MANAGING THE REAL ESTATE MARKET BASED ON STOCK MARKET DEVELOPMENT AND MACRO FACTORS

Quang T. L., Han T. L., Binh T. N.*

Abstract: By utilizing quarterly data in Vietnam, this study is the first paper to examine the causal relationship between stock market developments and real estate market developments. Three variables are used as a proxy of the stock market development: size, turnover ratio, and total value ratio. Total investment and expenditure on real estate are used as an indicator of real estate development. The highlight contribution is that the paper implements separate tests on the interrelationships between the variables through the results of variance decomposition and repulsion affecting these two markets. The multivariable vector autoregression model (VAR) and the Toda-Dolado methods are applied to fully consider the response of two variables. The results show a two-way causal relationship between the stock and the real estate market that diverges significantly from those of earlier research done in developed markets. The real estate market will experience a decline in the medium term when size and the total value ratio of the stock market decline. But in the long term, the stock market's size and total value ratio will gradually have less of an impact on the real estate market. In contrast, the trend of the impact of turnover ratio on the real estate market will gradually increase in the long term. This result offers empirical support for policymakers who manage the development of the real estate market based on macro factors and the stock market.

Key words: real estate market, stock market development, Granger causality, macro factors, emerging market

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Introduction

Based on OECD statistics in 2022, Vietnam's real estate price ranks among the most expensive in the world when the Property Prices Index = 34.5 (On average, a person must work 34.5 years and expend nothing to have enough money to buy a house). The Vietnamese government is attempting to implement various alternative strategies to reduce house prices to meet the needs of people living and working. To achieve this goal, the government must establish a stable and organized real estate

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market to attract investment in this industry and reduce housing costs. In addition, the government also must be aware of the deep relationship between the stock market, macro factors, and the real estate market to issue appropriate policies.

The connection between the stock and the real estate market is one issue that receives a lot of attention from researchers with many approaches and different scopes. Hui and Chan (2014) studied countries' economic and financial crises affecting the residential real estate market. Meanwhile, Muda et al. (2020) investigate rental supply, mortgages, and the bond market. Different from previous studies, the followings are how our paper contributes to the literature: (1) previous papers measure stock market return and house price, while the present study is the first to measure the variables that reflect changes in the stock market, such as market capitalization, the value trading, and the development of the real estates market such as the total value of firms and households investing in real estate and the total household expenditure on real estate. (2) Another highlight is that the paper implements separate tests on the interrelationships between the variables through the results of variance decomposition and repulsion affecting these two markets. The multivariable vector autoregression model (VAR) and the Toda-Dolado methods are applied to fully consider the response of independent variables to dependent variables in the research context in Vietnam. (3) Finally, the researchers find proof of a two-way causal relationship between the development of the stock market and the real estate market development. This finding diverges significantly from those of earlier research done in developed markets.

The research objectives of this paper are to examine the impact of stock market development and internal and external factors on the real estate market in Vietnam through multivariate VAR model estimation (using the Toda-Dolado approach), clarify the connection between macroeconomics, with stock and real estate market, assess the current situation of the real estate market and the stock market in Vietnam and propose policy recommendations to attract and improve capital flows into the real estate market.

This study confirms the existence of an interactive connection between the two markets; the results also have great significance for participants in both markets. When making investment decisions, investors who participate in any market need tools to recognize and assess the market environment through information channels. A shift in one market can serve as a cue to assess another and vice versa. In addition, these findings also have significant implications in assisting property valuations for asset managers in the fund management industry. Policymakers will be able to develop regulations that will encourage more active management of the two markets and propose methods to prevent risks caused by the negative impact of interest rate policy on the real estate market's supply.

Literature Review

Stock market and real estate market

Stock market development refers to the process of enhancing the accessibility, effectiveness, and quality of stock market infrastructure (Pradhan et al., 2014). Additionally, it relates to the interaction of numerous activities and cannot be measured by only one indicator. It is typically determined by the stock market size, liquidity, price fluctuations, concentration, integration with the global markets, and the market's legal law (regulation and monitoring) (Garca and Liu, 1999). For the real estate market, the development is assessed based on established indexes that reflect the evolution of real estate supply and demand, house and land prices, and transaction frequency (Fisher et al., 2007).

Most previous studies on this topic have investigated the connection between stock and real estate markets. The results mostly approve the positive linkage between these two markets (Liow, 2014; Chi, 2011). Liow et al. (2019) argue that the real estate market affects stock market volatility mainly in the short term. On the other hand, stock market fluctuations affect the real estate market mainly in the long term. Many theoretical and empirical studies also highlight how stock markets offer benefits that encourage real estate growth. When the stock market development is enhanced, it will promote the amount of capital in the real estate market. At that time, the value of assets in the holding portfolio and investment returns of households and firms will increase. This will increase housing demand and propel the growth of the real estate market (Wassal, 2013). Meanwhile, Roussakis (2010) reports that the development of the financial market will facilitate credit transmission to the real estate market, and most banks, savings and loans, insurance companies and pension funds have ended up owning (repossessing) real estate credits.

Other papers analyse the cross-border integration of these markets (Fu and Ng, 2001). For instance, Chi (2011) indicates that the volatility in the stock market affects the real estate market more than the opposite direction. Volatility in the UK property market will positively impact volatility in the French, Belgian and Dutch property markets. Liow (2014) find that the correlation between the stock market and the real estate market within each East Asian country is higher than the regional and global correlation. In contrast, in Europe and North America, the real estate market is more correlated with the regional and global stock markets than the stock markets in each of these countries.

In addition, some other researchers investigate the linkage between the stock and real estate markets in special contexts, such as financial crises or inefficient markets. For instance, John et al. (2002) examine the relationship between the real estate market and the Australian stock market in a case of market inefficiency. Using the alternative approach to the Granger causality test, they discuss that the structural change in the stock and real estate markets can lead to a linear and non-linear relationship. The changes in the stock market and prices affect real estate market returns. The non-linear causality tests show a strong unidirectional relationship running from the stock market to the real estate market. Hui and Chan (2014) use

Cokurtosis, Coskewness and Forbes – Rigobon to investigate the spread between equity and real estate in many markets during the global financial crisis. The results provide evidence that the Coskewness test can show additional channels of spillover that the Forbes – Rigobon test does not. When testing for Cokurtosis, the results also revealed other channels of transmission. The direction of spillover is: the US transmits the shock to the UK, while the UK transmits the shock to Hong Kong. The spillover effect in the stock market is larger than in the real estate market. In addition, the Cokurtosis test reports much more substantial evidence of contagion between the stock and real estate markets (Hui and Chan, 2013).

Macro factors and real estate market

William et al. (1990) show that housing prices are classified by GDP. In the long run, there is a stable equilibrium relationship between housing prices and macroeconomic variables such as the elasticity of GDP, income, and investment. William et al. (1990) also agree that housing demand is influenced by economic development, income per capita, and urban population. His findings are consistent with "wealth effect" theory, which implies that individual consumption alters in response to changes in income. People specifically spend more money if they see an increase in the value of their assets or income and less money if they see a decrease. When income increases, people prefer to increase the amount of real estate holding. Brychko et al. (2021) exploit the logit-modeling to investigate the real estate market behavior and the crisis in the financial sector. The finding shows that the real house price, price-to-income ratio, price-to-rent ratio, and rent prices accompanied by the financial sector consumers' feelings are statistically significant.

According to a different group of researchers, the biggest drivers of rising real estate prices are credit and interest rates. They conclude that low-interest rates cause high prices because they allow buyers to purchase real estate despite their limited financial condition (Akbari and Aydede, 2012; Mueller and Pauley, 1995). Wassal (2013) used the DBM-PSO clustering algorithm to analyze the money supply. The results indicate that the money supply positively impacts the floor area of real estate. Other studies investigate the influence of global macro variables on the real estate market, including exchange rates, risk, and foreign direct investment. For instance, Grum and Govekar (2016) discover that the increase in foreign investment is why Slovenia, Greece's real estate price growth rate is higher. Liu and Hu (2012) indicate that rising housing costs will depress exchange rates in the short term, but real estate benefits exchange rates over the long term. Kwame and Hwee (2005) compare the performance of emerging and developed real estate markets while considering exchange rate risk by using data from direct real estate investments over ten years. The findings demonstrate that a portfolio of real estate from emerging economies performs better over the long, medium, and short term than from developed economies. Sitek (2013) points out two main types of risks that exist in the financing of real estate investments: macroeconomic risk (market risk, systemic risk) and microeconomic risk (risk of a particular investment project)

Research Data and Methodology

The study exploits quarterly data from 2007 to 2021, compiled from the following main sources: General Statistics Office, State Treasury, IMF, and State Securities Commission. The period selection in this paper relies on the accessibility of time series data for each variable taken into the model. Table 1 provides more information on the variables and data sources.

There are many methods of measuring stock market development, such as measuring market size to GDP, number of listed companies, liquidity (stock turnover), volatility, and market integration level compared with other financial markets in the world (Pradhan et al., 2014; Wassal, 2013). Three variables are used as a proxy of stock market development in this paper. The first variable is market capitalization, which calculates the size of the stock market by comparing the entire market value of domestic firms listed on the stock exchange to GDP (Sethi and Acharya, 2019).

$$\text{MarketSize} = \text{Market capitalization/Gross domestic product}$$

The second variable is the Value Traded Ratio (VTR), which is measured as a ratio of the total trading value of domestic shares to the GDP. VTR shows market transactions relative to the size of the economy. A liquid market allows investors to withdraw funds from equities if they want to modify their portfolios. It also enables corporations to access cash on a long-term basis through equity offerings, and the more liquid the stock market, the more savings are moved to it.

$$\text{VTR} = \text{Total trading value/Gross domestic product}$$

The third variable is the stock market turnover, which represents a ratio of the total trading value of domestic stocks to market capitalization.

$$\text{TOR} = \text{Total trading value/ Market capitalization}$$

Depending on different purposes, there will be different methods to measure the real estate market development, such as the ability to supply real estate: real estate demand; housing prices; price movements; frequency of real estate transactions; or create a composite index including the above factors. In this paper, data is taken from the General Statistics Office to calculate the development of the real estate market (REM) through the growth in consumption and investment (Y) in the real estate market compared to the whole economy.

$$\text{REM} = I + C$$

Where, I is the total investment value of firms and households in the real estate market (such as buying real estate and developing real estate projects). C is the household's total expenditure in REM (such as the cost of renting a house). REM

shows the growth in the market value of real estate through investment and rental activity (Muda et al., 2020).

In a causal study, certain factors are not only explained by a certain dependent variable but also by the variable itself. All variables should be considered the same if there is a simultaneous dependency between several variables (Christopher, 1980). Alternatively, there should not be a distinction between endogenous and exogenous factors. When this distinction is neglected, all factors are viewed as endogenous. By using the necessary equations, the VAR model may display the delays of the other variables and the reliance of each variable on itself, solving the aforementioned issues. In addition, the VAR model combines two univariate autoregression (AR) and simultaneous equations (SEs) models. The advantage of AR is that it is very easy to estimate by the method of minimizing residuals, and the advantage of SEs is to estimate many equations simultaneously in the same system.

The Granger causality test in econometrics is used to investigate causal connections. Granger (1969) demonstrated that if variable X influences variable Y, we may use the past value of variable X to accurately forecast the future value of variable Y in the case of other conditions that remain constant. In reality, the Granger causality test identifies if one time series helps estimate another. The Granger test assumes that the variables must be stationary and, in the case of non-stationary, must be in the same order of integration.

To overcome the common weaknesses of Granger causality test, Toda et al. (1995) and Dolado et al. (1996) suggest using VAR estimation model at different dynamic levels and "testing general restrictions on the parameter matrices even if the processes can be integrated or cointegrated of an arbitrary order". Because the standard asymptotic theory is true, Toda et al. (1995) recognize that the application of the typical procedure for selecting a lag length is possible with an integrated or cointegrated VAR ("as long as the order of the integration of the process does not exceed the true lag length of the model"). Therefore, they suggest an estimation of the enhanced VAR model with additional lags based on the potential order integration of the series. Toda-Dolado (TD) technique can be used to test Granger causality, and the augmented VAR(p + dmax) can be presented as follows:

$$Y_t = \partial_0 + \sum_{i=1}^{p} \partial_{1i} Y_{t-i} + \sum_{i=p+1}^{p+dmax} \partial_{2i} Y_{t-i} + \sum_{i=1}^{p} \beta_{1i} X_{t-i} + \sum_{i=p+1}^{p+dmax} \beta_{2i} X_{t-i} + \sum_{i=1}^{m} \theta_i Z_i + \delta_{Yt}$$

$$X_t = \gamma_0 + \sum_{i=1}^{p} \gamma_{1i} X_{t-i} + \sum_{i=p+1}^{p+dmax} \gamma_{2i} X_{t-i} + \sum_{i=1}^{p} \alpha_{1i} Y_{t-i} + \sum_{i=p+1}^{p+dmax} \alpha_{2i} Y_{t-i} + \sum_{i=1}^{m} \theta_i Z_i + \delta_{Xt}$$

In which Y and X are two main variables (real estate market and stock market development); Zi are macro variable such as CPI and GDP…; m is number of macro variables; p is the optimal lag length; ∂, β, γ, α and θ are the coefficients; δy and δx are errors terms; d_max is the highest order of the integration of the variables. The

Wald test is applied for the first p matrix coefficients (Dolado and Lütkepohl, 1996). Determine whether time series are stationary by performing the extended Dickey-Fuller and unit root tests.

Granger causality analysis in the VAR model does not permit us to observe the dynamic interdependence of time series. Therefore, the estimated VAR will be applied to accurately simulate error variance decomposition and the impulse response function. When model innovations or shocks are represented by an increase in one standard deviation of a stochastic component in the equation for the endogenous variable, the impulse response function predicts how the endogenous variable will respond to those changes. The impulse response function decides how the shock will affect the endogenous variables. The short-term relationship between variables is primarily examined by the impulse response function.

Table 1. The variable descriptions

REM	Real estate market development is measured by the total investment and expenditure of firms and households in the economy.
MarketSize	Market size is measured by market capitalization/GDP
VTR	Value Traded Ratio is measured by total trading value of stock market to GDP
TOR	Turnover ratio is measured by total trading value/ Market capitalization
LIR	Loan interest rate of commercial banks
DIR	Bank's deposit interest rate
VNindex	Main index of Vietnam stock market
GDP	Year-over-year gross domestic product growth rate (quarterly)
GDP_per	GDP Per capita
CPI	Inflation
FDI	Foreign direct investment, measured as a percentage of GDP
EX	Exchange rate, USD/VND
Ms	Money supply
TB	Trade Balance

The Important Characteristics of Vietnam's Stock and Real Estate Market

Figure 1 demonstrates how the market size changed significantly from 2007 to 2021. The stock market's size significantly increased between 2007 and 2008 before rapidly declining after reaching a peak of more than 450% of GDP. From 2009 to 2017, the stock market's size shrank. From 2020, the market size increased again and remained nearly double the size of the economy. Figure 2 displays the value traded ratio of the Vietnamese stock market from 2006 to 2021. Statistics indicate that the market's value traded ratio increased noticeably in 2006-2007, 2009-2020 and 2021. The market's value traded ratio in the third quarter of 2021 exceeded 1% of GDP for the first time, demonstrating the market's growing size and value traded ratio. This development establishes a critical foundation for businesses seeking to raise capital through this channel.

The degree of development of the stock markets in Southeast Asian nations is depicted in Figure 3. The most developed market and the least developed market

exhibit a significant gap. There is no doubt that the Singapore stock market has developed significantly faster than other markets, while the Indonesian stock market lags behind that of Southeast Asian nations. Considering the stock market capitalization to GDP, Vietnam and Indonesia have the least developed stock markets in Asia. However, when based on liquidity, the Vietnamese market has become prominent, only behind Thailand and Singapore.

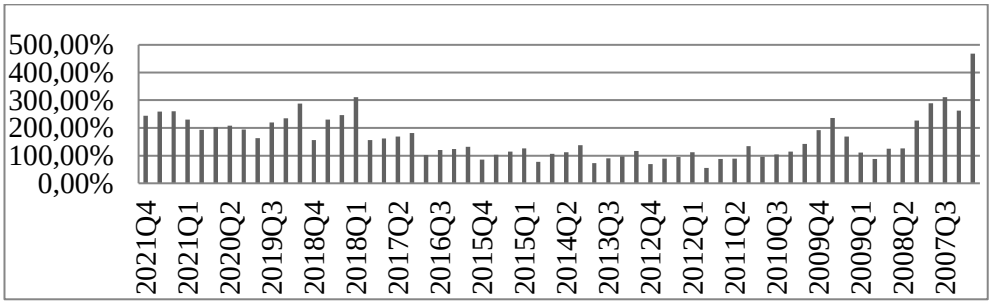


Figure 1: Stock market size, measured by market capitalization to gross domestic product.
Source: Own calculation based on data from State Securities Commission. Market Size is measured on quarterly data from 2007 to 2021.

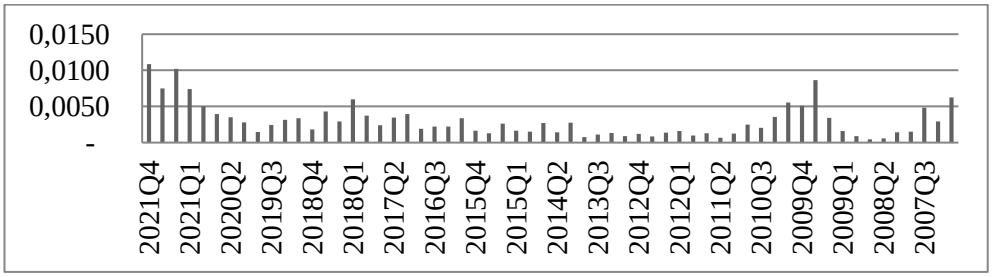


Figure 2: Liquidity Ratio of stock market, calculated by total trading value to the gross domestic product.
Source: Own calculation based on data from State Securities Commission. The liquidity ratio is measured on quarterly data from 2007 to 2021.

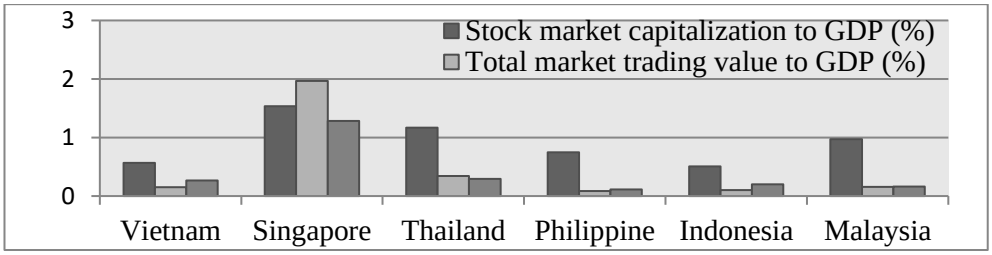


Figure 3: Comparison of the stock market development between Asian countries using market capitalization, market trading value and market turnover.
Source: Own calculation based on data from World Bank. The stock market development is average from 2007 to 2021.

Empirical Results and Discussion

In this study, REM is quarterly data. Therefore, the quarterly time series must be adjusted for the seasonal factor (If a time series' frequency is quarterly, Econometric Methods advises controlling for the seasonality factor). After removing the seasonal factor, the augmented Dickey-Fuller (ADF) unit root test is used to check the stationary of the time series. Table 2 shows the existence of the unit root for VNindex, GDP, VTR, DIR and FDI because they succeed in rejecting the null hypothesis of non-stationary. The time series of variables are stationary in the first differences (Table 3). After the second difference in Table 4, the ADF test unit roots show MarketSize, Ms, and EX are stationary.

Table 2. The augmented Dickey-Fuller unit root tests

Variable	t-statistic	ADF test statistic			Stationary
		1% level	5% level	10% level	
VNindex	-2.9851	-3.5360	-2.9113	-2.5930	Yes
GDP	-4.7033	-3.5461	-2.9131	-2.5943	Yes
VTR	-4.4490	-3.5460	-2.9117	-2.5935	Yes
DIR	-5.4336	-3.5482	-2.9126	-2.5940	Yes
FDI	-3.1244	-3.5481	-2.9125	-2.5939	Yes

Table 3. The augmented Dickey-Fuller unit root tests in the first differences

Variable	t-statistic	ADF test statistic			Stationary
		1% level	5% level	10% level	
REM	-7.6555	-3.5477	-2.9129	-2.5946	Yes
CPI	-9.0096	-3.5488	-2.9136	-2.5951	Yes
LIR	-10.7443	-3.5503	-2.9135	-2.5945	Yes
GDP_per	-3.8861	-3.5482	-2.9126	-2.5940	Yes
TOR	-4.3202	-3.5403	-2.9103	-2.5934	Yes

Table 4. The augmented Dickey-Fuller unit root tests in the second differences

Variable	t-statistic	ADF test statistic			Stationary
		1% level	5% level	10% level	
MarketSize	-13.0123	-3.5550	-2.9155	-2.5955	Yes
Ms	-11.3127	-3.5550	-2.9155	-2.5955	Yes
EX	-15.5907	-3.5526	-2.9145	-2.5950	Yes

The time series in the estimated model are in other integration orders. Therefore, we need to determine the optimal delay (p) when using the TD (Toda-Dolado) technique to evaluate the causal relationship between the development of the stock market and the market, knowing that d_max (maximum order of integration) is equal to 1. Next step, a series of tests is performed to select the optimal lag for the VAR model. The sequential modified LR test, the final prediction error criterion, the Schwarz information criterion, the Hanaan-Quinn information criterion, and the Akaike information criterion all indicate that the optimal number of lags is 2. Then test the autocorrelation of the residuals and the stability of the model. The results show that most of the values are within the circle, implying that the estimated VAR model is dynamically stable and has no errors.

The outputs of the TD (Toda-Dolado) Granger causality test procedure are summarized in Table 5, which confirms that there is a two-way causal linkage between the development of the stock market (as determined by market size, value traded ratio and turnover) and the real estate market development. Specifically, the Granger causality relationship between stock market capitalization and real estate market growth is at 1% significance level. A two-way causality is also confirmed between stock market value traded ratio, turnover and real estate market development at 1% significance level. Table 5 provides proof of a Granger causality connecting the development of REM to macro variables like LIR, DIR, VNindex, GDP, CPI, FDI, and EX.

Table 5. The outputs of the TD (Toda-Dolado) Granger causality test procedure

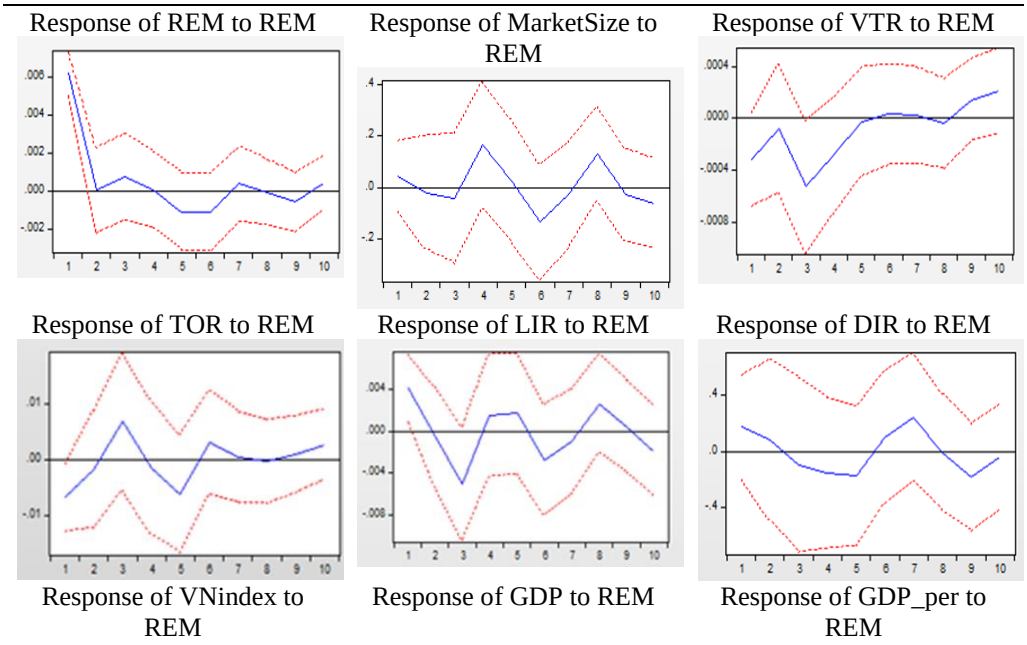
The direction of the causality	MWald statistics	p-value
MarketSize → REM	27.332***	0.0000
REM → MarketSize	28.492***	0.0000
VTR → REM	27.039***	0.0000
REM → VTR	28.944***	0.0000
TOR → REM	20.234***	0.0000
REM → TOR	17.157***	0.0003
LIR → REM	12.328**	0.0123
DIR → REM	10.332*	0.0776
VNindex → REM	12.345**	0.0187
GDP → REM	9.451*	0.0876
GDP_per → REM	9.782*	0.0750
CPI → REM	10.223*	0.6732
FDI → REM	12.374**	0.0247
EX → REM	10.110*	0.6776
Ms → REM	6.302	0.1644
TB → REM	5.898	0.1892

The Cholesky impulse method was employed to obtain the appropriate function in order to avoid the impact of the variables' order on the analytical outcomes. The vertical axis in Figure 4 denotes the magnitude of the shock response from the explanatory variables to the explained variables, while the horizontal axis in Figure 4 denotes the different periods in the impulse response function. According to Figure 4, REM will experience a decline in the medium term if the size of the stock market decreases. The graph also shows a long-term trend that the stock market's size will gradually impact REM less. The graph also demonstrates that REM will be affected negatively when the value traded ratio falls over the short term but positively when it rises over the long term. In addition, the stability in the variable TOR (turnover ratio) growth will stabilize the real estate market. Through the graph, we also see that the trend of the impact of TOR on REM will gradually increase in the long term. Regarding interest rates, the graph shows that: A decrease in deposit interest rates in the medium term will reduce REM, while a stable lending interest rate in the medium term will stabilize the real estate market. The graph shows that the trend of the impact of the lending interest rate factor on the real estate market will gradually decrease in the long term. In the first five years, VNIndex rises, which encourages a rise in REM development. Long-term, a decline in VNIndex will also slow the growth of REM. Regarding GDP, when GDP grows stably, it will stabilize the growth of REM. A decrease in GDP per capita in the medium term will reduce REM. It can also be seen that the trend of the impact of the GDP factor on REM will increase slightly in the long term. Besides, when CPI decreases in the short term, it will cool down REM. The trend of the impact of the inflation factor on REM will decrease slightly in the long term. When FDI (% GDP) increases, it will stimulate real estate growth. The trend of the impact of FDI on REM will gradually decrease in the long term. Real

estate growth will increase when the exchange rate rises over the medium term but will decline over the long term (10th year). The trend of the influence of exchange rate factors on REM will decrease slightly in the long term.

The analysis of the variance decomposition of the REM development variable provides additional support for the findings of the impulse response. Table 6 shows that CPI, FDI, GDP and lending interest rate have no impact (0.000) on the development of REM in the first year. The impact coefficient of the VNIndex on REM development starts to rise significantly in year 6, peaks in year 8 (value of 5.36) and then starts to decline gradually. In the fifth year, the development of REM is significantly influenced by the turnover ratio and lending rate. Additionally, the CPI's impact on REM's coefficient reaches a peak (value: 17.5) before gradually declining. Especially in year 5, CPI, lending interest rate and turnover ratio have higher impact coefficients than other variables. In other words, macroeconomic factors greatly influence REM in the medium term. Inflation has the greatest impact on REM compared to other factors (impact coefficient 17.5).

Tables 7 and 8 present the findings of the variance decomposition of the variables that represent the development of the stock market. The real estate market's influence on stock market size is clearly visible. The impact coefficient gradually rises from year 1 to year 8, reaches a maximum (value of 5.81), and then starts to decline. Similarly, year 4 saw the highest impact coefficient of REM on value traded ratio (13.34). Meanwhile, the first year has the biggest effect on turnover from REM (8.5).



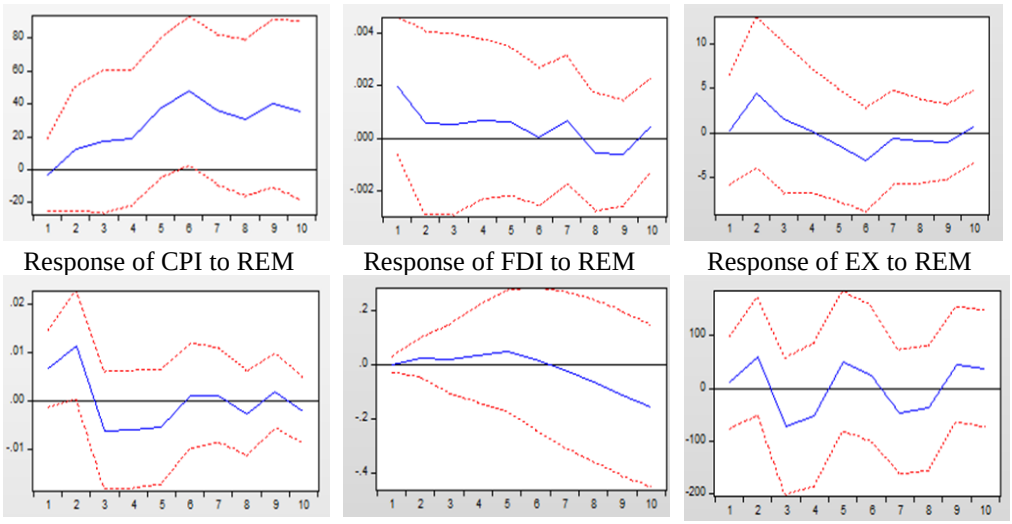


Figure 4: Response of REM to Cholesky One S.D. Innovations

The findings are generally consistent with the results of some previous papers, which emphasize the importance of the stock market and macro factors to the development of REM (Pradhan et al., 2014; Liow et al., 2019; Chi, 2011; Hartmann, 2015). The stock market is known as a place to provide capital at a lower cost than the monetary market and bank loans. The company can manage an optimal capital structure by raising capital on the stock market. In summary, companies should prioritize using the stock market to finance real estate projects, and policymakers should introduce initiatives to promote the growth of a sustainable real estate market using capital raised through the stock market.

Table 6. The variance decomposition of REM

Period	REM	Market	VTR	TOR	LIR	VNI	GDP	CPI	FDI
1	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	77	0.03	0.03	5.63	0.65	0.01	0.79	15.1	0.31
3	67.5	0.65	0.40	6.83	8.91	0.02	1.45	13.0	0.35
4	61.6	1.09	2.18	8.47	8.50	0.06	3.33	12.7	0.71
5	51.3	1.25	2.78	9.59	9.23	1.70	2.73	17.5	0.92
6	49.5	1.18	3.09	9.34	8.66	5.31	2.56	16.6	0.87
7	47.1	3.43	3.06	9.20	8.35	5.20	3.73	16.0	1.01
8	45.5	4.11	4.13	8.90	8.07	5.36	3.76	15.8	1.36
9	45.1	4.19	4.05	8.74	8.00	5.33	3.72	16.3	1.68
10	44.4	4.36	4.54	8.74	7.99	5.25	3.69	16.0	2.00

Table 7. The variance decomposition of Market Size

Period	REM	Market	VTR	TOR	LIR	VNI	GDP	CPI	FDI
1	0.77	92.0	0.00	0.00	0.00	7.15	0.00	0.00	0.00
2	0.44	72.1	5.12	0.00	0.31	16.0	0.66	1.71	1.04
3	0.65	63.5	8.84	0.64	1.67	15.2	2.90	1.49	0.86
4	3.86	53.3	11.0	3.03	5.50	12.5	3.92	2.56	1.01
5	3.33	52.5	11.5	3.04	4.66	11.9	4.03	4.88	0.93
6	4.84	52.5	11.0	2.80	4.36	11.0	4.12	4.67	0.95
7	4.63	51.8	11.9	2.65	4.74	10.7	4.37	4.51	0.91
8	5.81	50.3	12.1	2.99	5.22	10.1	4.19	4.53	0.91
9	5.51	49.2	12.4	3.85	4.99	10.1	4.16	5.24	0.93
10	5.55	48.4	12.2	3.96	4.79	10.2	3.98	6.21	0.92

Table 8. The variance decomposition of VTR

Period	REM	Market	VTR	TOR	LIR	VNI	GDP	CPI	FDI
1	5.38	13.9	66.4	0.00	0.00	14.1	0.00	0.00	0.00
2	4.38	21.4	53.1	1.66	0.36	14.1	1.50	0.10	1.26
3	12.1	23.4	41.9	1.36	1.12	11.6	2.38	0.74	2.94
4	13.3	21.0	37.7	1.69	3.09	10.4	3.60	1.12	5.04
5	12.8	20.3	36.9	1.84	3.22	10.3	4.23	1.16	6.34
6	11.9	19.2	36.2	2.24	3.42	9.8	4.56	2.42	6.94
7	11.7	18.9	36.1	2.34	3.39	10.3	4.53	2.47	6.91
8	11.3	20.2	35.4	2.67	3.32	10.4	4.39	2.38	6.74
9	11.4	19.6	34.5	2.59	3.22	10.2	4.37	2.86	7.76
10	11.7	18.6	32.7	2.50	3.41	10.1	4.31	3.46	9.51

Conclusion

This is the first study to investigate the causal relationship between stock market developments and real estate market developments by exploiting quarterly data from 2007 to 2021. Based on the obtained findings, it is concluded that there is a two-way Granger causality relationship between stock market development and the real estate market. It implies that the real estate market development can be predicted based on the development of the stock market. Therefore, creating a sustainable real estate market in Vietnam depends greatly on the development of the stock market.

Using the Cholesky impulse Method, it is evident that if the stock market's size and value traded ratio decline, the real estate market will experience a decline in the medium term. But in the long term, the stock market's size and value traded ratio will gradually have less of an impact on the real estate market. In contrast, the trend of the impact of TOR on the real estate market will gradually increase in the long term. This bidirectional causality is also reinforced by the analysis of variance, which emphasizes that in the medium term, VNIndex, TOR, and LIR have a strong impact on the real estate market. Therefore, supporting interest, improving stock market development, and enhancing VNIndex will promote the real estate market. In

addition, inflation has the highest impact on the real estate market, so it is necessary to stimulate inflation in the medium term.

By managing the development of the stock market and macro factors, policymakers can promote the sustainable development of the real estate market, thereby solving the issue of a lack of available homes and apartments.

This study also has some limitations, such as the short observation period, and it is impossible to include all macro factors in the model. Future research needs to evaluate the development of the stock market in other aspects. For example, international integration, institutional perfection and market concentration to determine if they create the same outcomes. Besides that, future research needs to deeply analyze other real estates market segments, such as resort and industrial real estate. The econometric model presented in this paper can be improved with additional variables to better understand stock market developments and represent more clearly its impact on the real estate market.

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ZARZĄDZANIE RYNKIEM NIERUCHOMOŚCI W OPARCIU O ROZWÓJ RYNKU AKCJI I CZYNNIKI MAKRO

Streszczenie: Wykorzystując dane kwartalne w Wietnamie, niniejsze badanie jest pierwszym dokumentem badającym związek przyczynowy między rozwojem rynku akcji a rozwojem rynku nieruchomości. Jako wskaźnik rozwoju rynku akcji wykorzystano trzy zmienne: wielkość, wskaźnik obrotu i wskaźnik wartości całkowitej. Całkowite inwestycje i wydatki na nieruchomości są wykorzystywane jako wskaźnik rozwoju rynku nieruchomości. Najważniejszym wkładem jest to, że w artykule wdrożono oddzielne testy dotyczące wzajemnych powiązań między zmiennymi poprzez wyniki dekompozycji wariancji i odpychania wpływające na te dwa rynki. Wielozmienny model autoregresji wektorowej (VAR) i metody Toda-Dolado są stosowane w celu pełnego uwzględnienia odpowiedzi dwóch zmiennych. Wyniki wskazują na dwukierunkowy związek przyczynowy między rynkiem akcji a rynkiem nieruchomości, który znacznie odbiega od wyników wcześniejszych badań przeprowadzonych na rynkach rozwiniętych. Rynek nieruchomości doświadczy spadku w średnim okresie, gdy wielkość i całkowity wskaźnik wartości rynku akcji spadną. Jednak w dłuższej perspektywie wielkość rynku akcji i całkowity wskaźnik wartości będą stopniowo wywierać mniejszy wpływ na rynek nieruchomości. W przeciwieństwie do tego, trend wpływu wskaźnika obrotu na rynek nieruchomości będzie stopniowo wzrastał w długim okresie. Wynik ten stanowi empiryczne wsparcie dla decydentów, którzy zarządzają rozwojem rynku nieruchomości w oparciu o czynniki makro i rynek akcji.

Słowa kluczowe: rynek nieruchomości, rozwój giełdy, przyczynowość Grangera, czynniki makro, rynek wschodzący

根据股市发展和宏观因素管理房地产市场

摘要：通过利用越南的季度数据，本研究是第一篇研究股票市场发展与房地产市场发展之间因果关系的论文。 **三个**变量被用作股票市场发展的代理：规模、周转率和总价值率。 **房地**产投资和支出总额作为房地产开发的指标。 **突出的**贡献是，论文通过影响这两个市场的方差分解和排斥的结果，对变量之间的相互关系进行了单独的检验。 应用多变量向量自回归模型（VAR）**和**Toda-Dolado**方法充分考**虑两个变量的响应。 结果表明，股票和房地产市场之间存在双向因果关系，这与早期在发达市场所做的研究有很大不同。 **中期来看**，**随着**规模与股市总市值之**比下降**，**房地**产市场将出现下滑。 **但从**长远来看，股市的规模和总市值比对房地产市场的影响会逐渐减弱。 **相比之下**，**周**转率对房地产市场的影响趋势将在长期内逐渐加大。 这一结果为政策制定者基于宏观因素和股票市场管理房地产市场发展提供了实证支持。

关键词: 房地产市场, **股市**发展, **格**兰杰因果关系, **宏**观因素, **新**兴市场