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Stock Prices' Response Towards Macroeconomic Shocks in Listed Malaysian Property and Construction Companies

Nur Atiqah Abdullah

Kintera Sdn Bhd
38 Jalan Sultanah 05350 Alor Setar Kedah
nuratiqah.kintera@gmail.com

ABSTRACT

This study seeks to determine the impact of macroeconomic shocks on both sectors' stock prices. Due to the similarity in their activities, this study aims to discover if changes in macroeconomic variables affect their stock prices. The stock price movement behavior of the stocks from these two sectors is investigated to assist investors in estimating the profitability of the stocks in property and construction sectors in Malaysia and to assist the government in developing policies to curb speculation in the stock market. The impact of macroeconomic shocks on both sectors' stock prices is evaluated to provide insight to investors and policy makers to prepare them for sudden changes in government monetary policies. This is investigated through the impulse response functions (IRF) and variance decomposition analysis. Annual data from 1995 to 2013 are evaluated and the IRF results indicate that interest rate changes influence stock prices the most while trade openness has the least effect on the stock prices.

Keywords: *construction sector, macroeconomic shocks, property sector, stock prices*

1.0 INTRODUCTION

In Malaysia, most of the property companies listed on Bursa Malaysia are property development companies which carry out building development, therefore making them directly related to the construction sector. This paper focuses on only property development companies (as a subsection of listed property companies in Malaysia) as it is comparable to listed construction companies where the aim is to compare the price behaviors of both sectors.

Real estate influences the industrial and commerce sectors such as banks, finance companies and insurance companies, all of whom have significant exposure in the property markets. Changes in the property and construction sectors could affect financial institutions which give out loans for property purchases and development as the financial institutions bear the risk in the case of a collapse in the two sectors. Thus, it is vital for these institutions to understand the behavior of stock prices of property and construction companies.

The relationship between macroeconomic variables and the stock price performance can be utilized by investors to determine whether it is profitable for them to invest in the property and construction sectors. The knowledge on the price movement in these sectors will also aid the government in developing policies to avoid speculation in these industries. The effects of shocks on macroeconomic variables on property and construction stock prices are also evaluated to provide insight to investors and policy makers on the effects of sudden changes in government monetary policies.

Property and construction sectors form integral parts of the Malaysian economy in

terms of their contribution to GDP and loans disbursements from banks. Hence, changes in economic factors should influence stock prices in these two sectors. Studies in other countries show that macroeconomic factors such as interest rates, GDP, inflation and trade openness are important in explaining stock price movements. How property and construction stock prices react to shocks in certain macroeconomic variables in Malaysia have yet to be determined. Do the shocks explain the movement of Malaysian property and construction stock prices? What are the macroeconomic variables that account for most of the variation?

The knowledge of the direction of stock prices has important implications. By studying the stock price behaviors of property and construction sectors, it is hoped that the findings will reveal whether property stocks are likely to provide returns which contradicts considerably from the returns on the latent real estate assets over a fairly long period and whether construction stocks follow the stock price behavior of the property sector. This information can be used as a guidance tool for investors who are eyeing the property and construction markets to make long term profit.

This study is also driven by the lack of empirical research on property and construction stock prices and the impact of changes in macroeconomic variables on these stock prices. This study aims to add to the academic writings in the property and construction sectors in Malaysia and to fill the gap in addressing this relationship. The value of this study lies in the baseline of comparison for subsequent studies as there is paucity of published research implications stated in the efficient market hypothesis and modern portfolio theory that have been investigated in a single study, particularly in Malaysia. Therefore, the main objective of this study is to discover the impact on property and construction stock prices to shock in macroeconomic variables.

This paper is organized as follows. The next section furnishes relevant literature in this area of study. The third section describes the data and methodologies implemented. The results and discussion are presented in the fourth section followed by the final section which concludes the study by providing a summary of the findings and its implications.

2.0 LITERATURE REVIEW

The Modern Portfolio Theory (MPT), which quantifies the theory of diversification, was developed by Harry Markowitz in 1952. Markowitz (1952) opined that the hypothesis that investors maximize discounted return has to be dismissed.

In the real estate context, the MPT is applied when diversification problems arise in real estate investment decisions. Real estate is considered as a promising new asset class for inclusion in a mixed-asset portfolio as it has (i) low correlation with other asset classes, (ii) potential for inflation hedge ability, and (iii) possibility for predictable returns (Norman, Sirmans, and Benjamin, 1995; and Corgel, McIntosh and Ott, 1995). Chao and Tao (2019) studied stocks in the A-share market in China and discovered that investors can use the mean-variance model proposed by Markowitz to obtain the existence of effective portfolios when they understand the historical average interest rate of each stock and the covariance matrix. Results from their study indicate that there is value in applying the capital combination idea proposed by Markowitz to the domestic stock market.

Hamid et al. (2010) tested the weak-form market efficiency of the stock market returns of Pakistan, India, Sri Lanka, China, Korea, Hong Kong, Indonesia, Malaysia, Philippines, Singapore, Thailand, Taiwan, Japan and Australia for a period of 5 years. They found that monthly stock prices do not follow random walks in all the countries of the Asia-Pacific region. Investors are able to gain benefits through arbitrage process from profitable opportunities across these markets since these markets are inefficient.

Listed construction and property companies in Nigeria were studied by Rasheed and Tajudeen (2006). Property shares were found to be able to present portfolio diversification when combined with construction and stock portfolios. Both sectors have low correlation with the stock market when combined in an equity investment portfolio in contrast to the findings of Ting (2002) who studied the performance of listed property companies in Malaysia where he found high correlation between property shares and other shares listed in the Bursa Malaysia, thus concluding that property shares in Malaysia cannot offer diversification opportunities.

Macroeconomic changes such as changes in interest rates, gross domestic product, inflation, money supply, unemployment and exchange rates are always linked to changes in the financial markets (Chen, Roll and Ross, 1986). Stock prices are usually considered to respond to external factors, including shocks to macroeconomic variables. The impact of a shock in monetary policies such as changes in interest rates, increases or decreases of the GDP and consumer price index (as measure for inflation) on stock prices can be traced by generating impulse response function using Vector Autoregressive Regression (VAR).

Brooks and Tsolascos (1999) found that the U.K. real estate returns are not significantly influenced by changes in economic variables; term structure of interest rates and unexpected inflation do have contemporaneous effect on property returns. This finding further supports results by Chen, Roll and Ross (1986), Hardouvelis (1987) and McCue and Kling (1994) which found changes in interest rates and inflation to be significant in explaining stock returns. Chang et al. (2019) studied that impact of macroeconomic variables on stock prices in Karachi Stock Exchange and found that these variables affect the movement of stock prices particularly the trade balance variable. They found that increase in trade balance can elevate the performance of the Pakistani stock market.

In a study on the impact of macroeconomic variables on stock prices in five ASEAN countries, Wongbangpo and Sharma (2002) found that there exists a negative long-run relationship between stock prices and interest rates in the Philippines, Singapore and Thailand but the opposite was observed in Malaysia and Indonesia. The findings from this study suggest that past values of macroeconomic variables can foresee future movements in stock price indices. Maysami, Howe and Hamzah (2004) provide further support where they discovered that the Singapore stock market and the SES All-S Equities Property Index composed significant links with the macroeconomic variables. This finding suggests the stock market forms cointegrating relationships with variations in the short and long term interest rates, industrial production, price levels, exchange rates and money supply.

In 2008, Khan studied the role of construction sectors in economic growth in Pakistan to ascertain the presence of long-run linkage between the construction sector and the economic growth (represented by the country's GDP). Results from the study suggest a powerful causal relationship between the aggregate economy and the construction sector exists in Pakistan. In another study, the construction sector growth rate was found to be impacting the growth rate of the economy in India by raising employment and therefore, raising the aggregate output in the economy (Mallick and Mahalik, 2010).

In a study to investigate the effect of trade openness on long-run growth, Shahbaz (2012) used cointegration, causality and forecast error variance decomposition to test on data from Pakistan. His findings confirm the existence of cointegration where in the long-run, trade openness was found to promote economic growth. Using the ARDL bounds test method, Lin (2012) found that co-movements between exchange rates and stock prices in the emerging Asian markets are stronger during crises periods, implying that governments incite economic growth and stock markets to

draw in capital inflow, thus avoiding currency crises.

In another study in Malaysia, Yusof and Ramli (2017) studied the effects of changes in macroeconomic factors, namely the exchange rate, inflation rate and crude oil price on stock market returns on selected sectors in Malaysia. Exchange rate and inflation rate changes are considered macroeconomic changes while crude oil price changes are considered as globalization factor. It is found that macroeconomic changes and globalization factors should be noted by investors in investment decision making processes as the changes might not be regulated but it can have significant impacts on the stock market as well investment profits.

3.0 DATA AND METHODOLOGY

The data used in this study consists of annual stock prices for Malaysian listed property companies that derive 50% or more of their revenue from property development activities and all listed construction stocks in Bursa Malaysia for the period of 1995 to 2013(19 years). This period is chosen as it includes the boom and bust periods in the Malaysian economy hence possible bias based on particular time period would be minimized.

Macroeconomic variables which include interest rate, GDP, inflation and trade openness are utilized in this study to examine the impact of macroeconomic shocks on property and construction stock prices. Interest rate is represented by the real risk free rate which is based on the Malaysian Treasury Bill rate. GDP report and CPI data which represent the inflation rate is extracted from the Statistics Department of Malaysia's website. Trade openness is measured by the sum of imports and exports as a percentage of GDP. It is utilized to calculate significance of international dealings in relation to internal or domestic trade. Data on the amount of imports and exports are also obtained from the Statistics Department of Malaysia's website. Among the methods used in this study to examine and evaluate the relationships of the variables included are VAR analysis, impulse response estimation tests and variance decomposition analysis.

3.1 VAR Analysis

The Vector Autoregression (VAR) is estimated to determine the interrelationships among the variables. In this study, it is utilized to ascertain the effect of macroeconomic variables on property and construction stock prices in Malaysia.

The standard panel VAR model can be written as:

$$y_{it} = \alpha_1 y_{i,t-1} + \ldots + \alpha_p y_{i,t-p} + \beta_0 x_{it} + \beta_1 x_{i,t-1} + \ldots + \beta_m x_{i,t-m} + u_{it}^{y} \quad (1)$$

where the error, u_{it}^{y}, is assumed to be serially uncorrelated and y and x are two arbitrary variables.

The lag length will be determined by the Schwartz Bayesian Criterion (SBC), where the model whose SBC value is smallest is chosen for further analysis. The significance of all the lags of each individual variable is tested jointly using the F-test.

In this study, the model is designed as follows:

$$P_{1t} = a_{10,0} + \sum_{i=1}^{l} a_{11,i} P_{i,t-n} + \sum_{i=1}^{l} a_{12,i} INT_{i,t-n} + \sum_{i=1}^{l} a_{13,i} GDP_{i,t-n} + \sum_{i=1}^{l} a_{14,i} INFL_{i,t-n} + \sum_{i=1}^{l} a_{15,i} TR_{i,t-n} + u_{1t}$$

$$INT_{2t} = a_{20,0} + \sum_{i=1}^{l} a_{21,i} P_{i,t-n} + \sum_{i=1}^{l} a_{22,i} INT_{i,t-n} + \sum_{i=1}^{l} a_{23,i} GDP_{i,t-n} + \sum_{i=1}^{l} a_{24,i} INFL_{i,t-n} + \sum_{i=1}^{l} a_{25,i} TR_{i,t-n} + u_{2t}$$

$$GDP_{3t} = a_{30,0} + \sum_{i=1}^{l} a_{31,i} P_{i,t-n} + \sum_{i=1}^{l} a_{32,i} INT_{i,t-n} + \sum_{i=1}^{l} a_{33,i} GDP_{i,t-n} + \sum_{i=1}^{l} a_{34,i} INFL_{i,t-n} + \sum_{i=1}^{l} a_{35,i} TR_{i,t-n} + u_{3t}$$

$$INFL_{4t} = a_{40,0} + \sum_{i=1}^{l} a_{41,i} P_{i,t-n} + \sum_{i=1}^{l} a_{42,i} INT_{i,t-n} + \sum_{i=1}^{l} a_{43,i} GDP_{i,t-n} + \sum_{i=1}^{l} a_{44,i} INFL_{i,t-n} + \sum_{i=1}^{l} a_{45,i} TR_{i,t-n} + u_{4t}$$

$$TR_{5t} = a_{50,0} + \sum_{i=1}^{l} a_{51,i} P_{i,t-n} + \sum_{i=1}^{l} a_{52,i} INT_{i,t-n} + \sum_{i=1}^{l} a_{53,i} GDP_{i,t-n} + \sum_{i=1}^{l} a_{54,i} INFL_{i,t-n} + \sum_{i=1}^{l} a_{55,i} TR_{i,t-n} + u_{5t} \quad (2)$$

P_{1it} represents the stock price at time t while INT_{2it} represents interest rate which is the proxy for monetary policy as it is mainly used by central banks as a tool to control inflation, output and lending. GDP_{3it} is the rate of gross domestic product at time t and $INFL_{4it}$ is the inflation rate as proxied by the CPI (Consumer Price Index), at time *t* while TR_{5it} represents trade openness at time *t*.

3.2 Impulse Response Estimation Test

In order to further investigate the effect of macroeconomic shocks on property and construction stock prices, the impact multipliers (orthogonalized impulse responses) for the estimated VAR models are calculated. The impulse response functions (IRF) seeks to discover the impact of a one-unit shock of each explanatory variable on the stock prices over time. A vector autoregression can be written as a vector moving average (VMA) where the VMA representation is featured in Sim's (1980) method that permits the tracing out of the time path of various shocks on the variables enclosed in the VAR system.

Each *Øjk (i)* is interpreted as the time specific partial derivatives of the VMA (∞) function (Enders, 2010):

$$\emptyset_{jk}(i) = \frac{\partial X_{ji}}{\partial e_k} \quad (3)$$

Equation (3) measures the change in the j^{th} variable in period t which is the result of a unit shock to the k^{th} variable in the present period. The coefficient ϕ can be used to produce the impacts of shocks on the time path and is known as an impact multiplier. However, it is still not feasible to trace out the time paths of the effects of the shocks as the estimated VAR is under-identified. To impose a restriction on the VAR system in order to identify the impulse responses, the Choleski decomposition has to be employed. It is used to obtain the underlying structural relationships and to perform innovation accounting (Gurguis and Schmidt, 2005).

The Cholesky decomposition of *S* is employed as:

$$S = TT' \quad (4)$$

where *T* is a lower triangular matrix and *T'* denotes the conjugate transpose of *T*. The key point for the Choleski decomposition is that the decomposition forces a potentially important asymmetry on the system since a shock on the macroeconomic variable will have simultaneous impacts on both property and construction stock prices. For that reason, the ordering of the variables in the model is important. The ordering of the variables in this study is based on decreasing order of exogeneity whereby the most exogenous variables are placed first followed by the less exogenous variables.

The effects of a one-unit shock of the macroeconomic variable on the stock prices are displayed in impulse response functions graphs where the asymmetry of the decomposition can be seen by comparing the two upper graphs. A one-unit shock in the macroeconomic variable causes the stock price value to increase or decrease and the period taken to achieve equilibrium after the shock can be observed on the graph.

3.3 Variance Decomposition Analysis

The variance decomposition analysis attempts to describe the total forecast error variance of each variable in terms of proportions caused

by evolutions in each variable. Similar to the impulse response function, it is necessary to restrict the B matrix whereby the Choleski decomposition is used to necessitate all of the one-period forecast error variance. As t increases, the variance decompositions should converge. If the correlation coefficient is significantly different from zero, it is customary to obtain the variance decompositions under various orderings. The ordering of the variables is critical in the decomposition as its effectiveness is tantamount to establishing limitations on the primitive form of the VAR.

To estimate the variance decompositions, the variances of interest rates, GDP, CPI and trade openness are decomposed into the percentages assignable to each type of innovation. The orthogonalized innovations are acquired from Choleski decomposition.

The results of the variance decomposition analysis are displayed in a table where each time series explains the predominance of its own past values. It will indicate how many percent of the macroeconomic variable forecast error variance is taken to explain the stock price movement.

4.0 ANALYSIS OF RESULT

4.1 VAR Model

The results of a VAR rely on the order of the variables. Following Pesaran, Shin and Smith (1999), who opined that different orderings will give different estimates of the impulse response functions, the ordering of the variables based on the degree of impact that the variable has on the stock prices as discovered by previous studies is applied. According to Enders (2010), if the correlation coefficient between the variables is low, the ordering is probably not important. The cut-off limit as suggested by Enders (2010) (when the ordering does not have any influence in a VAR residual cross-correlation) is 0.2.

Table 1 shows the VAR residual cross-correlations for property stock price and construction stock prices respectively with the influencing macroeconomic variables. It can be seen that several variables are strongly correlated with each other. GDP is found to be highly correlated with stock price at 0.474 and 0.348 for the property and construction sectors respectively. It is also negatively correlated with CPI at -0.26 and strongly correlated with trade openness at 0.307.

The property and construction stock prices are also seen to be negatively correlated with CPI at -0.284 and -0.235 respectively. Interest is also quite highly correlated with CPI at 0.418 while it is correlated with trade openness at 0.278 in the property sector. It can be observed that stock prices for both sectors are correlated positively with GDP and negatively with CPI while interest is strongly positively correlated with CPI and trade openness.

GDP is found to be negatively correlated with CPI at -0.259 for the property sector and -0.252 for the construction sector. GDP is also highly correlated with trade openness for both sectors at 0.31. Since the correlation coefficients are more than 0.2, it can be concluded that ordering is important in influencing the outcomes of the impulse response functions and variance decompositions in this study.

TABLE 1
VAR Residual Cross-Correlations

Panel A: Property Sector

	PRICE1	INT	GDP	CPI	OPEN
PRICE1	1.00	-0.152385	0.473862	-0.284395	-0.006427
INT	-0.152385	1.000000	-0.057004	0.417821	0.278307
GDP	0.473862	-0.057004	1.000000	-0.259271	0.306987
CPI	-0.284395	0.417821	-0.259271	1.00000	-0.149570
OPEN	-0.006427	0.278307	0.306987	-0.149570	1.000000

Panel B: Construction Sector

	PRICE2	INT	GDP	CPI	OPEN
PRICE2	1.0000000	-0.112593	0.347987	-0.234592	-0.003265
INT	-0.112593	1.000000	-0.055440	0.419926	0.279875
GDP	0.347987	-0.055440	1.000000	-0.252055	0.312349
CPI	-0.234592	0.419926	-0.252055	1.00000	-0.144867
OPEN	-0.003265	0.279875	0.312349	-0.1448667	1.000000

PRICE1 is the property stock price; *PRICE2* is the construction stock price; *CPI* is the consumer price index which is the proxy for inflation; *GDP* is the Gross Domestic Product which is displayed in RM million; *Open* is trade openness which is the sum of exports plus imports as a share of GDP; *Int* is the Malaysian Interest Rate represented by the Malaysian Treasury Bill rate

Ordering is done by placing the macroeconomic variables (interest rate, CPI, GDP and trade openness) in the decreasing order of exogeneity. Based on economic theory or previous empirical findings, the variable which is most exogenous is placed as the first variable followed by variables in decreasing order of exogeneity. In other words, the variable that is most likely to influence the other will be placed first followed by lesser influencing variables. In this study, the order of the variables is as follows: interest rate, trade openness, CPI and GDP.

4.2 Impulse Response Function

The impulse responses graphically display the reaction of each property/construction variable to a positive, one standard deviation shock in every one of the other variables over a nineteen-year period. Figure 1 displays the responses to interest rates for the property sector in Malaysia from 1995 to 2013. Initially, a positive monetary policy shock (interest rate) had a positive impact on property stock prices in the first two years whereby the stock price started declining after the second year. After the fifth year, it started to dip down to display a negative impact on the stock price and remained near equilibrium until it achieved total equilibrium by period fifteen. In year two, interest rates had the largest impact on property stock prices where a one standard deviation shock in the interest rate caused the stock prices to increase by about nearly 30%. This result is similar to the findings of Karim, Harif and Adziz (2006) in Malaysia where the effect of interest rate shock had an initial positive impact on the real estate sector before it declined to display a negative impact after the sixth year.

Therefore, it can be said that the property stock price reverts to equilibrium at about eleven years after experiencing an interest rate shock. The result of this impulse response graph proves that changes in interest rates do affect the movement of property stock prices, therefore proving that a shock in interest rates do affect property stock price. Shocks in interest rates would cause an immediate hike in the stock price before moving down and adjusting to equilibrium.

Most studies found interest rate changes to correlate negatively with stock prices. However, the result of this study has contradicted this finding. A recent research report by Credit Suisse (May, 2015) revealed that since 1998, equity and bond yields have been responding positively to rises in interest rates. This could be because lower interest rates are reflective of sluggish economic growth and vice versa. By using the framework of a discounted cash flow valuation approach, the higher cash flows resulting from higher expected growth compensates for the increase in the discount rate, hence a positive correlation. Since this study utilizes T-Bills (maturity of 3, 6 and 12 months) rate as the representative for interest rate in this study, it can be said that short-term interest rate is used in this study. Therefore, the result of reaction of property stock price towards interest rate shock corresponds with the results of study by Goswami and Jung (1997) where short-term interest rate is found to correlate positively with stock prices.

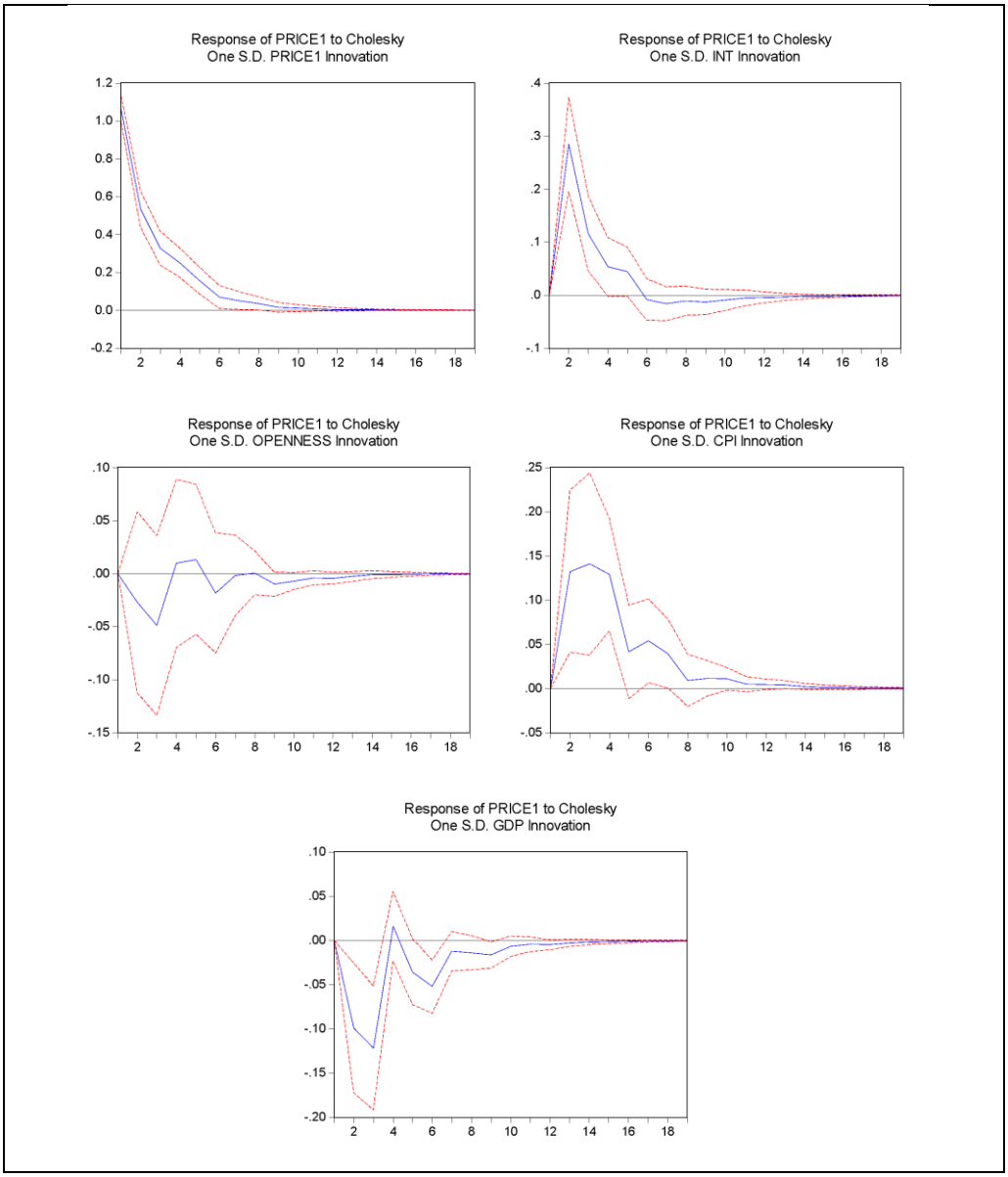

FIGURE 1
Responses to Interest Rate, Trade Openness, Inflation Rate and GDP Impulses: Property Stock Price

The response of property stock prices to the shocks in trade openness for the period of 1995 to 2013 is shown in the third graph in Figure 1. The results indicate that a rise in trade openness had a negative impact on property stock prices. In period three, it created the largest impact on property stock prices where a one standard deviation shock to trade openness caused property stock prices to decrease by about 5%. Beginning from period nine, the prices began to stabilize and remained close to equilibrium until period fourteen where the stock price finally settled at equilibrium. Basu and Morey (2005) found that countries with full trade openness become integrated with the global economy and constraints on imported inputs disappear. Thus growth becomes endogenous resulting in no predictable component in stock returns, making stock prices behave as random walk.

Meanwhile, the impulse response graph in Figure 1 suggests that a shock in CPI has a positive impact towards property stock price. The rise in inflation led to a positive impact on property stock prices up to about 15% before

beginning to decline after the fourth period. After period eight, it declined at a slower pace and remained close to equilibrium where it achieved full equilibrium at period fifteen. The impulse response graph shows that a rise in inflation leads to an increase in property stock prices. The result indicates that it is possible to predict the movement of the stock prices once the changes in inflation are detected.

Figure 1 also shows movements on the responses of Malaysian property stock prices towards GDP shock. Upon a positive shock on the GDP, the property stock prices initially dip down for the first three periods. Then, it displayed a slight positive response at period four. The largest impact of GDP on property stock price can be seen during period three where an increase in the country's GDP reduced the property stock price by about 12%. The stock price returned to equilibrium during period fourteen after starting to drift near equilibrium from period nine. Therefore, it can be concluded that upon a positive shock on GDP, property stock prices converge towards equilibrium beginning from period nine and revert back to its equilibrium by period fourteen.

The response of interest rate shock on construction stock prices in Malaysia for the period 1995 to 2013 is displayed in Figure 2. Similar to the response of property stock price shock to the positive monetary policy shock, it responded by producing a positive impact in the beginning. The biggest impact was in period two where one standard deviation of interest rate shock produced about 22% of increase in the construction stock price. After period two, the monetary shock impact started declining until it reached equilibrium at period six and declined further to produce a slight negative effect. It then converged to reach equilibrium at period eight and remained close to equilibrium until it achieved total equilibrium at period thirteen. It can be said that interest rate shocks produce a positive impact on construction stock prices as the prices showed a positive reaction to the change in interest rate for a long period (from beginning of the period to period six). The reason for this positive relationship could be that the government increased the interest rates during that period as it had anticipated high inflation in the near future.

A shock on trade openness initially brings a negative impact on construction stock price for the first three periods before increasing to produce a positive effect, as shown in Figure 2. The largest impact is in period four where a one standard deviation of shock on trade openness led to an increase of about 5% on construction stock prices. The stock price reached equilibrium at period nine. It can be concluded that the stock prices take a shorter period to achieve equilibrium due to trade openness shocks compared to other macroeconomic variable shocks.

Figure 2 also shows the response of construction stock prices to the shocks in CPI in Malaysia for 1995 to 2013. Similar to property stock prices, construction stock prices also generally respond positively to inflation shocks. The inflation shock had the biggest impact on construction stock prices in period two where a one standard deviation shock in the CPI caused the stock prices to increase by about 8%. After period four, the stock price began to decrease until it showed a slight negative response during period five and between periods seven and ten. The stock price converged to equilibrium at period ten after responding negatively following the innovation on CPI. The construction stock price response towards change in CPI differs from the response of property stock price as it displays negative behavior during the fifth period after being shocked whereas the property stock prices remained positive throughout the study period.

GDP shock produced an initial negative impact on construction stock prices in the first four periods, as shown in Figure 2. Similar to the property stock price responses to GDP shock, for a brief period between period four and five, the stock prices displayed positive reactions. However, from period five to period seven, the stock price showed a negative impact before reaching equilibrium during period eight.

Therefore, it can be concluded that construction stock prices experience initial negative response towards GDP shock before rising to display positive impact for a short period and settle at equilibrium. In period two, the GDP shock had the largest impact on construction stock prices where a one standard deviation shock in the GDP caused construction stock prices to decrease by about 10%. This decrease in stock prices in response to GDP innovation is less than the reduction in property stock price when shocked by GDP. It can be concluded that a shock in GDP creates a smaller negative impact to construction stock price compared to property stock price.

This could be due to the smaller percentage of the construction sector's contribution towards Malaysian GDP compared to the property sector.

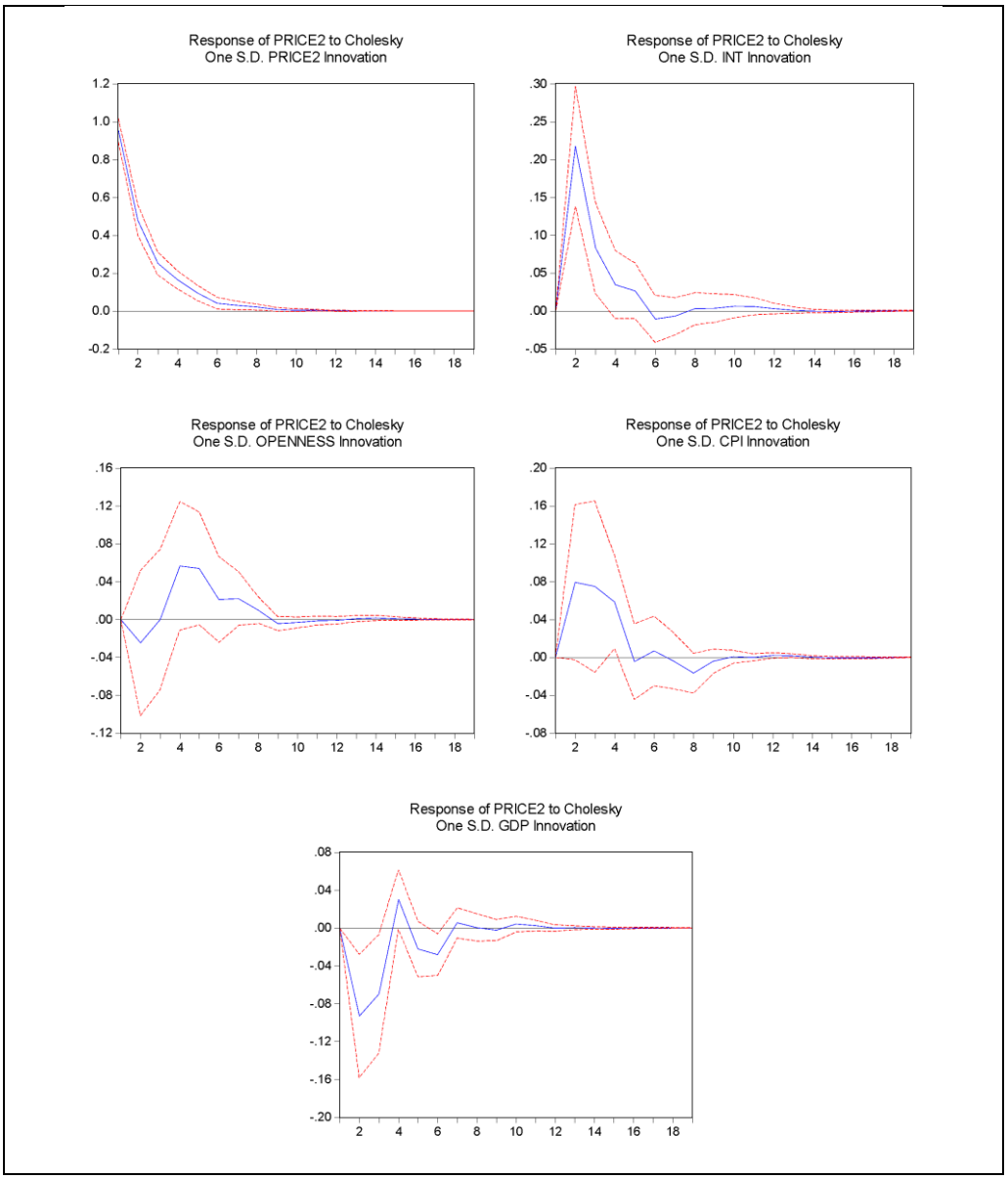

FIGURE 2

Responses to Interest Rate, Trade Openness, Inflation Rate and GDP Impulses: Construction Stock Price

Overall, it can be concluded that interest rate and CPI impulses affect property stock prices positively while trade openness and GDP produces negative responses on the stock

prices. As for the construction sector, all the macroeconomic variables (except GDP) shocks produce positive effect on their stock prices. Most of the stock prices respond within two periods once shocked. The largest impact of shock on stock price can be seen from the response of property stock price to shocks in the interest rate while the lowest impact is on the response of property and construction stock price to shocks on trade openness.

Shocks on these macroeconomic variables are seen to influence both sectors quite similarly except for the response of the stock price on trade openness shock where the prices respond negatively for the property sector whereas the positive shock on trade openness created a positive impact on construction stock prices. Bardhan, Edelstein and Tsang (2008) studied the impact of trade openness on public property companies and discovered that an economy's property security excess (risk-adjusted) returns are negatively related to its openness.

The results from the impulse response functions tests show that all publicly available information does affect the prices of the property and construction stocks in Malaysia. Information on changes in macroeconomic variables, which in this case are, interest rates, GDP, CPI and trade openness are reflected on the movement of the stock prices. Therefore, it can be concluded that the property and construction stock prices in Malaysia do not conform to the semi-strong form of the Efficient Market Hypothesis (EMH) as it takes approximately ten periods before the price reaches equilibrium.

4.3 Variance Decomposition

Table 2 shows the variance decomposition results of the effect of the macroeconomic variables on property stock prices for nineteen years (1995 to 2013). The reported figures show the percentage of movement in each variable that is caused by its own shock and the shocks to the other variables in the system. The results in Table 2 indicate that besides its own shock, interest rate had a strong significant influence on property stock prices, especially towards the longer horizon. At the nineteenth-year horizon, the forecast error variance explained by interest rate on the property stock price is 5.514%, followed by CPI at 3.338%, GDP at 1.629% and trade openness at 0.216%. This result shows that interest rates have a strong influence on property stock prices compared to other macroeconomic variables. CPI and GDP also influence the prices while trade openness has less influence in explaining the property stock price movements in Malaysia.

TABLE 2
Variance Decomposition – Percentage of Movements in the
Property Stock Price Explained by Shocks to Macroeconomic Variables

Period	S.E.	PRICE1	INT	OPENNESS	CPI	GDP
1	1.064151	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.235761	92.85477	5.305312	0.048435	1.148891	0.642593
3	1.298209	90.52038	5.611933	0.185640	2.221107	1.460944
4	1.329545	89.84050	5.511904	0.182191	3.057554	1.407850
5	1.340624	89.72313	5.529700	0.189189	3.103020	1.454964
6	1.344723	89.45206	5.499878	0.206503	3.244884	1.596680
7	1.346438	89.36972	5.500588	0.206119	3.322566	1.601004
8	1.347077	89.35828	5.501452	0.205951	3.324050	1.610263
9	1.347423	89.32705	5.507625	0.211254	3.329710	1.624361
10	1.347576	89.31322	5.511108	0.213887	3.335405	1.626381
11	1.347635	89.30935	5.512135	0.214763	3.336382	1.627367
12	1.347673	89.30535	5.512887	0.215781	3.337388	1.628591
13	1.347692	89.30312	5.513440	0.216156	3.338263	1.629019
14	1.347700	89.30228	5.513782	0.216222	3.338504	1.629213
15	1.347704	89.30175	5.514027	0.216260	3.338592	1.629368

16	1.347707	89.30147	5.514180	0.216281	3.338636	1.629437
17	1.347708	89.30135	5.514252	0.216291	3.338646	1.629462
18	1.347708	89.30129	5.514283	0.216300	3.338650	1.629475
19	1.347708	89.30126	5.514296	0.216307	3.338653	1.629481

Cholesky Ordering: PRICE1 INT OPENNESS CPI GDP

The variance decomposition result of the impact of macroeconomic variables on construction stock prices is displayed in Table 3. The result is relatively similar with the earlier result of property stock price reaction to shocks in the macroeconomic variable except for the level of influence of GDP and CPI on the shifts of the construction stock prices. GDP is found to influence construction stock price slightly more as compared to CPI. Shocks to interest rate and GDP highly influence the movement of construction stock prices in Malaysia for the period of 1995 to 2013. The reaction of the construction stock prices to shocks in interest rate, trade openness, CPI and GDP is weaker than the property stock result. At the nineteen-year horizon, the forecast error variance ranged from 4.213% for interest rates, 0.582% for trade openness, 1.172% for CPI and 1.173% for GDP.

TABLE 3
Variance Decomposition – Percentage of Movements in the
Construction Stock Price Explained by Shocks to Macroeconomic Variables

Period	S.E.	PRICE2	INT	OPENNESS	CPI	GDP
1	0.955227	100.0000	0.000000	0.000000	0.000000	0.000000
2	1.098106	94.78189	3.926509	0.051131	0.523276	0.717190
3	1.134093	93.75864	4.220241	0.047938	0.925606	1.047576
4	1.149664	93.26478	4.198820	0.289509	1.159143	1.087743
5	1.155397	93.02302	4.210347	0.503566	1.149106	1.113956
6	1.156726	92.93466	4.208584	0.535816	1.149913	1.171027
7	1.157343	92.89878	4.207668	0.571820	1.149795	1.171938
8	1.157708	92.87381	4.205750	0.579110	1.170107	1.171221
9	1.157766	92.87028	4.206513	0.580527	1.171257	1.171423
10	1.157807	92.86572	4.209254	0.581226	1.171215	1.172587
11	1.157833	92.86260	4.211955	0.581285	1.171163	1.172995
12	1.157840	92.86153	4.212710	0.581325	1.171452	1.172981
13	1.157842	92.86116	4.212789	0.581388	1.171680	1.172979
14	1.157844	92.86097	4.212780	0.581591	1.171679	1.172976
15	1.157844	92.86087	4.212794	0.581671	1.171687	1.172983
16	1.157845	92.86082	4.212803	0.581688	1.171701	1.172983
17	1.157845	92.86081	4.212803	0.581688	1.171717	1.172984
18	1.157845	92.86080	4.212805	0.581690	1.171721	1.172985
19	1.157845	92.86079	4.212809	0.581693	1.171721	1.172985

Cholesky Ordering: PRICE2 INT OPENNESS CPI GDP

Interest rate had a strong significant influence on the movement of construction stock prices during the period of study. Similar to the property sector, CPI and GDP also influence the construction stock price significantly. However, trade openness is also found to have less influence and insignificant in explaining the construction stock price movements compared to interest rates, CPI and GDP over the nineteen year period.

The results show that interest rate is an important factor in influencing property and construction prices. This could be mainly due to the high reliance of both sectors on bank financing. Reilly and Brown (2011) find that interest rates and inflation are important variables which affect stock prices. Interest

rates increase because of a rise in the rate of inflation and corporate earnings.

Results show that GDP influences the property stock more greatly than the construction stocks. This could be because the real estate sector performance is one of the leading economic indicators which usually changes before the economy changes. Hence, the real estate sector is effective as short-term predictors of the economy. Decline in leading economic indicators usually begin before the economy as a whole declines and usually begins to improve before the general economy starts to heal from a slump.

The main impact of inflation on stock prices is from the effect it has on a company's earnings. High inflation would cause the company's profits to be higher which will eventually lead to higher stock prices while low inflation keeps the sale prices low resulting in lower profits. Trade openness has very little effect on property and construction stock prices in Malaysia. This result is in line with the discovery of Basu and Morey (2005) which explored the effect of trade openness on stock price behavior and found that once a country opens up on the trade front, the stock returns show zero correlation with the variable.

In summary, it can be concluded that for both property and construction stock prices, variance decomposition results reveal that monetary policy tightening, CPI and GDP contractions significantly influences the stock price at a longer horizon. CPI influences property stock price more strongly compared to GDP. The effect of changes in interest rates, CPI and the GDP has a less profound impact on construction stock prices compared to property stock prices. Trade openness appears to have the least influence on the stock prices where it only influences the property stock price at 0.216% and construction stock price at 0.582%. Although CPI is found to strongly influence the property stock price, it is found to have less influence in affecting the construction stock price.

5.0 DISCUSSION

Changes in Malaysian T-Bills rates should be the main concern of investors, fund managers, academicians and policy makers as it is found that the real risk free rate is the main macroeconomic variable that significantly influences stock prices in these two sectors compared to other variables. This study can provide BNM with guidance to what degree of change and time period taken is acceptable so as to avoid a drastic change on the stock prices. Academicians can use the results of this study to further investigate the movements of Malaysian property and construction stock prices to delve deeper into the issue. The Securities Commission could also utilize the information from this study to reduce arbitrage opportunities on short-term speculative activities. The rise of interest rates could raise stock prices which will lead to a buoyant economy where more jobs can be created thus indirectly could solve the problems of social ills in this country.

While efforts have been made to minimize the shortcomings in this study, there are several unavoidable issues which still stand. This study only includes property development companies and not the overall listed property companies in Malaysia in the sample to be compared to the construction sector. Investors may overlook and base their decision to invest in the whole listed property companies instead of concentrating on only specific property development companies if they are not aware of the sample limitation. Another issue is that this study only focuses on the property and construction stock prices in Malaysia. Results from this study are restricted and applicable to only within the country since it is not compared with stock price behaviors of these two sectors within the same period in neighboring countries.

The results of this study leads to a number of suggestions for future research in the area of investment. A longer and wider range of samples to be included in the study could also improve the accuracy of the result. Similar studies can be done on other Southeast Asian

countries to compare the domestic results with overseas markets. It is also recommended to include money supply as another macroeconomic variable to study the effects of its shocks on property and construction stock prices as previous studies have indicated a link between this variable with the stock market. Finally, by including other sectors, such as finance and REITs, one could evaluate the relationship and performances of the stock prices with these sectors.

6.0 CONCLUSION

This study discovered the impact of macroeconomic shocks on the stock prices. Impulse response function tests found interest rate and inflation influences the stock prices positively while GDP has negative relationships with the stock prices. Property stock prices respond negatively whereas construction stock prices respond positively to trade openness shocks. It also found that the impact of trade openness on stock prices is limited. The variance decomposition analysis found that interest rates, inflation and GDP influence the property stock prices at a longer horizon by a significantly high percentage, while trade openness appears to have less impact on the proportion of changes in the property sector. However, the variance decomposition analysis showed that interest rate affects the construction stock prices strongly and significantly followed by GDP and inflation while trade openness only affects the stock price movement in small percentages.

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