RIDING OR CHALLENGING THE WAVES: UNCOVERING THE VOLATILITY OF SOUTHEAST ASIAN STOCK MARKETS AMIDST GLOBAL UNCERTAINTIES

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ABSTRACT

The purpose of this study is to examine the effect of global economic uncertainty on the stock markets in four developing countries in Southeast Asia, namely Indonesia (JKSE), Malaysia (KLCI), Thailand (SETI), and Vietnam (VNI). The study uses the U.S., China, and Europe Economic Policy Uncertainty (EPU) indices and the CBOE Volatility Index (VIX) from the Chicago Board Options Exchange as proxies for global uncertainty. By analyzing monthly composite stock index return rates in each stock market and monthly percentage changes in both the EPU and VIX, the Vector Auto-Regressive (VAR) model demonstrates that increases in the US EPU negatively impact JKSE, KLCI, and SETI return rates, while VNI tends to respond positively. Increases in EPU in China and Europe tend to have a negative effect on all stock markets. However, the impact of the Chinese EPU was stronger than that of the European EPU, particularly in JKSE and SETI, and the KLCI was more sensitive to the European EPU shock. On the other hand, the effect of an increase in the VIX was comparable to the impact of the US EPU, with JKSE, KLCI, and SETI experiencing negative pressure, while VNI responded positively.

Keywords: South East Asia; Stock market; Economic Policy Uncertainty; Volatility Index

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INTRODUCTION

Bernanke (1983) was one of the first to investigate the impact of uncertainty on business investment. He identified macroeconomic factors such as changes in oil prices, monetary and fiscal policies, and technological innovations as sources of uncertainty that can negatively impact investment. Baker et al. (2016) found evidence that increased uncertainty leads to short-term risks, reducing business activity and delaying investment and workforce recruitment. Uncertainty also causes households to be more cautious, leading to reduced consumption and a preference for safer investments (Bijsterbosch & Guérin, 2021; Bloom, 2016; Fernández-Villaverde et al., 2011). Pástor & Veronesi (2012) studied the impact of uncertainty in financial markets and found that higher uncertainty can lead to higher capital costs and decreased investment. Giavazzi & McMahon (2012) and Julio & Yook (2012) focused on the impact of increased political uncertainty surrounding U.S. elections and found that it led to lower investment and consumption. Pástor & Veronesi (2012) also measured stock price after policy changes by monetary and fiscal authorities and found that the slow recovery from the Great Recession (2008) was related to higher policy uncertainty.

In recent years, attention has been paid to the economic policy uncertainty (EPU) index, which is an average of three indicators of uncertainty: economic uncertainty headlines, expiring tax provisions, and policy and inflation disagreements. Several studies have explored the relationship between the EPU index and economic growth (Baker et al., 2016; Basu & Bundick, 2017; Jurado et al., 2015; Nilavongse et al., 2020), the adverse effects of policy uncertainty on investment (Rodrik, 1991; Gulen and Ion, 2015; Bahmani-Oskooee & Maki-Nayeri, 2019), and the impact of uncertainty on employment (Julio & Yook, 2012). Many studies have analyzed the impact of EPU on macroeconomic variables, but studies on the relationship between EPU and stock markets only emerged after the 2008 global financial crisis (Li et al., 2016). However, literature on the impact of EPU on stock markets, particularly in emerging countries, is still rare due to limited data availability for EPU data. Despite this, globalization and open market policies adopted by many countries have made it impossible to ignore the possibility that EPU in one country could impact other countries' economies and financial markets.

Studies have been done to examine the spatial impact of EPU, such as Mensi et al. (2014), who used a quantile regression approach for the period 1997 to 2013 and found that the BRICS stock market is dependent on global stock and commodity markets (S&P index, oil, and gold) but is independent of the US EPU index. Urakhma & Muharram (2021), using regression and GARCH methods, found that US EPU positively affected the stock market volatility of Malaysia, Singapore, and Thailand but had no impact on Indonesia and the Philippines. China's EPU also had no effect on stock market volatility in the five countries.

In the era of globalization and trade openness, a country's economy is highly likely tied to other countries. This can be reflected in global supply chains and international capital flows, which can originate from a country with a high level of economic uncertainty to a relatively stable country. Therefore, we support the initial hypothesis put forward by Mensi et al. (2014) and Urakhma & Muharram (2021) regarding the possibility of EPU in major economic countries affecting developing countries' economies and financial markets. As an extension and advocacy of the ideas developed by Mensi et al. (2014) and Urakhma & Muharram (2021), this study investigates the effect of the global EPU index proxied by 3 main countries/regions (USA, China, and Europe) on stock returns in four developing Southeast Asian countries which include Indonesia, Malaysia, Thailand, and Vietnam. We also include the Chicago Board Options Exchange's CBOE Volatility Index (VIX) as an additional indicator. VIX is a popular measure of the stock market's expectation of volatility based on S&P 500 index options. It is calculated and disseminated in real-time by the CBOE and is often called the fear index or gauge.

Although this study supports the fundamental idea presented by Mensi et al. (2014) and Urakhma & Muharram (2021) concerning the relationship between global uncertainty and emerging stock markets, it employs a distinct methodology by incorporating the possibility of lag. This approach captures the probability of delayed responses, as the impact of uncertainty in the t-period may affect that period and have repercussions in subsequent periods, such as t+1, t+2, and so on. Specifically, this study investigates impulse responses using the Vector Autoregressive (VAR) method. The analysis of impulse responses offers a comprehensive perspective on various aspects, including how the market reacts to uncertainty shocks from key countries/regions, the timing of the most significant impact, instances of less impactful shocks, and the identification of volatility.

This research contributes significantly to the existing literature by examining the impact of global economic uncertainty, as represented by

EPU and VIX, on the stock markets of developing countries in Southeast Asia. Furthermore, this study provides valuable insights into the analysis of stock market resilience within the Southeast Asian region in the context of global uncertainty. The findings of this study have practical implications for policymakers, offering guidance for proactive policy-making aimed at mitigating potential shocks to domestic stock markets. Moreover, market players can benefit from this study as it provides valuable insights for optimizing returns and minimizing risks. To the best of our knowledge, this study is the first attempt to measure the impact of uncertainty in three major countries/regions on stock market returns in four Southeast Asian countries.

LITERATURE REVIEW

Studies on the impact of Economic Policy Uncertainty (EPU) on the economy, in general, have been carried out for the past several decades, but the interest of scholars to study more deeply the relationship between EPU and the stock market has just begun to emerge after the 2008 global financial crisis (Aydin et al., 2021). Li et al. (2016) applied a rolling-window bootstrap causality test to assess the relationship between EPU and stock returns in China and India. Using monthly data from 1995:02 to 2013:02 in China and 2003:02–2013:02 in India, this study found a two-way causal relationship between EPU and stock returns in some sub-periods rather than across the sample period. However, the relationship between EPU and stock returns was generally weak for these two developing countries.

Arouri et al. (2016) examined the impact of economic policy uncertainty on the stock market in the United States from 1900-2014 using a linear model and market shifts. As a result, it was revealed that an increase in policy uncertainty reduced stock returns significantly. However, the relationship between EPU and stock returns was not linear and the effect of EPU on stock returns was stronger and persistent during periods of extreme volatility.

Wu et al. (2021) used the difference between the intraday high and low prices as a volatility proxy and applied the conditional autoregressive range (CARR) and (CARR-MIDAS) models. The empirical results of this model showed that the China EPU (CEPU) and global EPU (GEPU) significantly negatively affected the volatility of the Chinese stock market. Furthermore, this study also found that CEPU provided superior volatility forecasts compared to GEPU. This study used a quantile regression approach in Brazil, Russia, India, China and South Africa (BRICS) for the period September 1997 to September 2013 and showed that the BRICS stock market was dependent on global stock and commodity markets (S&P index, oil and gold), as well as changes in the U.S. stock market. This dependency structure is often asymmetric and influenced by the onset of the global financial crisis. In contrast, U.S. economic policy uncertainty did not impact the BRICS stock market (Aydin et al., 2021).

Meanwhile, Yu et al. (2021) tried to investigate the impact of global economic policy uncertainty (GEPU) on stock volatility for nine developing countries (Brazil, Russia, India, China, South Africa, Mexico, Indonesia, South Korea, and Turkey). They used the extended GARCH-MIDAS approach. The estimation results found that GEPU had an empirically significant impact on stock volatility for nine developing countries, and the impact of GEPU was greater when conditions were unstable. This study, which considered the relationship between EPU and stock market volatility in emerging markets, also revealed that economic policy uncertainty was an important determinant of stock market volatility, and a higher EPU led to a significant increase in volatility. This study also claimed that a thorough understanding of the EPU-Volatility relationship could be beneficial for investors to better predict stock market volatility behavior (Mohapatra & Mishra, 2020).

Additionally, Urakhma & Muharram (2021) applied a regression model and Generalized Autoregressive Conditional Heteroscedasticity (GARCH) to analyze specifically the relationship between EPU and volatility in Southeast Asia. As a result, it was revealed that the US EPU positively affected the volatility of the stock market indices of Malaysia, Singapore, and Thailand, while for the stock markets of Indonesia and the Philippines, there was no positive effect. In contrast, China's EPU had absolutely no impact on the volatility of the ASEAN 5 stock market indices. Arouri et al. (2016) and Li et al. (2016) explained that EPU in China and America affected the return rate on each country's domestic capital market. Wu et al. (2021) also described similar results, namely that

China's EPU influenced the volatility of the domestic stock market. Likewise, Yu et al. (2021) discovered that Global EPU had a share in stock price volatility in several developing countries such as Brazil, Turkey, and Indonesia.

Studies have shown that the EPU of a country, the Global EPU, and the EPU of major economies have a negative effect on stock market returns and tend to increase volatility. This is understandable, as stock markets are known to be sensitive to changes in sentiment. In today's interconnected world, where economic production factors are linked, and information is easily accessible, uncertainty in one country can impact others. However, the level of interdependence and the severity of the shock experienced should also be considered. Theoretically, a domestic capital market with strong connections to the global market will experience a dual impact. Suppose the domestic market has a close relationship with a specific country. In that case, shocks in that country can greatly affect the domestic economy and financial markets, but if the global economy experiences a quick recovery, the domestic market will also benefit. On the other hand, a country with weak connections, when faced with a significant shock of uncertainty, will not experience much disturbance in its domestic economy and financial market, but a recovery in the global economy will not greatly impact it either.

Therefore, it is important to understand the relationship between uncertainty and the stock market, especially in Southeast Asia, where there is a high possibility that the stock market will be affected by uncertainty shocks from major economic countries. This study contributes to the understanding of the relationship between uncertainty and the stock market in Southeast Asia by examining the impact of economic policy uncertainty from the U.S., China, and Europe on the stock market rate of return in four Southeast Asian countries, Indonesia, Malaysia, Thailand, and Vietnam. By using the VAR model and including the VIX as an alternative measure of global uncertainty, the study seeks to explore the pattern of the response of each country's stock market to global economic uncertainty. The results of this study will provide insights into the resilience of the Southeast Asian stock market.

METHODS

Data

This study used monthly EPU data from three main economic countries/regions: the United States, China, and Europe. These three regions had the largest economies in terms of nominal GDP in 2021, so we assumed that they represent global economic uncertainty. Following the EPU data timeframe, this study also used monthly VIX data. Meanwhile, for data on stock price, we took from four composite indices in four Southeast Asian countries, which include: JCI, KLCI, SET, and VNI, representing stock markets in Indonesia, Malaysia, Thailand, and Vietnam. To get robust results, we took a data timeframe on quite dynamic global economic conditions, starting from the recovery phase after the 1998 Asian financial crisis, the severe shocks during the 2008 global financial crisis, the post-crisis recovery of 2008 to the last shock caused by the COVID-19 pandemic. In detail, we used EPU data and monthly stock market indexes from January 2000 to December 2021 for the Indonesian stock market, June 2002 to December 2021 for the Malaysian stock market, January 2002 to December 2021 for the Thailand stock market, and August 2000 to December 2021 for the Vietnam stock market. We extracted EPU data from policyuncertainty.com, VIX data from https://www.cboe.com, and selected stock indexes from investing.com.

Research models

This study takes a different approach from Urakhma & Muharram (2021), who focused on measuring the impact of Economic Policy Uncertainty (EPU) on volatility. Instead, this study follows the methodology used by Arouri et al. (2016) and Li et al. (2016), which proxies the impact of EPU on the rate of return. The rate of return proxy was chosen over volatility as the data used was a monthly return, making volatility lower. The study considered the possibility of lag of EPU and Volatility Index (VIX) in the previous month but disregarded the possibility of co-integration. The assumption is that monthly fluctuations in EPU and VIX would affect the sentiment of the stock market, which tends to be responsive and reactive. However, shocks in month t may suddenly disappear due to optimism in later months, making the co-integration between the percentage rate of change of EPU and VIX on the stock market rate of return irrelevant.

The Vector Autoregressive (VAR) model was employed to analyze the relationship between Economic Policy Uncertainty (EPU), the Volatility Index (VIX), and the rate of return in the stock markets of Indonesia, Malaysia, Thailand, and Vietnam. The VAR model was chosen due to its ability to handle lags and its lack of requirement for co-integration, although ensuring data stationarity at the level posed a challenge. The study utilized the monthly percentage change as a proxy for EPU, VIX, and return rates to ensure data stationarity, as outlined in equation (1).

The VAR model facilitates the assessment of the magnitude of the impact of EPU and VIX in previous periods through the Impulse Response Function (IRFs). Additionally, the Vector Error Decomposition Function (VEDF) was applied to decompose the forecast error of the VAR model into contributions from individual variables. However, instead of solely relying on IRFs, we also present the coefficients of each variable. The coefficients provide information about the partial relationships between the variables in the VAR model. This complements the IRFs, which give an overview of the overall system impact arising from changes in a particular variable.

$$\hat{\rho}_t^i = \frac{\rho_t^i - \rho_{t-1}^i}{\rho_{t-1}^i} \quad (1)$$

$\hat{\rho}$, ρ, i and t sequentially, are the percentage change in data value, actual value, data type, and time period.

Assume $y_t = (y_{1t},\ y_{2t},\ y_{kt})$ is k stochastic dimension of time series data, with $t = 1,2,3,\ldots,T$ for each $y_{it} \sim I(1)$, and every k influenced by an exogenous variable with a dimension $x_{1t},\ x_{2t}, x_{dt}$. Based on these assumptions, the VAR model can be constructed following equation (2), where A_0 is a vector of size $M \times 1$ and matrix A_i respectively of size $M \times M$. Based on the variables and research objectives, this study constructs a VAR model such as equations (2.1)-(2.4).

$$y_t = \sum_{i=1}^{p} A_0 + A_i y_{t-i} + v_t \quad (2)$$

$$y_t^{JKSE} = \alpha_{11} + \sum_{i=0}^{q} \alpha_{12}\theta_{t-1} + \alpha_{13} \sum_{i=0}^{q} \vartheta_{t-1} + \alpha_{14} \sum_{i=0}^{q} \phi_{t-1} + v_{1t} \quad (2.1)$$

$$y_t^{KLCI} = \alpha_{11} + \sum_{i=0}^{q} \alpha_{12}\theta_{t-1} + \alpha_{13} \sum_{i=0}^{q} \vartheta_{t-1} + \alpha_{14} \sum_{i=0}^{q} \phi_{t-1} + v_{1t} \quad (2.2)$$

$$y_t^{SETI} = \alpha_{11} + \sum_{i=0}^{q} \alpha_{12}\theta_{t-1} + \alpha_{13} \sum_{i=0}^{q} \vartheta_{t-1} + \alpha_{14} \sum_{i=0}^{q} \phi_{t-1} + v_{1t} \quad (2.3)$$

$$y_t^{VNI} = \alpha_{11} + \sum_{i=0}^{q} \alpha_{12}\theta_{t-1} + \alpha_{13} \sum_{i=0}^{q} \vartheta_{t-1} + \alpha_{14} \sum_{i=0}^{q} \phi_{t-1} + v_{1t} \quad (2.4)$$

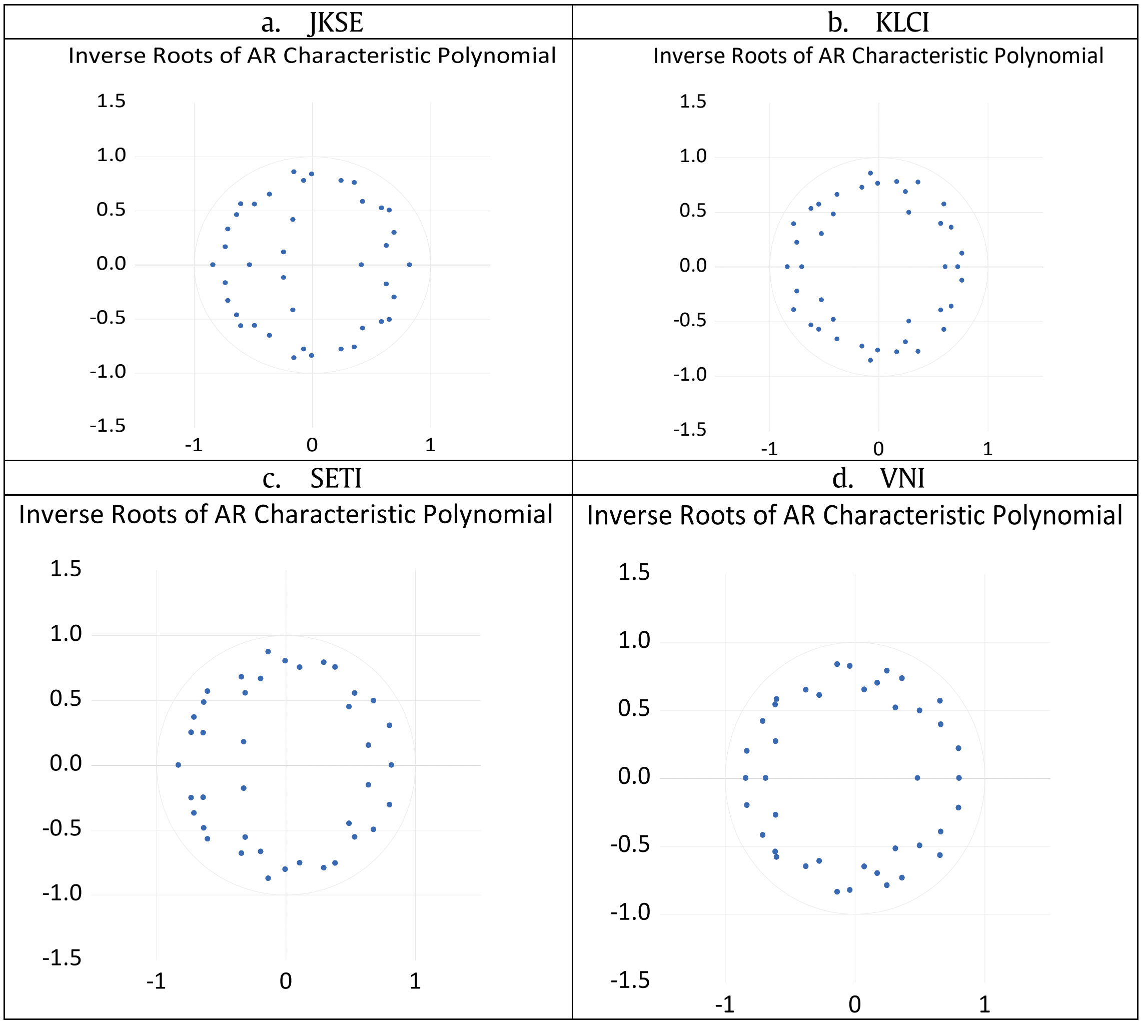
Note: θ,ϑ,ξ,ς,ϕ respectively, represent United States EPU, European EPU, and China EPU; p represents the maximum lag length; α represents the coefficient; v represents an error; and JKSE, KLCI, SETI, and VNI represent the rate of return on the capital markets of Indonesia, Malaysia, Thailand, and Vietnam.

Table 1: Lag length criteria

	LR	FPE	AIC	SC	HQ	Implemented Lag
JKSE	3	2	2	1	1	2
KLCI	3	2	2	0	1	2
SETI	3	2	2	0	1	2
VNI	3	2	2	1	1	2

Notes: L.R. is sequential modified L.R. test statistic (each test at 5% level); FPE is Final prediction error; AIC is Akaike information criterion; S.C. is Schwarz information criterion; and H.Q. is Hannan-Quinn information criterion.

Since each variable is a percentage, it is naturally stationary, so we immediately run the VAR model. Initially, we ran the model with a lag of 8 and performed a stability test through roots of characteristics polynomial with a threshold value of each modulus below 1 to obtain a stable model. Furthermore, we looked for the optimal lag by implementing the information obtained from the sequential modified L.R. test statistic (each test at 5% level); Final prediction error (FPE); Akaike information criterion (AIC); Schwarz information criterion (S.C.); and the Hannan-Quinn information criterion (H.Q.). This study implemented the lag with the highest recommendation frequency from the five tests carried out, and if there was the same lag frequency, then the lag that nominally had the largest value was chosen. The selection of the largest lag value when there were two of the same lag frequency aimed to accommodate dynamic changes in the model. Because of the long data series, the lag with the highest order would not reduce the degrees of freedom.



Notes: The modulus of the inverse root of A.R. is depicted on both the horizontal and vertical axis

Figure 1: Stability test

EMPIRICAL RESULT

The results of the stability test using the roots of characteristics polynomial show that the modulus for each model had a value below 1 so the VAR model satisfies the stability condition. In detail, the visualization of the stability test can be seen in Figure 1. Furthermore, the lag length criteria test in Table 1 shows that based on the frequency of the five tests carried out, each model has the same lag length, namely in the second lag (VAR (2)).

Table 2: VAR coefficient estimation

	JKSE	KLCI	SETI	VNI
JKSE(-1)	0.135002			
	(0.06831)			
JKSE(-2)	-0.009090*			
	(0.06517)			
KLCI(-1)		0.022636*		
		(0.07789)		
KLCI(-2)		0.121909*		
		(0.07659)		
SETI(-1)			-0.004540*	
			(0.07201)	
SETI(-2)			0.076571*	
			(0.06963)	
VNI(-1)				0.391968
				(0.06765)
VNI(-2)				-0.076059*
				(0.06774)
EPU_US(-1)	0.004289*	-0.007136*	0.014528*	0.021390*
	(0.02364)	(0.01544)	(0.02486)	(0.03779)
EPU_US(-2)	-0.000400*	0.006105*	-0.002947*	0.011239*
	(0.02303)	(0.01510)	(0.02425)	(0.03705)
EPU_CHINA(-1)	-0.010853**	-0.004289*	-0.008003*	0.004358*
	(0.00612)	(0.00437)	(0.00652)	(0.01049)
EPU_CHINA(-2)	-0.013866	-0.000452*	-0.022852	-0.005095*
	(0.00612)	(0.00439)	(0.00646)	(0.01054)
EPU_EUROPE(-1)	-0.000768*	0.010233*	-0.006198*	-0.006478*
	(0.01803)	(0.01245)	(0.01943)	(0.02834)
EPU_EUROPE(-2)	0.003370*	-0.001002*	0.023087*	0.011328*
	(0.01774)	(0.01233)	(0.01896)	(0.02803)
VIX(-1)	-0.047059	-0.017226*	-0.032053***	0.007723*
	(0.01730)	(0.01146)	(0.01896)	(0.02740)
VIX(-2)	0.007364*	0.003835*	0.017602*	0.018171*
	(0.01816)	(0.01196)	(0.01982)	(0.02767)
C	0.014118	0.004145*	0.010904	0.007938
	(0.00410)	(0.00265)	(0.00420)	(0.00628)
R-squared	0.103947	0.038737	0.070185	0.139027
Sum sq. resids	0.835150	0.286681	0.926123	2.010322
S.E. equation	0.057798	0.036017	0.060865	0.090956
F-statistic	2.900136	0.890590	1.887078	3.923887
Mean dependent	0.011160	0.004057	0.007404	0.013892
S.D. dependent	0.059873	0.035931	0.061894	0.096068

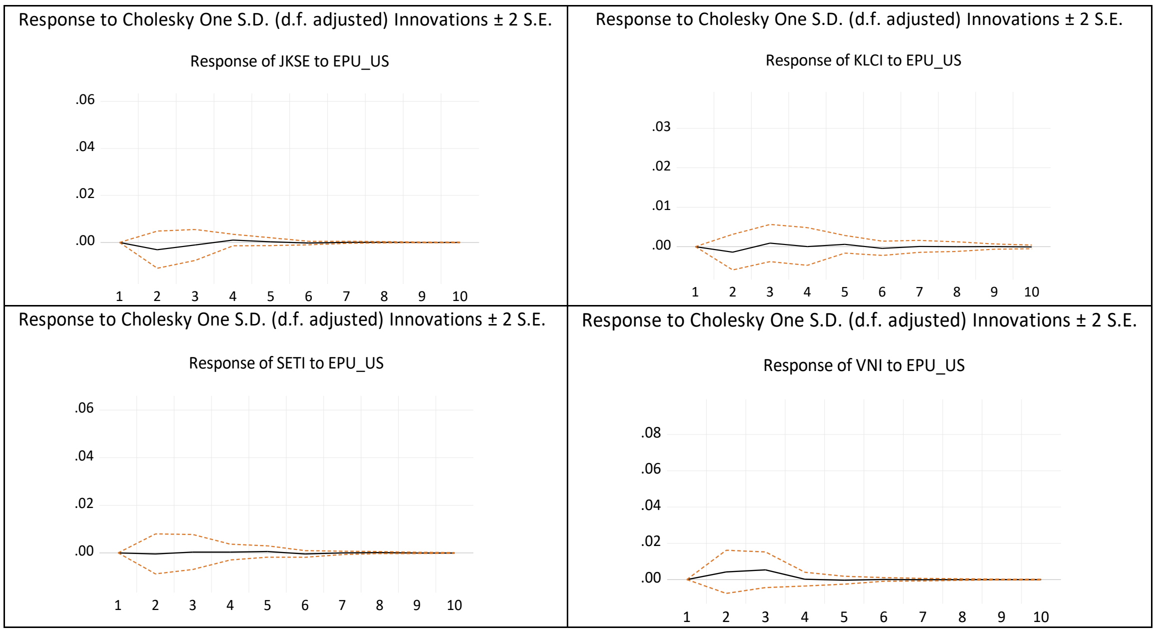
Notes: *,** represent significance levels at 0.05 and 0.1, and ( ) represent standard errors.

Response to uncertainty in the United States

Based on Table 2, the increase of US EPU in period t positively impacts the Indonesian and Thai stock markets in period t+1. However, the JKSE and SETI indices respond negatively to US EPU shocks in period t+2. In contrast, the Malaysian stock market immediately responds negatively to the increase in US EPU in period t+1, but the KLCI eventually experiences a reversal in period t+2. Unlike the other three stock markets, where there is at least one period of an increase in the EPU to which the market responds negatively, the increase in the EPU in the U.S. received a positive response from the

Vietnamese capital market. A positive VNI reaction is shown by the coefficients on t-1 and t-2, which both have significant positive coefficient values.

As seen in Figure 2, the Impulse response provides a clearer illustration; a one standard deviation shock for uncertainty in the U.S. in period t will depress the Indonesian stock market in period t+1. However, the Indonesian stock market began to return to a steady state without significant volatility. The Malaysian and Thai stock markets show a fluctuating response to US EPU shocks. The difference is that KLCI shows quite large fluctuations, and SETI only shows minor volatility. Meanwhile, in line with its coefficients on t-1 and t-2, the Vietnamese stock market, which are positive, US EPU shocks will encourage higher levels of return in the two periods after the US EPU shocks, and the impulse response does not show any significant volatility at VNI.

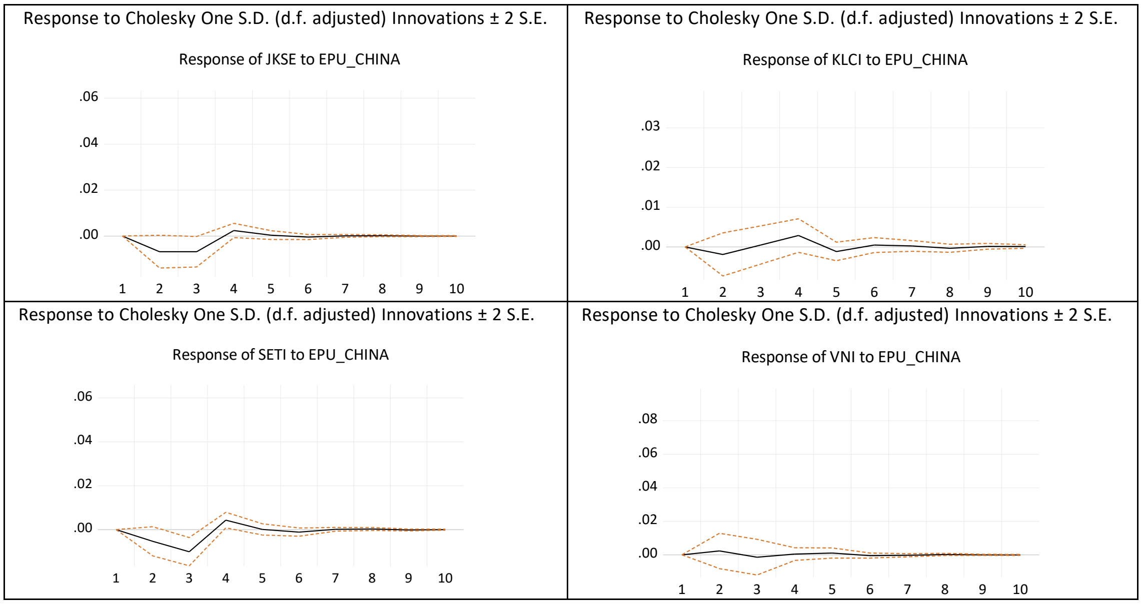


Notes: The horizontal axis represent the time of the month, while the vertical axis represents the percentage change in stock market returns

Figure 2: Impulse response function (IRFs) from one S.D of EPU US

Response to uncertainty in China

Referring to Table 2; JKSE has the largest negative coefficient in response to China's EPU in the t-1 periods. These findings indicate that the Indonesian stock market is closely related to China's economic conditions. The same thing is shown by KLCI and SETI where the rate of return in period t will also experience pressure when there is an increase in uncertainty in periods t-1 and t-2. Meanwhile, the VNI experiences a slow response. An increase in China's EPU in the new t period will have a negative impact in the t+2 period, while in the t+1 period, the impact will still be positive. The IRFs in Figure 3 illustrate that Indonesia and Thailand are two countries that are experiencing considerable pressure in dealing with China's EPU shocks. The difference is that there is a U shape recovery pattern for Indonesia and a V shape for Thailand; these inform that the recovery in the Thailand stock market will proceed faster than in Indonesia when there is a shock of uncertainty in China. Meanwhile, the pressures received by the Malaysian and Vietnamese capital markets tend to be lighter than those received by Indonesia and Thailand. However, it should be noted that the Malaysian stock market tends to be more volatile in response to shocks from the Chinese EPU.

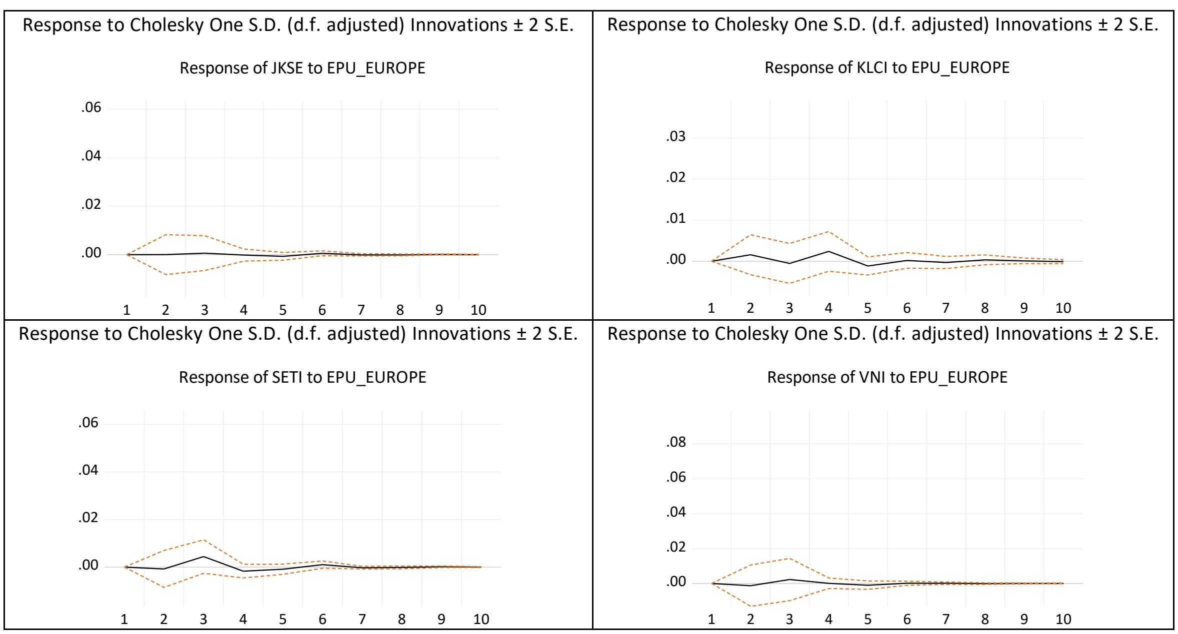


Notes: The horizontal axis represent the time of the month, while the vertical axis represents the percentage change in stock market returns

Figure 3: Impulse response function (IRFs) from one S.D of EPU China

Response to uncertainty in Europe

In general, the impact of uncertainty in Europe, as shown in Table 2, harms the stock market in the four Southeast Asian countries. In Indonesia, the increase in European EPU receives a negative response in both the t-1 and t-2 periods. The negative impact of an increase in European EPU is only seen in period t-1, while in period t-2, the EPU coefficient is positive for the Thai and Vietnamese stock markets.



Notes: The horizontal axis represent the time of the month, while the vertical axis represents the percentage change in stock market returns

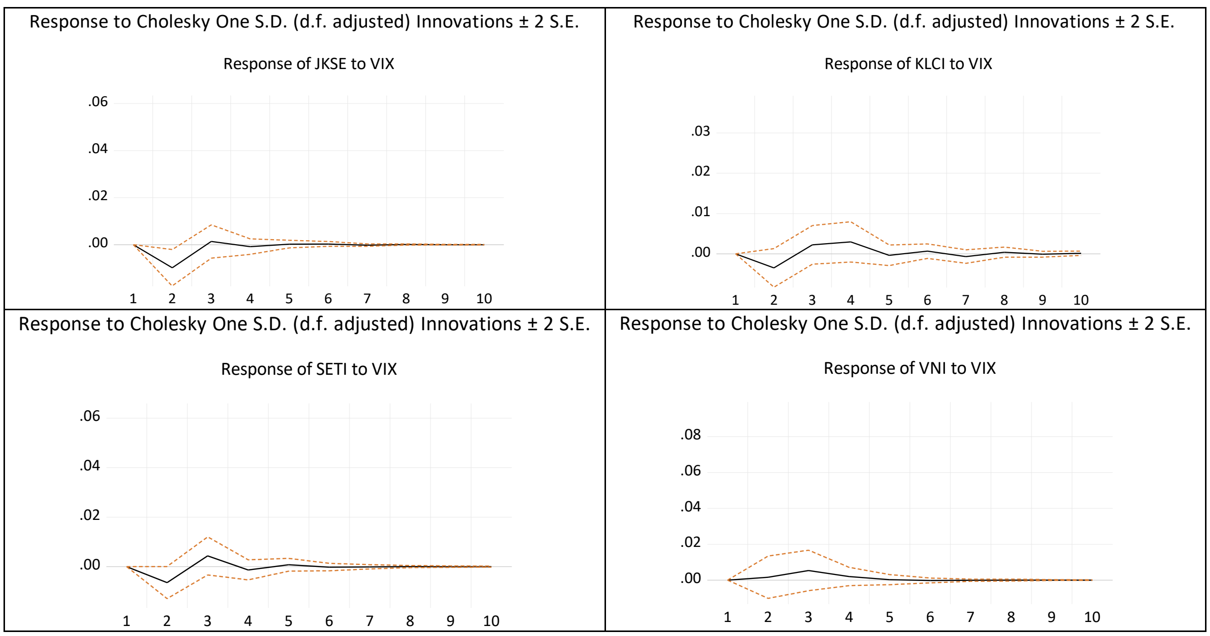
Figure 4: Impulse response function (IRFs) from one S.D of EPU Europe

Meanwhile, the Malaysian stock market experience sluggishness, where the increase in

European EPU in period t still received a positive response from KLCI in period t+1 and only suppressed the return rate at t+2. Based on the impulse response, Indonesia and Vietnam are quite resilient to uncertainty in Europe, while the impact received by Thailand and Malaysian stock markets looks quite volatile, at least until the 6th month (see Figure 4).

Response to the Volatility Index

Based on Figure 5. The stock markets in Indonesia, Malaysia, and Thailand negatively reacted to the VIX increase in t-1 but not to the rise in VIX in t-2, as shown by the coefficient value. On the other hand, the stock market in Vietnam had a positive correlation with both VIX and VNI in t-1 and t-2, respectively. As per the impulse response in Figure 5, the impact of VIX was severe on the JKSE rate of return, but there was no noticeable volatility. However, KLCI and SETI displayed a significant volatility reaction to the VIX shocks. Unlike these three markets, the Vietnam stock market responded positively to VIX, and its impulse response was not volatile, as indicated by its coefficient values. The results show that the rate of return on the stock markets in Indonesia, Malaysia, and Thailand is closely related to the VIX, implying that the U.S. capital market's expectations greatly impact these countries' stock markets, with higher expectations of volatility, leading to the lower rate of return.



Notes: The horizontal axis represent the time of the month, while the vertical axis represents the percentage change in stock market returns

Figure 5: Impulse response function (IRFs) from one S.D of VIX

Vector Error Decomposition Function (VEDF)

The Chinese EPU has the most significant impact on the rate of return of the JKSE, as shown by the VEDF (see the appendix). The period following a shock (t+1) saw the rate of return of JKSE being explained by China's EPU at 1.268%. This percentage continued to rise until it stabilized at 2.674% in t+5. Conversely, VIX had a greater impact in explaining the variations in JKSE's return rate, reaching 2.647% at t+1 and stabilizing at 2.677% at t+6. The analysis results indicate that the Economic Policy Uncertainty indices of the three main countries/regions did not significantly affect the KLCI, with the percentage of their combined impact being below one percent. Instead, VIX had the most significant impact in explaining the variations in KLCI's return rate, reaching 0.950% at t+1 and stabilizing at 1.058% at t+3. In the case of the SETI, China's EPU was the dominant factor in explaining the return rate, with a percentage of 0.740% in t+1 and 3.778% in t+8, while VIX only had a maximum impact of 1.580% in the t+5 period. The stock market in Vietnam (VNI) was the most resilient to EPU and VIX, with the explained return below 1%. However, the US EPU was the most dominant factor compared to the other two EPUs and VIX.

CONCLUSION

The previous discussion of the coefficient's value, impulse response, and variance decomposition reveals some significant results. The US EPU appears to negatively affect the stock market return rates in Indonesia, Malaysia, and Thailand. On the other hand, in Vietnam, there is a direct proportion between the increase in US EPU and the return rate on the stock market. All four countries' stock markets react negatively to increases in EPU from China and Europe, but the impact and volatility caused by the European EPU are lower than the impact from China's EPU. The impulse response and variance decomposition also show that a shock from China's EPU will significantly affect the return rate of JKSE and SETI, while KLCI and VNI are relatively more resilient. Additionally, the VIX strongly impacts the return rates of JKSE, KLCI, and SETI - the higher the VIX value, the lower the return rate. However, VNI remains resilient in its response to shocks from the VIX.

The findings of this study suggest that the impact of EPU and the VIX varies across different stock markets. These variations indicate that a country's specific economic structure, encompassing factors such as trade volume, investment climate, foreign direct investment (FDI), and regulations, is likely to influence the resilience of its stock market in responding to EPU and VIX shocks. It is important to note that this study did not examine these economic structure-related factors. Hence, future research should incorporate the domestic economic structure to investigate the impact of EPU on stock market resilience. Expanding the scope of research in this dimension will contribute to a more comprehensive understanding of the effects of EPU and VIX, particularly in the context of emerging markets.

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Appendix

1. Variance decomposition of JKSE

Period	S.E.	JKSE	EPU_US	EPU_CHINA	EPU_EUROPE	VIX
1	0.057798	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.060459	95.81991	0.264165	1.268384	6.24E-06	2.647533
3	0.060896	94.52126	0.293268	2.514465	0.010625	2.660385
4	0.060958	94.33017	0.318492	2.666071	0.011436	2.673826
5	0.060966	94.31119	0.320604	2.669350	0.024301	2.674557
6	0.060972	94.29403	0.322696	2.674157	0.032963	2.676156
7	0.060972	94.29272	0.322697	2.674199	0.033269	2.677110
8	0.060972	94.29205	0.322748	2.674468	0.033563	2.677173
9	0.060972	94.29186	0.322749	2.674515	0.033712	2.677169
10	0.060972	94.29184	0.322753	2.674526	0.033713	2.677168
Cholesky Ordering: JKSE EPU_US EPU_CHINA EPU_EUROPE VIX						

2. Variance decomposition of KLCI

Period	S.E.	KLCI	EPU_US	EPU_CHINA	EPU_EUROPE	VIX
1	0.036017	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.036456	98.09086	0.149249	0.381298	0.427642	0.950947
3	0.036724	97.82233	0.269540	0.378251	0.472492	1.057386
4	0.036733	97.77772	0.275341	0.411390	0.477036	1.058515
5	0.036738	97.76249	0.276247	0.425288	0.477742	1.058233
6	0.036739	97.76150	0.276540	0.425280	0.478469	1.058210
7	0.036739	97.76030	0.276559	0.426024	0.478736	1.058379
8	0.036739	97.76016	0.276573	0.426075	0.478738	1.058455
9	0.036739	97.76006	0.276578	0.426128	0.478777	1.058459
10	0.036739	97.76001	0.276578	0.426154	0.478795	1.058458
Cholesky Ordering: KLCI EPU_US EPU_CHINA EPU_EUROPE VIX						

3. Variance decomposition of SETI

Period	S.E.	SETI	EPU_US	EPU_CHINA	EPU_EUROP E	VIX
1	0.060865	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.061535	98.14594	0.005312	0.740462	0.016790	1.091491
3	0.062686	94.64935	0.008555	3.295073	0.512706	1.534312
4	0.062897	94.09000	0.011286	3.747895	0.583768	1.567056
5	0.062912	94.04915	0.019652	3.746458	0.603523	1.581217
6	0.062933	93.98855	0.024958	3.775407	0.630179	1.580907
7	0.062934	93.98625	0.024957	3.775794	0.632018	1.580978
8	0.062935	93.98335	0.025389	3.777733	0.632564	1.580963
9	0.062936	93.98232	0.025403	3.778350	0.632975	1.580948
10	0.062936	93.98228	0.025438	3.778355	0.632976	1.580949
Cholesky Ordering: SETI EPU_US EPU_CHINA EPU_EUROPE VIX						

Appendix: Continued

4. Variance decomposition of VNI

Period	S.E.	VNI	EPU_US	EPU_CHINA	EPU_EUROPE	VIX
1	0.090956	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.097447	99.70645	0.190995	0.057013	0.017603	0.027939
3	0.097904	99.02737	0.493514	0.075842	0.070909	0.332362
4	0.097930	98.98187	0.493819	0.077952	0.070976	0.375380
5	0.097942	98.95823	0.494990	0.089660	0.081099	0.376017
6	0.097944	98.95577	0.495018	0.091593	0.081259	0.376365
7	0.097945	98.95475	0.495036	0.092305	0.081511	0.376401
8	0.097945	98.95417	0.495039	0.092800	0.081588	0.376400
9	0.097945	98.95415	0.495052	0.092800	0.081588	0.376408
10	0.097945	98.95410	0.495055	0.092841	0.081597	0.376408
Cholesky Ordering: VNI EPU_US EPU_CHINA EPU_EUROPE VIX						