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The Response of Southeast Asian Stock Markets to Energy Market Dynamics

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This study investigates how stock markets in Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam respond to energy market dynamics from 2007 to 2023, utilizing mean group and pooled mean group estimators. The findings indicate that Southeast Asian stock markets react to fluctuations in energy markets both in the short and long term. Based on these results, it is recommended that policymakers closely monitor energy markets to better anticipate changes in Southeast Asian stock markets.

I. Introduction

The impact of commodity markets on stock markets is well-established in the empirical literature. Studies such as Ioannis et al. (2015) and Kang et al. (2020) conclude that stock markets respond not only to fundamental changes in domestic macroeconomics but are also influenced by global factors like oil prices, gold prices, and energy prices. However, the direction and significance of these effects may vary across studies. The authors note that this relationship is most pronounced in efficient markets, while most markets are not fully efficient in their responses to global commodity price changes.

Energy commodities encompass petroleum, natural gas, coal, and propane (IMF, 2015). Energy products—including petroleum, gasoline, diesel, paraffin, motor oil, and grease—drive economic activity in most modern economies worldwide (Felix et al., 2019).

The response of stock markets to changes in energy markets has attracted substantial research interest. When the stock market faces uncertainty, commodities are often considered a safer alternative to stocks (Ergun & Ibrahim, 2013). Investors closely monitor commodity market volatility to anticipate the direction of both commodity and stock prices (Mohammad, 2017). A diversified portfolio, which includes both stocks and energy commodities, provides greater risk-hedging efficiency for investors in both emerging and developed markets. This, in turn, encourages broader participation from those seeking to minimize risk by trading in both markets (Manal & Tamat, 2020). In summary, there is no consensus on the precise effects of energy

markets on stock markets. For instance, Yadav et al. (2023) argue that changes in energy prices have no effect on real stock markets, whereas Cong & Shen (2013) find that rising energy prices are linked to stock market declines—a view supported by Ahmed & Sarkodie (2021) and Wu et al. (2023).

In recent years, Southeast Asian stock markets have grown and attracted foreign investors. The integration of these markets with global commodity markets has also increased. The IMF (2015) reports that fluctuations in energy prices, including oil, from 2008 to 2014, had a significant impact on stock prices and output in oil-importing emerging markets, including those in Southeast Asia. Global commodity and energy price swings also contributed to increasing global inflation—from 4.7 percent in 2021 to 8.8 percent in 2022, before falling to 6.5 percent in 2023 and projected to drop to 4.1 percent in 2024 (IMF, 2024). The heavy reliance of Southeast Asian economies on energy is once again evident in the volatility of regional stock markets.

Empirical evidence confirms that Southeast Asian stock markets are influenced by global commodity prices, including oil (Ehsan et al., 2013; Fatemeh et al., 2016; Robiyanto, 2018; Sugeng et al., 2017). However, until now, there has been no research directly linking the global energy market to Southeast Asian stock markets. Therefore, this paper clarifies the response of six selected Southeast Asian stock markets to energy markets.

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Table 1. Descriptive statistics

Variable name	Number of observations	Mean value	Standard deviation	Coefficient of variation	Minimum value	Maximum value
<i>SI</i>	1,224	7.6123	0.8140	3.896388	5.5043	9.0784
<i>EPI</i>	1,224	5.0701	0.3421	2.965749	3.966	5.7443
<i>ER</i>	1,224	4.6947	3.7008	1.025025	0.1857	10.0545
<i>CPI</i>	1,224	4.7226	0.1657	19.19451	4.1972	5.1412
<i>IR</i>	1,224	1.9100	0.39639	5.296542	1.1217	3.0082

Note: This table reports selected descriptive statistics namely observations, mean value, standard deviation, coefficient of variation, minimum and maximum value of stock index (*SI*), energy price index (*EPI*), exchange rate (*ER*), consumer price index (*CPI*) and interest rate (*IR*).

II. Data and Methodology

The study utilizes panel data spanning from January 2007 to December 2023. Data for the energy price index (*EPI*), consumer price index (*CPI*), exchange rate (*ER*), and interest rate (*IR*) are sourced from the Worldwide Governance Indicators published by the World Bank. Stock index (*SI*) data for Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam are obtained from the respective official stock exchange websites.

Following the methodologies of Mahmood et al. (2017) and Megaravalli & Sampagnaro (2018), the research employs a dynamic heterogeneous panel regression using the Mean Group (MG) and Pooled Mean Group (PMG) estimators (Pesaran & Shin, 1999). This is incorporated within an error correction model under the ARDL approach:

$$\begin{aligned} \Delta SI_{it} = & \alpha_i + \Phi_i (SI_{i,t-1} - \theta_{1i} EPI_{i,t-1} - \theta_{2i} x_{i,t-1}) \\ & + \sum_{j=1}^{p-1} \lambda_{ij} \Delta SI_{i,t-j} + \sum_{j=0}^q \lambda'_{ij} \Delta EPI_{i,t-j} \\ & + \sum_{j=0}^q \lambda''_{ij} \Delta x_{i,t-j} + \varepsilon_{it} \end{aligned} \quad (1)$$

In this regression, i and t represent country and time, respectively. *SI* and *EPI* denote the stock index and energy price index, while x represents a set of control variables, including *ER*, *CPI* and *IR*. The short-run coefficients of the lagged dependent variable and other control variables are denoted by λ , λ' and λ'' respectively. The long-run coefficients in our model are θ_1 and θ_2 , Φ_i represents the speed of adjustment, ε_{it} is the error term, and Δ indicates the first-difference operator.

III. Empirical Results

The descriptive statistics indicate that the dependent variable, *SI* has a maximum value of 9.0784 and a minimum value of 5.5043, with a standard deviation of 0.8140 and a coefficient of variation of 3.8964. The *EPI* variable has an average value of 5.0701, ranging from a low of 3.966 to a high of 5.7443, with a standard deviation-to-mean ratio of 0.3421 and a coefficient of variation of 2.9657.

The results show that not all variables are stationary at the same level of integration. According to the IPS test, energy prices are not stationary at the root level. The exchange rate is stationary at the root level at the 1% significance level in the Breitung test but not in the other

unit root tests. The interest rate is only non-stationary at the root level in the Fisher-ADF and Fisher-Phillips Perron tests, while the remaining variables are all non-stationary at the root level.

The first difference unit root test results reveal that all variables become stationary at the 1% significance level. Westerlund's (2007) test was used to estimate cointegration between *SI* and *EPI*, as well as other macroeconomic variables. The p-values for all statistics are below 1%, leading to the rejection of the null hypothesis, H_0 , that there is no cointegration. Consequently, cointegration is found in all models for every country, indicating possible long-term and short-term correlations between Southeast Asian stock prices, energy prices, and other macroeconomic variables.

The Hausman test (Yerdelen, 2013) is used to select between the MG and PMG estimators. With a p-value greater than the significance level α , the hypothesis that the PMG estimator is more efficient than the MG estimator cannot be rejected. Therefore, the analysis proceeds using the PMG model results.

The PMG estimation results demonstrate that the *EPI* variable has a negative impact on *SI* in both the long and short term at the 5% significance level. This means that when the energy price index increases, the stock market price index decreases, and vice versa. The error correction coefficient between energy prices and stock market indices in the analyzed countries is significantly negative (approximately -0.47), indicating that about 47% of any disequilibrium between the two variables is corrected in the following period. This underscores the significant response of Southeast Asian stock markets to changes in energy markets, both in the short and long term. Since energy commodities—including crude oil, natural gas, and coal—are essential inputs in production, the economies of all countries, including those in Southeast Asia, are directly or indirectly affected by energy prices. This result aligns with the findings of Mohammad (2017), Manal & Tamat (2020), and Ahmed & Sarkodie (2021).

Additionally, other macroeconomic variables have varying effects on the stock markets of Southeast Asian countries. Exchange rates negatively impact Southeast Asian stock markets. The domestic consumer price index has a negative effect on these markets in the long term but a positive effect in the short term. Interest rates also exert an inverse effect on the stock markets of the selected Southeast Asian countries.

Table 2. Unit root stationarity test results

Level	Breitung	IPS	Fisher-ADF	Fisher-PP
SI	-0.6554	-4.2400	7.8374	-7.4647
	0.2561	0.1278	0.2612	0.3543
EPI	-2.1479	-3.3264	4.0405	7.0852
	0.1745	0.1249	0.5360	0.4593
ER	-1.4643*	-1.8345	2.3180	-1.5774
	0.0716	0.1023	0.1125	0.9426
CPI	1.3530	-1.1495	5.2181	3.0966
	0.9120	0.4377	0.9634	0.2298
IR	-0.3096	-0.9994	2.8884***	2.4829***
	0.3784	0.1588	0.0020	0.0065
1 st Difference	Breitung	IPS	Fisher-ADF	Fisher-PP
SI	-12.1833***	-23.6412***	79.8756***	85.6799***
	0.0000	0.0000	0.0000	0.0000
EPI	-8.1479***	-23.1485***	80.4750***	85.8391
	0.0000	0.0000	0.0000	0.0000
ER	-11.8269***	-22.9324***	76.0763***	81.0356***
	0.0000	0.0000	0.0000	0.0000
CPI	-9.2187***	-23.4327***	78.0236***	83.6819***
	0.0000	-0.0001	0.0000	0.0000
IR	-11.5309***	-10.3455***	28.0772***	59.6707***
	0.0000	0.0000	0.0000	0.0000

Note: This table represents unit root [stationarity test](#) results of variables at the root level and the 1st difference level. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels, respectively.

Table 3. Westerlund Panel Cointegration Test

Valuables		G_t	G_α	P_t	P_α
EPI	Coefficient	-9.111	-223.351	-21.937	-195.238
	p-value	0.0000	0.0000	0.0000	0.0000
ER	Coefficient	-9.130	-243.748	-19.282	-196.215
	p-value	0.0000	0.0000	0.0000	0.0000
CPI	Coefficient	-8.861	-213.239	-19.248	-183.449
	p-value	0.0000	0.0000	0.0000	0.0000
IR	Coefficient	-8.675	-229.051	-20.127	-198.834
	p-value	0.0000	0.0000	0.0000	0.0000

Note: This table reports panel cointegration results obtained using the Westerlund's test (2007) approach.

IV. Conclusion

The responsiveness of Southeast Asian stock prices to changes in energy prices, in both the short and long term, highlights the role of energy markets as a channel through which price fluctuations are transmitted to stock markets. Consequently, policymakers need to closely monitor energy prices to anticipate their potential effects on Southeast Asian stock markets whenever changes occur. These findings also have practical implications for domestic and foreign institutional investors or portfolio managers, as they can help in constructing well-structured portfolios.

Moreover, stock markets are influenced by domestic macroeconomic factors. To ensure the stability of their stock markets, Southeast Asian governments should focus on controlling inflation, adjusting interest rates, and managing exchange rates. Future research could further investigate specific industry groups within the stock markets of each Southeast Asian country.

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Table 4. Results of the Panel ARDL Model

	PMG		MG	
Dependent variable: <i>LSI</i>	Coefficients	Std. Error	Coefficients	Std. Error
Long-run cointegration vectors				
<i>LEPI</i>	-0.547**	0.023	-0.468**	0.029
<i>LER</i>	-0.380***	0.080	-0.604***	0.208
<i>LCPI</i>	1.248***	0.337	1.139***	0.386
<i>LIR</i>	-0.411**	0.377	-0.410**	0.350
Short-run dynamics				
Error Correction Coefficient	-0.472***	0.015	-0.185***	0.023
$\Delta LEPI$	-0.289**	0.028	0.244**	0.016
ΔLER	0.858***	0.335	0.660***	0.207
$\Delta LCPI$	-0.744**	0.326	-0.093	0.183
ΔLIR	-0.355**	0.307	-0.249*	0.765
C (constant)	-0.703***	0.228	-0.374**	0.509
Observations	1218		1218	
Num. of countries	6		6	
Hausman Test	4.74			
P-value	0.4489			

Note: This table represents results obtained using panel ARDL models, namely Pool Mean Group (PMG) and Mean group (MG) estimators. *, **, and *** denote statistical significance at 10%, 5%, and 1% levels, respectively.

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