies. With a large capitalization in the market, the price of stocks in the oil and gas industry increased, raising the VN-Index in the short term. The negative impact of oil prices on the profits of other industries can be mitigated in the short term as the Vietnamese government tends to stabilize gasoline prices in the short run. Recently, when the world oil price increased due to the Russia-Ukraine conflict, the Ministry of Finance proposed to reduce the environmental protection tax on gasoline prices as a typical example of this policy. Therefore, in the short term, the positive impact of rising oil prices on petroleum companies is usually more significant than the negative impact on other industries. However, such stabilization policies can only be maintained for a limited

time but in the long term. Therefore, in the long run, these two effects cancel each other, leading to the fact that the model could not find a clear relationship between oil prices and the VN-Index.

The model results also show that the exchange rate variable has a negative impact on the VN-Index in both the short and long term. This finding is different from many other experimental studies around the world. Aspren (1989) and Mukherjee and Naka (1995) found evidence of a positive relationship between exchange rates and stock indexes in European countries and Japan. This positive relationship is consistent with theories of international economics. When the exchange rate rises and the domestic currency depreciates, exported goods become more competitive, and export turnover increases. The local economy then gains benefits. This beggar-thy-neighbor effect may still hold for the Vietnamese economy. However, the characteristic of Vietnam's economy is that the export sector is dominated by FDI enterprises. According to a report by the Ministry of Planning and Investment (2019), in 2018, 70.04% of export turnover was generated by FDI enterprises. These enterprises are rarely listed on the Vietnam stock exchange. In addition, the relationship between these enterprises and Vietnamese enterprises was very weak and unchanged from the period 2010–to 2017 (Tuan, 2021). Therefore, this beggar-thy-neighbor effect is not reflected in the VN-Index. Besides, when the cause of the increasing exchange rate, or the depreciation of the local currency, comes from the instability of the economy and concerns about future inflation, factors often negatively affect stock prices, the correlation between exchange rate and the stock price will be negative. This is also the result of the ARDL model in this study. This result is also often found in previous studies on Vietnam, such as that of Kieu and Diep (2013), Phong and Bach Van (2015),

Loc (2014), Nguyen and Nguyen (2019), Nhu Quynh and Huong Linh (2019), and Trinh and Linh Dan (2020).

The money supply variable, M2, has a positive effect on the VN-Index in both long-term and short-term models. This is consistent with most of the domestic and abroad empirical studies. The expanding money supply creates a liquidity effect and raises demand for financial assets, including stocks.

The interest rate variable has a negative effect on the VN-Index in the short term. This is consistent with the expected results and the same as the domestic and international empirical evidence. This variable has a negligible positive effect on the VN-Index in the long run. This effect is also not statistically significant.

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