

The Effect of Exchange Rate, Gold Price and Oil Price on Stock Markets

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Abstract

This study examines the effects of the real effective exchange rate (REER), real gold price, and real oil price on real stock markets in Malaysia, Thailand, Indonesia, Singapore, and South Korea from January 2005 to August 2025 using linear Autoregressive Distributed Lag (ARDL) and Nonlinear Autoregressive Distributed Lag (NARDL) models. The findings indicate that fluctuations in the REER and real oil price generally depress stock markets in Singapore, Thailand, Indonesia, and South Korea, while enhancing Malaysia's stock market performance. Changes in real gold prices increase stock market returns in Malaysia, Singapore, and Thailand but reduce them in Indonesia and South Korea. An appreciation of REER benefits Malaysia's stock market but adversely affects the other economies, whereas a depreciation of REER supports Malaysia and Singapore's stock markets while harming stock markets of the other economies. Rising and falling real gold prices generally elevate stock markets across all countries. This study offers valuable guidance for policymakers in the management of stock market risk, including through hedging strategies using futures and options.

Keywords: REER, Real Gold Price, Real Oil Price, Real Stock Market, Cumulative Dynamic Multipliers

JEL Classifications: F31, E44, G15, G10

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1. Introduction

As economic globalisation deepens and financial markets integrate, the interconnectivity among stock prices across countries has substantially increased, amplifying the transmission of risks and potentially affecting stock markets. In March 2020, the U.S. stock market experienced severe disruptions due to the coronavirus pandemic (2020-2023), triggering ripple effects across Malaysia, South Korea, Indonesia, Thailand and Singapore. Stock prices in these economies were influenced by exchange rate movements (Wong, 2022), while gold served as a hedge and safe-haven asset during periods of economic uncertainty (Sharma & Karmakar, 2023). Oil, as the most traded commodity, also significantly affected both emerging and industrial economies, with unexpected price shifts impacting stock markets (Maghyereh et al., 2019).

The coronavirus pandemic, declared by the World Health Organization on 11 March 2020, generated global economic uncertainty in the absence of a vaccine, leading to widespread investment sell-offs that impacted stock prices (Fu et al., 2021). Although the pandemic affected the entire world, countries experienced differing impacts and responded differently (Ramelli & Wagner, 2020), with the pandemic officially concluding on 5 May 2023 (World Health Organization, 2023). Similarly, the financial crisis from December 2007 to June 2009 represents the longest economic downturn in recent history (Weinberg, 2012; Rodini, 2022; Loo, 2023), with China and the U.S. playing pivotal roles in shaping global investment trends and stabilising stock markets worldwide (O'Neill, 2023).

Global stock markets are strongly influenced by exchange rates, oil prices and gold prices, which affect corporate profitability, trade competitiveness and investor sentiment. According to the Arbitrage Pricing Theory (APT), these macroeconomic factors directly impact expected stock returns (Reinganum, 1981). Rising oil prices can reduce profits and stock valuations, while lower prices support returns (Tri Wahyudi & Rahmawati, 2025). Gold often acts as a safe-haven asset, moving inversely to stock markets during economic uncertainty (Neelam et al., 2025; Wang et al., 2025). Exchange rate fluctuations affect import costs, export competitiveness and investment returns, with weaker currencies benefiting exporters and stronger currencies potentially triggering capital outflows (Naidoo et al., 2025; Rady et al., 2024; Sokhanvar et al., 2024; Wengerek et al., 2025). The motivation for examining the impact of exchange rates, gold prices and oil prices on the stock markets of Malaysia, Thailand, Indonesia, Singapore and South Korea stems from the economic interdependencies and unique vulnerabilities of these developing and newly industrialised Asian economies. These countries are highly exposed to fluctuations in global commodity prices and exchange rates due to their open economies and trade dependence.

This study contributes to the literature by examining the effects of the real effective exchange rate, real gold price, and real oil price on real stock markets over time. It addresses gaps in prior research by analysing both developing economies (Malaysia, Thailand, Indonesia) and newly industrialised economies (Singapore, South Korea) during crises such as the coronavirus pandemic (2020-2023) and the global financial crisis (2007-2009). Methodologically, this study employs linear Autoregressive Distributed Lag (ARDL) models to assess the individual long- and short-run impacts of exchange rates, gold prices, and oil prices, and Nonlinear ARDL (NARDL) models to capture their asymmetric effects.

2. Literature Review

Global stock markets are significantly influenced by fluctuations in exchange rates, oil prices and gold prices. According to the Arbitrage Pricing Theory (APT), these macroeconomic factors directly affect expected stock returns (Reinganum, 1981). Oil prices, as a key input in production, influence corporate costs and profitability: higher prices reduce profits and stock prices, while lower prices enhance returns (Tri Wahyudi & Rahmawati, 2025). Gold is traditionally considered a safe-haven asset, often moving inversely to stock markets during economic uncertainty, as investors seek protection from volatility (Neelam et al., 2025; Wang et al., 2024). Exchange rate fluctuations also affect stock valuations through import costs, export competitiveness and investment profitability. A weaker domestic currency benefits export-orientated firms and increases stock prices, whereas a stronger currency reduces competitiveness and may trigger capital outflows, negatively affecting markets (Naidoo et al., 2025; Rady et al., 2024; Sokhanvar et al., 2024; Wengerek et al., 2025).

The impact of these factors differs across countries. Wong (2017) showed that exchange rate depreciation negatively affects stock markets in seven countries, whereas Rahim & Hamid (2020), Cheah et al. (2017), Long et al. (2021) and El-Diftar (2023) found positive effects. Sahay et al. (2025) demonstrated that global crises, such as COVID-19 and the Russia–Ukraine war, intensify the influence of exchange rate fluctuations on BRICS stock markets. Similarly, Lohana et al. (2024) found that volatility in China's stock market affects most G20 countries, except Australia, suggesting diversification opportunities.

Oil and gold prices also substantially influence stock returns (Afşar et al., 2026; Singh et al., 2026). Rising oil prices increase production costs, compress profit margins and reduce stock prices in importing economies, while benefiting oil-exporting countries through higher revenues and improved trade balances (Aladwani, 2025; Agboola et al., 2024; Büyükkara et al., 2025). Oil-exporting economies are more sensitive to oil price changes than diversified economies. Gold prices generally have positive effects on stock markets (Khan et al., 2019; Singhal et al., 2019; Dang et al., 2020), although some studies report no significant impact (Al-Ameer et al., 2018). Studies also highlight asymmetric and long-run effects of commodity prices in markets such as the U.S., China and Hong Kong (Jiang & Liu, 2021).

In Southeast and East Asia, the impact of these variables varies by country. In Malaysia, crude oil price volatility and exchange rate movements significantly affect stock returns (Siow et al., 2023; Razi et al., 2025; Tan & Yeap, 2026). Thailand's stock market responds strongly to fluctuations in gold, oil and exchange rates (Harnphattananusorn, 2024). Singapore, as a global financial hub, is indirectly affected through international market linkages. South Korea exhibits sector-specific responses to oil, gold and exchange rate changes (Lee & Kim, 2025; Pala et al., 2025; Ro & Oh, 2025), while Indonesia is more sensitive to exchange rate fluctuations, with limited effects from oil and gold (Hadi & Robiyanto, 2025; Prananta & Alexiou, 2024). Overall, Malaysia and Thailand show high sensitivity to commodity prices, Indonesia is driven by exchange rates, South Korea exhibits sector-specific impacts and Singapore is indirectly influenced through global linkages.

Despite extensive research, few studies examine the simultaneous impact of oil, gold and exchange rate fluctuations across multiple Southeast and East Asian economies. Furthermore, asymmetric and nonlinear effects remain underexplored. Based on these gaps, this study hypothesises that oil price fluctuations, gold price volatility and exchange

rate movements significantly influence stock market returns, with the magnitude and direction of these effects varying across Malaysia, Thailand, Singapore, South Korea and Indonesia.

Past studies have employed different methodological approaches to examine these relationships, reflecting the complexity and varying contexts of global and regional markets. In this study, the ARDL and NARDL frameworks are applied to capture both long-run and short-run dynamics. In addition, few studies have applied the Cumulative Dynamic Multiplier (CDM) (Shin et al., 2014), which traces the cumulative effects of real oil price, real gold price, and the real effective exchange rate on real stock markets over time. This approach is particularly relevant during periods of heightened volatility, such as the COVID-19 pandemic and global financial shocks, as it provides a comprehensive assessment of long-term impacts in Southeast and East Asian stock markets.

3. Data and Methodology

This study examines the stock markets of five Asian economies—Malaysia, Singapore, Thailand, Indonesia and South Korea—representing diverse economic landscapes. Malaysia, Thailand and Indonesia are classified as developing countries, exhibiting rapid industrialisation and economic development, while Singapore and South Korea are newly industrialised economies, reflecting advanced industrialisation, technological progress and integration into the global economy.

Monthly data from January 2005 to August 2025 are employed. The endpoint of August 2025 provides a contemporary perspective, capturing recent economic conditions and major events, including the coronavirus pandemic (2020-2023), which significantly affected global financial markets.

Key variables include real gold prices, real oil prices and the real effective exchange rate, alongside control variables to enhance model robustness. The real effective exchange rate is measured using the US dollar against the Malaysian ringgit. Gold prices are measured by the spot price of gold in U.S. dollars, and oil prices by the West Texas Intermediate (WTI) crude oil first contract, also in U.S. dollars per barrel. Control variables include the money supply (M2, year-over-year) and industrial production (manufacturing sector, year-over-year). Global market influences are represented by the Shanghai Stock Exchange (China) and the Standard & Poor's 500 Index (U.S.). All variables, except the real effective exchange rate and dummy variables, were used in real terms by applying the formula: $\text{Real Price} = \text{Nominal Price} / \text{Consumer Price Index}$.

DUMMYC takes the value 1 during the COVID-19 pandemic (March 2020-May 2023) and 0 otherwise, while DUMMYF takes the value 1 during the global financial crisis (December 2007-June 2009) and 0 otherwise.

To ensure the robustness of the model, several diagnostic tests are conducted. The normality of residuals is assessed to verify the distribution of error terms. The Breusch-Godfrey Serial Correlation LM Test detects potential serial correlation, ensuring temporal accuracy and unbiased standard errors. Heteroskedasticity is evaluated using the Breusch-Pagan-Godfrey Test, identifying systematic variability in residuals that could affect estimation efficiency. Finally, coefficient stability is examined through the Cumulative Sum (CUSUM) and Cumulative Sum of Squares (CUSUMSQ) tests, detecting significant deviations in estimated parameters over the sample period and confirming model consistency and reliability.

3.1 Linear Autoregressive Distributed Lag (ARDL)

The lag selection method employs the Adjusted R-squared to provide a more accurate measure of model fit, accounting for the number of predictors included (Frost, 2017). Unlike the Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SIC), also referred to as the Bayesian Information Criterion (BIC), which balance model fit and complexity through penalisation rules, Adjusted R-squared directly adjusts for the number of predictors, effectively penalising excessive model complexity (Bhandari, 2024). This approach ensures that the goodness of fit is not artificially inflated by the inclusion of additional variables. To address potential non-stationarity in the data, a logarithmic transformation is applied, and stationarity is verified using the Augmented Dickey-Fuller (ADF) test, confirming that all series are stationary.

The ARDL (autoregressive distributed lag) method of cointegration, introduced by Pesaran et al. (2001), provides significant advantages over other econometric techniques by accommodating variables with different integration properties. Unlike traditional cointegration methods that require all variables to be either $I(0)$ or $I(1)$, the ARDL approach can handle variables that are integrated of order zero, one, or a mixture of both (Pesaran & Shin, 1998). This flexibility allows for a more comprehensive analysis of the long-run impact between variables, as it does not impose the restriction of having all variables in the same integration order. The Arbitrage Pricing Theory (APT) further provides a theoretical foundation, suggesting that macroeconomic shocks such as real oil price, real gold price and real effective exchange rate movements can influence stock market returns. The linear autoregressive distributed lag model specification for estimation is as follows:

$$\Delta \log SM_t = \beta_{10} \log REER_t + \beta_{11} \log GOLD_t + \beta_{12} \log OIL_t + \sum_{i=1}^q \beta_{13i} \Delta \log SM_{t-i} + \sum_{i=0}^q \beta_{14i} \Delta \log REER_{t-i} + \sum_{i=0}^q \beta_{15i} \Delta \log GOLD_{t-i} + \sum_{i=0}^q \beta_{16i} \Delta \log OIL_{t-i} + \sum_{i=0}^q \beta_{17i} \Delta \log CV_{t-i} + \beta_{18} D_t + \varepsilon_{t1} \quad (1)$$

where SM denotes the stock market, REER denotes the real effective exchange rate, GOLD denotes the real gold price and OIL denotes the real oil price. CV represents control variables, including the real money supply (M2), real industrial production, the Shanghai Stock Exchange and the Standard & Poor's 500 Index. D is dummy variables which account for the Coronavirus disease (2020-2023) and the global financial crisis (2007-2009). ε_{t1} represents the error term.

The ARDL framework is employed to estimate both long-run relationships and the short-run dynamics through the error correction term, following the methodologies of Pesaran & Shin (1998), Bahmani-Oskooee & Saha (2015), Sun et al. (2017), Tursoy (2019) and Wong (2022). The short-run coefficients are captured by the first-differenced variables, while the long-run effects are derived from the levels of the regressors. The error correction term ε_t measures the speed at which deviations from the long-run equilibrium are corrected. The long-run ARDL equation is expressed as:

$$\log SM_t = \beta_{20} \log REER_t + \beta_{21} \log GOLD_t + \beta_{22} \log OIL_t + \varepsilon_{t2} \quad (2)$$

The error correction term of the real stock market equation is expressed as follows:

$$\Delta \log SM_t = \sum_{i=1}^q \beta_{30i} \Delta \log SM_{t-i} + \sum_{i=0}^q \beta_{31i} \Delta \log REER_{t-i} + \sum_{i=0}^q \beta_{32i} \Delta \log GOLD_{t-i} + \sum_{i=0}^q \beta_{33i} \Delta \log OIL_{t-i} + \sum_{i=0}^q \beta_{34i} \Delta \log CV_{t-i} + \beta_{35} D_t + \beta_{36} ECT_{t-1} + \varepsilon_{t3} \quad (3)$$

where Δ denotes the first difference and is the ECT_{t-1} denotes error correction term lagged by one period.

3.2 Non-Linear Autoregressive Distributed Lag (NARDL)

Shin et al. (2014) introduced the nonlinear ARDL cointegration approach (NARDL) as an asymmetric extension of the ARDL model by Pesaran & Shin (1998). This method captures long-run and short-run asymmetries in the effects of real effective exchange rates, real gold prices and real oil prices on real stock markets.

The long-run NARDL equation and error correction term are adapted from Shin et al. (2014); Ibrahim (2015); Liang et al.(2020); Omoregie et al. (2020); and Wong (2022). The long-run NARDL equation is expressed as follows:

$$\log SM_t = \beta_{40} \log REER_{t-i}^+ + \beta_{41} \log REER_{t-i}^- + \beta_{42} \log GOLD_{t-i}^+ + \beta_{43} \log GOLD_{t-i}^- + \beta_{44} \log OIL_{t-i}^+ + \beta_{45} \log OIL_{t-i}^- + \mathcal{U}_{t1} \quad (4)$$

where $\mathcal{U}_t$ is the error term. The equation is split into 2 components + captures positive shocks and – captures negative shocks. $\Delta \log x_t^+ = \sum_{j=1}^t \max(\Delta \log x_j, 0) = \sum_{j=1}^t \Delta \log x_j^+$, $\Delta \log x_t^- = \sum_{j=1}^t \min(\Delta \log x_j, 0) = \sum_{j=1}^t \Delta \log x_j^-$. x denotes the real effective exchange rate or real gold price or real oil price. $\Delta \log x_t^+$ and $\Delta \log x_t^-$ denotes the cumulative sums of positive and negative changes in $\log x_t$. The coefficients of β can exhibit either positive or negative values. A noticeable asymmetry in the long-run impact becomes evident when examining the coefficients of β^+ and β^- are differ. The error correction term of the stock market equation is expressed as follows:

$$\begin{aligned} \Delta \log SM_t &= \sum_{i=0}^q \beta_{50i} \Delta \log SM_{t-i} + \sum_{i=1}^q \beta_{51i}^+ \Delta \log REER_{t-i} + \sum_{i=1}^q \beta_{52i}^- \Delta \log REER_{t-i} \\ &+ \sum_{i=1}^q \beta_{53i}^+ \Delta \log GOLD_{t-i} + \sum_{i=1}^q \beta_{54i}^- \Delta \log GOLD_{t-i} + \sum_{i=1}^q \beta_{55i}^+ \Delta \log OIL_{t-i} \\ &+ \sum_{i=1}^q \beta_{56i}^- \Delta \log OIL_{t-i} + \sum_{i=0}^q \beta_{57i} \Delta \log CV_{t-i} + \beta_{58} D_t + \beta_{59} ECT_{t-1} \\ &+ \mathcal{U}_{t2} \end{aligned} \quad (5)$$

where Singapore and Thailand are using an intercept constant. Malaysia, Singapore and Thailand preferred models without a constant, suggesting that their data aligned better with a regression line that did not assume a baseline intercept. This approach indicated that the relationships between variables were best represented without assuming a fixed starting point. Conversely, Singapore and Thailand found their results more suitable when including a constant, implying that their data exhibited a clearer pattern when accounting for a baseline value. An asymmetric effect is evident when $\sum \Delta \log X_{t-i}^+$ and $\sum \Delta \log X_{t-i}^-$ are not equal. This can be examined through the application of the Wald test. Coefficient stability was validated using CUSUM and CUSUMSQ tests. Heteroskedasticity was assessed with the Breusch–Pagan–Godfrey test, and normality of residuals was examined. Serial correlation was tested using the Breusch–Godfrey LM test. Heteroscedasticity was addressed using the OLS estimator with Huber-White standard errors.

3.3 Symmetry Test

The symmetry tests within the NARDL framework are employed to determine whether positive and negative changes in the independent variables exert symmetric or asymmetric effects on stock markets in both the long run and the short run. The equation for the long-run symmetry is as follows:

$$\begin{aligned} \Delta \log SM_t &= -\phi \left[\log SM_{t-1} - \sum_{r=1}^k \left(\frac{\lambda_r}{\phi(x_{r,t-1}^+)} + x_{r,t-1}^- \right) \right] + \sum_{j=1}^{p-1} \gamma_j \Delta \log SM_{t-j} \\ &+ \sum_{r=1}^k (\eta_r^+ \Delta \log x_{r,t}^+ + \eta_r^- \Delta \log x_{r,t}^-) \\ &+ \sum_{r=1}^k \sum_{j=1}^{p-1} (\delta_{r,j}^+ \Delta \log x_{r,t-j}^+ + \delta_{r,j}^- \Delta \log x_{r,t-j}^-) + \sum_{o=1}^m \alpha_o d_{o,t} \\ &+ \epsilon_{t4} \end{aligned} \quad (6)$$

The equation for the short run symmetry is as follows:

$$\begin{aligned} \Delta \log SM_t &= -\phi \left[\Delta \log SM_{t-1} - \sum_{r=1}^k \left(\frac{\lambda_r^+}{\phi} x_{r,t-1}^+ + \frac{\lambda_r^-}{\phi} x_{r,t-1}^- \right) \right] + \sum_{j=1}^{p-1} \gamma_j \Delta \log SM_{t-j} \\ &+ \sum_{r=1}^k \eta_r (\Delta \log x_{r,t}^+ + \Delta \log x_{r,t}^-) + \sum_{r=1}^k \sum_{j=1}^{p-1} \delta_{r,j} (\Delta \log x_{r,t-j}^+ + \Delta \log x_{r,t-j}^-) \\ &+ \sum_{o=1}^m \alpha_o D_{2o,t} + \epsilon_{t5} \end{aligned} \quad (7)$$

where x represents the independent variable, k is a positive integer that represents the upper limit or maximum value for the index variable r , D_2 represents the Coronavirus disease (2020-2023) and the global financial crisis, 2007-2009.

3.4 Cumulative Dynamic Multipliers (CDM)

For ARDL models, CDM is defined for the long-run distributed-lag variable. The CDM for the ARDL equation is expressed as follows:

$$CDM_{r,t}(h) = \sum_{o=0}^h \frac{\partial \log SM_{t+o}}{\partial \log x_{r,t}} \quad (8)$$

where $r = 1, \dots, k$. Note that as $h \rightarrow \infty$, $CDM_{r,t}(h) \rightarrow \frac{\lambda_r}{\phi}$. This implies that with an increasing number of lags, the cumulative impact approaches $\frac{\lambda_r}{\phi}$. This behaviour indicates the long-run impact of SM and the lagged values of x , capturing the persistent impact over time. The parameter represents the long-run multiplier impact of the lagged variable on SM. For NARDL models, CDM are calculated for each long-run distributed lag variable by using the partial derivatives for positive and negative partial sum regressors. The equation for CDM for NARDL is as follows:

$$CDM_{r,t}^+(h) = \sum_{o=0}^h \frac{\partial SM_{t+o}}{\partial Y_{r,t}^+} \quad (9)$$

$$CDM_{r,t}^-(h) = \sum_{o=0}^h \frac{\partial SM_{t+o}}{\partial Y_{r,t}^-} \quad (10)$$

where if the time lag h approaches infinity ($h \rightarrow \infty$), the CDM denoted as ‘stabilise’ towards specific values represented by $\frac{Y_r^+}{\phi}$, $\frac{Y_r^-}{\phi}$. The absolute difference between the two derivatives (Shin et al., 2014).

Real effective exchange rate is expected to negatively affect stock markets due to higher costs for firms reliant on imports (Hajilee & Nasser, 2014; Cheah et al., 2017; Dang et al., 2020; Shabbir et al., 2020; Long et al., 2021; Wong, 2022). Gold prices are anticipated to positively influence stock markets, acting as a hedge against inflation and economic instability (Singhal et al., 2019; Shabbir et al., 2020; Arisandhi & Robiyanto, 2022). Oil prices are expected to exert mixed effects, positively impacting stock markets in oil-exporting countries while negatively affecting those dependent on imports (Delgado et al., 2018; Nguyen et al., 2018; Shabbir et al., 2020; Joo & Park, 2021). Control variables, including money supply and industrial production, are projected to positively influence stock markets, reflecting overall economic growth (Bhattacharjee & Das, 2021; Liu et al., 2022; Athari et al., 2023). The Chinese and U.S. stock market indices are expected to show positive correlations, highlighting global market interconnectedness (Vo & Tran, 2020; Huang et al., 2023; Wang & Xiao, 2023). Dummy variables for the Coronavirus disease (2020-2023) and the global financial crisis (2007-2009) are anticipated to carry negative coefficients, capturing periods of heightened uncertainty and economic downturns (Bhowmik et al., 2022; Rehman & Karimullah, 2023).

4. Empirical Results

Table 1 shows that the variables are generally non-stationary at levels, with the exception of real industrial production, which is stationary in both Singapore and Thailand. Real oil prices are stationary across all the countries studied. However, all variables become stationary when analysed in first differences.

Table 1: Augmented Dickey–Fuller Test Unit Root Test Result

	Malaysia	Thailand	Indonesia	Singapore	Korea
logSM	0.2741	-1.4770	-1.1930	0.1190	-1.1930
ΔlogSM	-13.3311***	-12.8336***	-14.6615***	-13.7232***	-15.1531***
logREER	0.5568	0.9247	-0.5698	2.0458	-0.5698
ΔlogREER	-14.6455***	-10.9379***	-10.1629***	-4.0675***	-10.1629***
logGOLD	1.1676	1.1676	1.1676	1.1676	1.1676
ΔlogGOLD	-15.9153***	-15.9153***	-15.9153***	-15.9153***	-15.9153***
logOIL	-2.0374**	-2.0374**	-2.0374*	-2.0374*	-2.0374**
ΔlogOIL	-12.2521***	-12.2521***	-12.2521***	-12.2521***	-12.2521***
logM2	5.8295	-1.4967	5.5463	3.7920	-2.2382
ΔlogM2	-8.0433***	-13.3707***	-5.8961***	-6.1685***	-14.0180***
logIPI	-1.2409	0.8395	-0.7051	-1.7218*	-2.9975***
ΔlogIPI	-13.1999***	-3.8322***	-13.5210***	-3.4383***	-3.6633***
logCSM	0.0058	0.0058	0.0058	0.0058	0.0058
ΔlogCSM	-13.3131***	-13.3131***	-13.3131***	-13.3131***	-13.3131***
logUSSM	1.3555	1.3555	1.3555	1.3555	1.3555
ΔlogUSSM	-14.6614***	-14.6615***	-14.6615***	-14.6615***	-14.6615***

Notes: Values in parentheses denoted the *t*-statistics. Significance levels: *** (1%), ** (5%), * (10%). M2 denoted money supply, IP denoted industrial production, USSM denoted the Standard and Poor's 500 Index, CSM denoted the Shanghai stock exchange, DUMMYC denoted the Coronavirus disease (2020-2023) and DUMMYF denoted the global financial crisis (2007-2009).

Source: Authors' own estimates using EViews 13, based on data obtained from Bloomberg.

The ARDL results in Table 2 reveal a statistically significant positive long-run impact of the real effective exchange rate on real stock markets in Malaysia and Singapore. Specifically, in Malaysia, a 1% fluctuation in the real effective exchange rate is associated with a 1.0747-unit increase in the real stock market, as noted by El-Diftar (2023). This finding contradicts the hypothesis of a negative impact. The real effective exchange rate also influences the long-run real stock markets of Thailand, Indonesia, and Korea, in line with expectations and supported by Wong (2017) and Danila et al. (2023).

Real gold prices positively affect the long-run real stock markets of Malaysia and Singapore, with Malaysia experiencing a 0.3181-unit increase per 1% rise, as supported by Arisandhi & Robiyanto (2022). Conversely, the real stock markets of Singapore and Thailand are negatively affected by real gold price changes in the long run, consistent with Shabbir et al. (2020) and the study's hypothesis.

There is evidence of cointegration across all countries. The CUSUM and CUSUMSQ tests confirm the stability of coefficients over time, while diagnostic tests indicate that the estimated models meet the necessary conditions.

Table 2: Autoregressive Distributed Lag (ARDL) Long Run Estimates

Variables	Malaysia	Thailand	Indonesia	Singapore	Korea
Long run					
logREER _t	1.0747 (0.0000)***	-0.8714 (0.0000)***	-0.9283 (0.0000)***	0.6952 (0.0000)***	-0.8967 (0.0000)***
logGOLD _t	0.3181 (0.0000)***	1.0988 (0.0000)***	0.0084 (0.9624)	-0.02749 (0.7988)	-0.0418 (0.8341)
logOIL _t	-0.2516 (0.0000)***	-0.4425 (0.0664)*	-0.1813 (0.3392)	0.1322 (0.2638)	-0.1479 (0.4564)
Diagnostic test					
F-statistic	23.9255**	3.5730*	4.4964**	4.9380**	4.2714**
LM	21.6413***	0.6652	0.7796	4.3158	0.9927
HETERO	0.6914	3.2418***	3.1854***	1.7446**	2.4382***
RESET	2.3675	0.0853	3.4151*	1.6254	4.0900*
CUSUM	Stable	Stable	Stable	Stable	Stable
CUSUMSQ	Stable	Stable	Stable	Stable	Stable

Notes: Values in brackets indicate p-values and values in parentheses represent F-statistics. Significance levels: * (10%), ** (5%), *** (1%). F-statistic obtained from Pesaran et al. (2001) bounds testing for cointegration. LM denotes LM Breusch-Godfrey Serial Correlation Test, HETERO denotes the heteroscedasticity test and RESET denotes the Ramsey RESET Test. CUSUM and CUSUMSQ denotes cumulative sum and cumulative sum of squares tests.

Source: Authors' own estimates using EViews 13, based on data obtained from Bloomberg.

Table 3 presents the ARDL short-run results, highlighting the immediate effects of the real effective exchange rate, real gold prices, and real oil prices on stock markets in Malaysia, Indonesia, South Korea, Thailand, and Singapore. In the short run, a 1% increase in the real effective exchange rate positively affects the real stock markets of Thailand (0.7021 units), Indonesia (0.3324 units), and Korea (0.2985 units), as noted by Javangwe & Takawira (2022). This partially contradicts the hypothesis of a negative impact.

A 1% rise in real gold prices boosts the real stock markets of Malaysia (0.2217 units) and Thailand, as supported by Singhal et al. (2019). Real oil price fluctuations show varied short-run effects across the five economies. In Malaysia, Thailand, Indonesia, Singapore, and Korea, rising real oil prices tend to increase real stock market

returns, consistent with Dong et al. (2024). These markets either benefit directly from stronger energy-sector performance or interpret higher oil prices as signals of robust global demand with positive spillover effects.

In the short run, the Malaysian real stock market declines in response to changes in real money supply, as supported by Sheikh et al. (2020), aligning with the hypothesis. Conversely, the real stock markets of Singapore and Thailand benefit from real money supply changes, supported by Sheikh et al. (2020) and Bhattacharjee & Das (2021). The real industrial production index positively influences the Malaysian real stock market in the short run, consistent with Athari et al. (2023).

The Malaysian and Singaporean real stock markets are adversely affected by the Chinese stock market in the short run, while the U.S. stock market negatively impacts Malaysia but positively influences Singapore, Thailand, Indonesia, and Korea, in line with Vo & Tran (2020). Malaysia's real stock market benefits during financial crises, as noted by Silva et al. (2023). In contrast, the COVID-19 pandemic (2020-2023) negatively impacts the real stock markets of Malaysia and Singapore, supported by Bhowmik et al. (2022), consistent with expectations during periods of uncertainty. In general, error correction coefficients are consistently negative, significant, and less than one across all countries.

Table 3: Autoregressive Distributed Lag (ARDL) Short Run Estimates

Variables	Malaysia	Thailand	Indonesia	Singapore	Korea
$\Delta \log SM_{t-1}$	-0.0715 (0.1652)	0.0954 (0.0910)***	-0.0912 (0.0711)***	0.0627 (0.1523)	-0.0668 (0.2011)
$\Delta \log SM_{t-2}$	-	-0.1012 (0.0976)***	-	-	-
$\Delta \log REER_t$	0.1687 (0.3098)	0.7021 (0.0031)*	0.3324 (0.0401)**	0.1128 (0.7285)	0.2985 (0.0587)***
$\Delta \log REER_{t-1}$	-0.3549 (0.0327)**	-0.1875 (0.3924)	-0.2410 (0.1012)***	0.2718 (0.3665)	-0.3047 (0.0689)***
$\Delta \log REER_{t-2}$	-0.1164 (0.5021)	0.1765 (0.4087)	-	0.4981 (0.0915)	0.0786 (0.6092)
$\Delta \log REER_{t-3}$	0.2217 (0.0000)*	0.1186 (0.0485)***	0.0531 (0.3407)	-0.0354 (0.4742)	0.0782 (0.1794)
$\Delta \log REER_{t-4}$	-	-0.1159 (0.0280)**	-	-0.1185 (0.0041)*	-0.0238 (0.5542)
$\Delta \log REER_{t-5}$	0.0502 (0.0009)*	0.0911 (0.0016)*	0.0681 (0.0072)*	0.0873 (0.0000)*	0.0614 (0.0189)**
$\Delta \log REER_{t-6}$	-	0.0594 (0.0395)**	-	0.0288 (0.1047)	-
$\Delta \log GOLD_t$	-	0.0651 (0.0090)*	-	0.0429 (0.0231)**	-
$\Delta \log GOLD_{t-1}$	-0.0810 (0.0000)*	0.7017 (0.0012)*	0.2798 (0.2241)	0.9485 (0.0000)*	0.2613 (0.2742)
$\Delta \log GOLD_{t-2}$	0.3291 (0.0000)*	-0.0147 (0.6735)	0.0142 (0.7391)	0.0049 (0.7839)	-0.0062 (0.8842)
$\Delta \log GOLD_{t-3}$	0.0091 (0.3550)	0.0493 (0.2218)	0.0951 (0.0071)*	0.1298 (0.0002)*	0.0965 (0.0090)*
$\Delta \log GOLD_{t-4}$	-0.0704 (0.0000)*	0.4335 (0.0000)*	0.5516 (0.0000)*	0.4652 (0.0000)*	0.5831 (0.0000)*
$\Delta \log GOLD_{t-5}$	-0.0163 (0.0000)*	-0.0031 (0.2845)	-0.0037 (0.1987)	-0.0041 (0.0521)***	-0.0033 (0.1940)
$\Delta \log GOLD_{t-6}$	-0.0081 (0.0264)**	-0.0033 (0.4721)	-0.0059 (0.1512)	-0.0045 (0.1498)	-0.0071 (0.1983)

Variables	Malaysia	Thailand	Indonesia	Singapore	Korea
$\Delta \log GOLD_{t-7}$	-0.2694 (0.0000)*	-0.0407 (0.0002)*	-0.0441 (0.0000)*	-0.0705 (0.0000)*	-0.0418 (0.0000)*
$\Delta \log OIL_t$	0.0215 (0.3520)	0.0879 (0.0021)*	0.0712 (0.0083)*	0.0824 (0.0001)*	0.0627 (0.0148)**
$\Delta \log OIL_{t-1}$	—	-0.0195 (0.3980)	—	-0.0112 (0.6195)	—
$\Delta \log OIL_{t-2}$	—	0.0593 (0.0385)**	—	0.0281 (0.1152)	—
$\Delta \log OIL_{t-3}$	—	0.0192 (0.4785)	—	0.0224 (0.2077)	—
$\Delta \log OIL_{t-4}$	—	0.0648 (0.0095)*	—	0.0472 (0.0181)**	—
$\Delta \log OIL_{t-5}$	—	—	—	-0.0179 (0.2725)	—
$\Delta \log M2_t$	-0.0798 (0.0000)*	0.6821 (0.0012)*	0.2974 (0.2050)	0.9425 (0.0000)*	0.2628 (0.2571)
$\Delta \log IPI_t$	0.3281 (0.0000)*	-0.0159 (0.6610)	0.0142 (0.7351)	0.0063 (0.7622)	-0.0061 (0.8725)
$\Delta \log CSM_t$	0.0085 (0.3471)	0.0557 (0.1988)	0.0924 (0.0078)*	0.1297 (0.0002)*	0.1023 (0.0065)*
$\Delta \log USSM_t$	-0.0712 (0.0000)*	0.4391 (0.0000)*	0.5486 (0.0000)*	0.4668 (0.0000)*	0.5810 (0.0000)*
DUMMYC	-0.0165 (0.0000)*	-0.0035 (0.2831)	-0.0041 (0.1872)	-0.0047 (0.0479)***	-0.0040 (0.1763)
DUMMYF	-0.0084 (0.0248)**	-0.0028 (0.4910)	-0.0061 (0.1429)	-0.0045 (0.1631)	-0.0072 (0.1974)
ECT_{t-1}	-0.2695 (0.0000)*	-0.0410 (0.0003)*	-0.0441 (0.0000)*	-0.0662 (0.0000)*	-0.0385 (0.0000)*

Notes: ECT_{t-1} denotes error correction term lagged by one period..

Source: Authors' own estimates using EViews 13, based on data obtained from Bloomberg.

Table 4 reports the NARDL long-run results. A higher real effective exchange rate negatively impacts the stock markets of Indonesia and Korea, consistent with expectations that currency depreciation raises costs for import-dependent firms, supported by Cheah et al. (2017) and Long et al. (2021).

An increase in real gold prices positively influences the Thailand real stock market, consistent with gold's role as a hedge against inflation and instability (Shabbir et al., 2020). Positive and negative real gold price fluctuations have mixed effects on Malaysia and Singapore, with positive effects for Malaysia and adverse effects for Singapore. In contrast, real gold prices adversely affect Indonesia's and Korea's real stock markets, supporting the view that real gold prices benefit oil exporters like Malaysia but harm oil importers such as Indonesia (Joo & Park, 2021).

There is evidence of cointegration across all countries. CUSUM and CUSUMSQ tests confirm the stability of coefficients, while diagnostic tests indicate that the models meet standard econometric requirements.

Table 4: Nonlinear Autoregressive Distributed Lag (NARDL) Long Run Estimates

Variables	Malaysia	Thailand	Indonesia	Singapore	Korea
Panel A: Long run					
logREER ⁺	1.7920 (0.2630)	-1.5290 (0.2145)	-13.2105 (0.0575)*	-2.8650 (0.1428)	-13.0950 (0.0550)*
logREER ⁻	2.0985 (0.2270)	-2.3325 (0.1330)	-4.2750 (0.3490)	1.9420 (0.5220)	-4.2250 (0.3580)
logGOLD ⁺	0.7400 (0.4460)	0.8720 (0.0011)***	2.1620 (0.3590)	0.5980 (0.1365)	2.1890 (0.3510)
logGOLD ⁻	0.6415 (0.5975)	-0.0510 (0.8870)	-0.8020 (0.6690)	-0.2890 (0.2465)	-0.8920 (0.6640)
logOIL ⁺	0.9280 (0.0610)*	-0.2945 (0.1565)	-2.9050 (0.0145)**	0.2215 (0.0700)*	-2.7980 (0.0150)**
logOIL ⁻	1.0410 (0.0890)*	0.1980 (0.2450)	-2.1350 (0.0845)*	0.3470 (0.0065)***	-2.1180 (0.0875)*
Diagnostic test					
F-statistics	2.2350	3.8655**	3.2980**	3.8290**	3.2955***
LM	0.1525	0.5120	0.7380	4.7015***	0.7855
HETERO	1.1880	1.6575**	1.9625***	1.5485**	2.0250***
RESET	0.5565	6.8125***	4.5890**	5.3950**	4.4865**
CUSUM	Stable	Stable	Stable	Stable	Stable
CUSUMSQ	Stable	Stable	Stable	Stable	Stable

Notes: + and - denotes positive and negative.

Source: Authors' own estimates using EViews 13, based on data obtained from Bloomberg.

Table 5 presents the short-run NARDL estimates, highlighting significant asymmetries. For Malaysia, a positive real effective exchange rate does not significantly reduce the real stock market, while a negative real effective exchange rate positively influences it. This finding, supported by Hajilee & Nasser (2014) and Wong (2022), is consistent with expectations.

Real gold price oscillations show mixed effects. In Malaysia, both positive and negative short-run changes matter (Khan et al., 2019; Shabbir et al., 2020; Musa et al., 2022). For Singapore, a positive real effective exchange rate benefits the real stock market, whereas a negative real effective exchange rate is detrimental, in line with Wong (2022) and El-Diftar (2023). Real gold price changes do not significantly affect Singapore's real stock market in the short run, consistent with Al-Ameer et al. (2018). However, falling real oil prices positively influence Singapore's real stock market, as shown by Nguyen et al. (2020).

Thailand's real stock market responds positively to a positive real effective exchange rate and a negative real gold price (Dang et al., 2020; Salisu et al., 2020). Falling real oil prices also boost the short-run real stock markets of Thailand, Indonesia, and Korea (Nguyen et al., 2020). Real effective exchange rate and real gold price lags reveal further asymmetries across Indonesia, Korea, Thailand, and Singapore, while real oil price lags significantly shape the real stock markets of Malaysia, Thailand, and Singapore.

Real money supply positively influences the short-run real stock markets of Malaysia, Singapore, and Thailand, consistent with Liu et al. (2022). The real industrial production index has a positive short-run effect on Malaysia (Athari et al., 2023).

The Chinese stock market exerts a positive short-run effect on Malaysia, Singapore, Indonesia, and Korea, while the U.S. stock market benefits Singapore,

Indonesia, Thailand, and Korea, consistent with Huang et al. (2023) and Wang & Xiao (2023). Interestingly, the COVID-19 pandemic positively influences the stock markets of Malaysia, Indonesia, Thailand, and Korea, contrary to expectations, while Malaysia's stock market is negatively affected during financial crises, as supported by Dharani et al. (2023) and Rehman & Karimullah (2023).

Overall, error correction terms across all countries are negative, significant, and less than one, confirming proper adjustment towards long-run equilibrium.

Table 5: Nonlinear Autoregressive Distributed Lag (NARDL) Short Run Estimates

Variables	Malaysia	Thailand	Indonesia	Singapore	Korea
$\Delta \log SM_{t-1}$	—	0.0952 (0.0850)***	-0.1217 (0.0190)**	0.0721 (0.1135)	-0.1189 (0.0210)**
$\Delta \log SM_{t-2}$	—	-0.0679 (0.2210)	—	—	—
$\Delta \log REER_t^+$	-0.0625 (0.8320)	1.3441 (0.0012)*	-0.0026 (0.9910)	1.1578 (0.0140)**	-0.0025 (0.9930)
$\Delta \log REER_t^-$	0.7230 (0.0020)*	0.0389 (0.9220)	0.4071 (0.1175)	-1.7063 (0.0117)**	0.4140 (0.1145)
$\Delta \log REER_{t-1}^+$	0.0387 (0.8950)	-0.6578 (0.1245)	-0.6839 (0.0135)**	—	-0.6850 (0.0138)**
$\Delta \log REER_{t-1}^-$	-0.4555 (0.0500)	-0.2101 (0.5760)	0.0017 (0.9945)	—	-0.0158 (0.9550)
$\Delta \log REER_{t-2}^+$	—	0.5993 (0.1502)	0.4950 (0.0685)***	—	0.5020 (0.0652)***
$\Delta \log REER_{t-2}^-$	—	0.2680 (0.4745)	-0.0825 (0.7370)	—	-0.0791 (0.7445)
$\Delta \log REER_{t-3}^+$	—	0.1446 (0.7220)	0.4265 (0.1172)	—	0.4185 (0.1246)
$\Delta \log REER_{t-3}^-$	—	0.2428 (0.5185)	-0.0146 (0.9510)	—	-0.0261 (0.9140)
$\Delta \log REER_{t-4}^+$	—	0.4220 (0.2985)	-0.0695 (0.7980)	—	-0.0564 (0.8325)
$\Delta \log REER_{t-4}^-$	—	0.3882 (0.3130)	-0.1825 (0.4520)	—	-0.1762 (0.4765)
$\Delta \log REER_{t-5}^+$	—	—	-0.5379 (0.0375)**	—	-0.5465 (0.0340)**
$\Delta \log REER_{t-5}^-$	—	—	0.6945 (0.0025)*	—	0.6915 (0.0026)*
$\Delta \log GOLD_t^+$	0.2182 (0.0001)*	0.0009 (0.9925)	0.0021 (0.9785)	-0.0133 (0.8505)	0.0023 (0.9795)
$\Delta \log GOLD_t^-$	0.1602 (0.0099)*	0.1978 (0.0360)**	0.0931 (0.3100)	0.0635 (0.4235)	0.0895 (0.3275)
$\Delta \log GOLD_{t-1}^+$	—	-0.1712 (0.0500)**	-0.1035 (0.1700)	-0.1730 (0.0110)**	-0.1060 (0.1600)
$\Delta \log GOLD_{t-1}^-$	—	0.1995 (0.0372)**	0.2200 (0.1705)	0.1155 (0.1380)	0.2230 (0.0115)**
$\Delta \log GOLD_{t-2}^+$	—	-0.1430 (0.0940)***	—	0.0275 (0.6772)	—
$\Delta \log GOLD_{t-2}^-$	—	0.0572 (0.5530)	—	0.0370 (0.6310)	—
$\Delta \log GOLD_{t-3}^+$	—	—	—	-0.1815 (0.0075)*	—

Variables	Malaysia	Thailand	Indonesia	Singapore	Korea
$\Delta \log GOLD_{t-3}^-$	—	—	—	0.0833 (0.2820)	—
$\Delta \log OIL_t^+$	0.0092 (0.7680)	0.0280 (0.5630)	0.0050 (0.9015)	0.0300 (0.4425)	0.0027 (0.9440)
$\Delta \log OIL_t^-$	0.0515 (0.0370)**	0.2035 (0.0000)*	0.1062 (0.0029)*	0.1422 (0.0000)*	0.1068 (0.0030)*
$\Delta \log OIL_{t-1}^+$	0.0537 (0.0537)***	0.0909 (0.0680)***	—	-0.0091 (0.8190)	—
$\Delta \log OIL_{t-1}^-$	-0.0067 (0.7930)	-0.0920 (0.0227)**	—	-0.0565 (0.0795)***	—
$\Delta \log OIL_{t-2}^+$	0.0755 (0.0073)*	0.0698 (0.1580)	—	-0.0270 (0.4332)	—
$\Delta \log OIL_{t-2}^-$	-0.0042 (0.8655)	0.0240 (0.5860)	—	0.0330 (0.3130)	—
$\Delta \log OIL_{t-3}^+$	—	0.0892 (0.0755)***	—	0.0582 (0.0930)***	—
$\Delta \log OIL_{t-3}^-$	—	0.0458 (0.2665)	—	0.0033 (0.9240)	—
$\Delta \log OIL_{t-4}^+$	—	0.0410 (0.3345)	—	—	—
$\Delta \log OIL_{t-4}^-$	—	0.0460 (0.2530)	—	—	—
$\Delta \log OIL_{t-5}^+$	—	-0.1230 (0.0039)*	—	—	—
$\Delta \log OIL_{t-5}^-$	—	0.1115 (0.0065)*	—	—	—
$\Delta \log M2_t$	0.1310 (0.0000)*	0.9365 (0.0000)*	0.2805 (0.2380)	0.9040 (0.0000)*	0.2995 (0.2010)
$\Delta \log IPI_t$	0.3460 (0.0000)*	-0.0250 (0.4070)	0.0196 (0.6150)	0.0125 (0.5340)	0.0092 (0.7970)
$\Delta \log CSM_t$	0.0242 (0.0008)*	0.0550 (0.1790)	0.0965 (0.0085)*	0.1275 (0.0001)*	0.0993 (0.0065)*
$\Delta \log USSM_t$	0.0142 (0.2120)	0.3375 (0.0000)*	0.5679 (0.0000)*	0.4680 (0.0000)*	0.5630 (0.0000)*
DUMMYC	0.0047 (0.0890)***	0.0100 (0.0055)*	0.0073 (0.0145)**	-0.0038 (0.1570)	0.0071 (0.0165)**
DUMMYF	-0.0110 (0.0005)*	-0.0036 (0.4960)	-0.0005 (0.9235)	-0.0039 (0.3005)	-0.0007 (0.8935)
ECT_{t-1}	-0.5015 (0.0000)*	-0.0980 (0.0000)*	-0.0125 (0.0000)*	-0.1050 (0.0000)*	-0.0124 (0.0000)*
C	—	-0.0679 (0.0000)*	—	0.1285 (0.0000)*	—

Notes: C denotes constant term.

Source: Authors' own estimates using EViews 13, based on data obtained from Bloomberg.

Table 6 reports the results of symmetry tests. Long-run asymmetry in real effective exchange rates and real gold prices is evident for Malaysia's and Thailand's real stock markets, while Malaysia's real stock market also shows long-run asymmetry in response to real oil prices. Short-run asymmetry is detected in real effective exchange rates for Singapore, Thailand, Indonesia, and Korea, and in real gold prices for Indonesia and Korea. Real oil prices generate short-run asymmetry for Singapore's real stock

market. Real effective exchange rate asymmetries affect both the long and short run in the real stock markets of Malaysia, Singapore, Indonesia, and Korea. Malaysia's and Thailand's real stock markets also display long- and short-run asymmetries in response to real gold prices, while real oil prices generate asymmetries in the real stock markets of Malaysia, Singapore, and Thailand.

Table 6: Symmetric Test Estimates

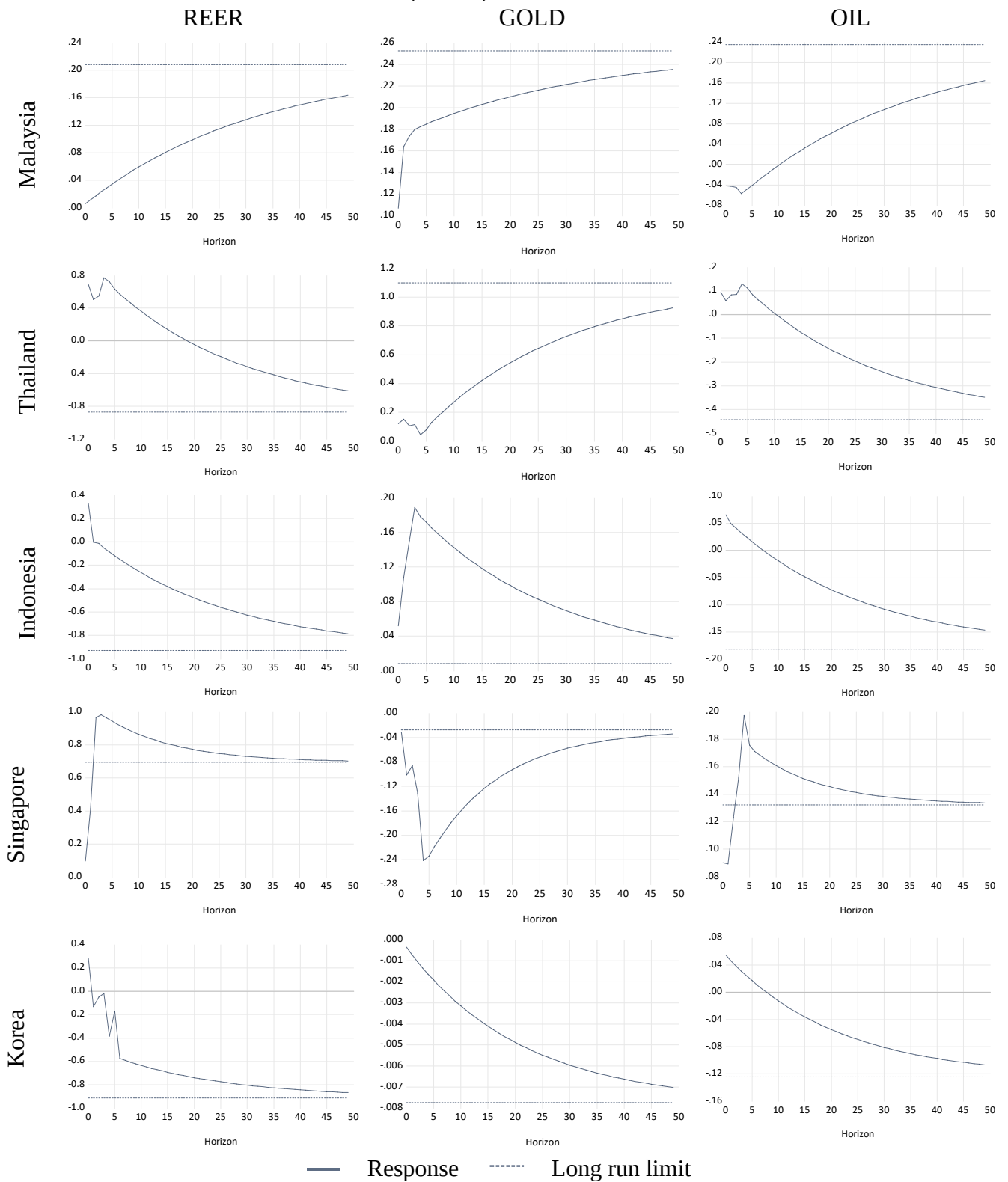
Variables	Malaysia	Thailand	Indonesia	Singapore	Korea
L _{logREER}	18.1025*	3.7524***	0.9623	2.1340	0.9515
L _{logGOLD}	34.4821*	10.1894*	0.8925	1.6021	0.8678
L _{logOIL}	35.7023*	0.3410	0.8012	1.1845	0.8367
S _{logREER}	0.2584	5.4780**	3.9921**	6.1123**	4.0215**
S _{logGOLD}	0.3492	0.5118	3.2844***	0.3378	3.3015***
S _{logOIL}	1.3995	0.4823	0.8124	12.0841*	0.7925
J _{logREER}	9.1410*	0.7158	2.4885***	3.8012**	2.4779***
J _{logGOLD}	17.5122*	6.5915*	1.8640	1.0962	1.8094
J _{logOIL}	18.0514*	5.4679*	0.8215	7.1432*	0.8288

Notes: L denotes the long run Symmetric effect and S indicates the short run asymmetric effect. J denotes the combined effects.

Source: Authors' own estimates using EViews 13, based on data obtained from Bloomberg.

Figure 1 (ARDL CDM results) illustrates country-specific cumulative impacts. Malaysia's real stock market consistently benefits from real effective exchange rate appreciation, while Thailand, Indonesia, and Korea experience increasingly negative effects. Singapore initially responds positively before stabilising at a weaker level. Real gold price increases benefit Malaysia's and Thailand's real stock markets over the long run, while Indonesia's, Singapore's, and Korea's real stock markets show predominantly negative responses. Real oil price increases generate long-run benefits for Malaysia's and Singapore's real stock markets but have adverse effects on Thailand's, Indonesia's, and Korea's real stock markets.

Figure 1: Cumulative Dynamic Multiplier (CDM) for Autoregressive Distributed Lag (ARDL) Estimates

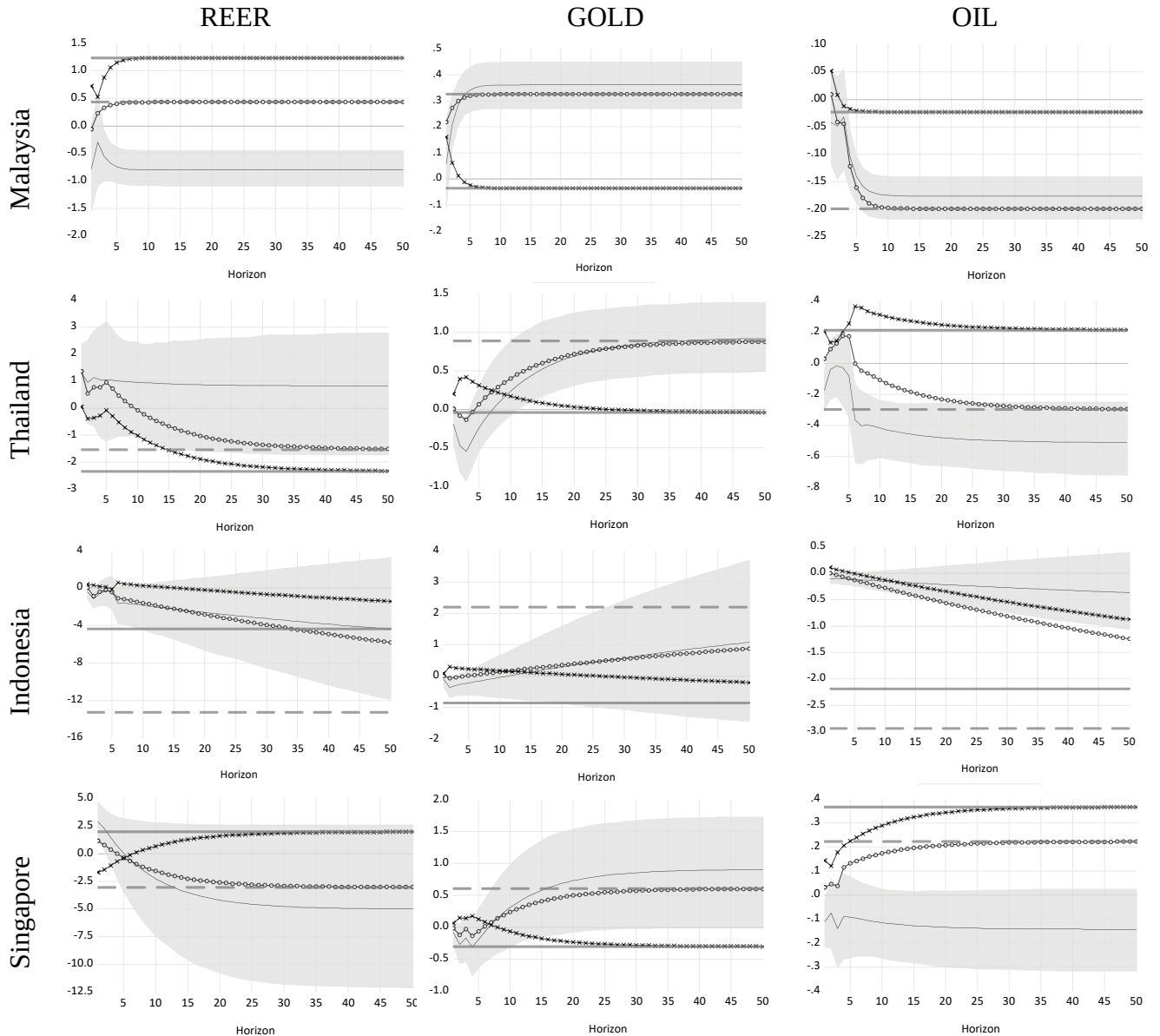


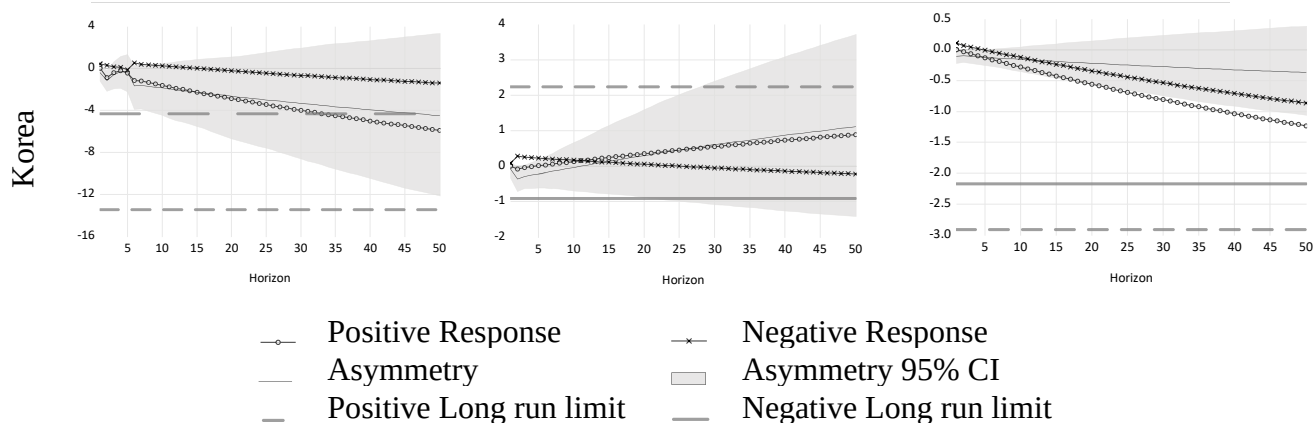
Source: Authors' own estimates using EViews 13, based on data obtained from Bloomberg.

Figure 2 (NARDL CDM results) shows asymmetric responses. Malaysia's real stock market responds more strongly to real effective exchange rate appreciations than

depreciations. Thailand's real stock market reacts positively to appreciations but negatively to depreciations. Indonesia's and Korea's real stock markets show declining responses to both shocks, while Singapore's real stock market exhibits stronger positive responses to depreciations. For real gold prices, Malaysia, Indonesia, and Korea show sustained positive effects, while Thailand's and Singapore's stock markets display stronger reactions to increases. Real oil prices positively affect Malaysia's and Singapore's stock markets but exert long-run negative impacts on Indonesia's, Korea's, and Thailand's stock markets.

Figure 2: Cumulative Dynamic Multiplier (CDM) for Nonlinear Autoregressive Distributed Lag (NARDL) Estimates





Source: Authors' own estimates using EViews 13, based on data obtained from Bloomberg.
 Authors' own estimates using EViews 13, based on data obtained from Bloomberg.

5. Conclusion

This study estimated the effects and asymmetric influences of the real effective exchange rate, real gold prices, and real oil prices on the real stock markets from January 2005 to August 2025, utilising ARDL, NARDL, and cumulative dynamic multipliers. Several key findings emerged from the study. Consistent with the Arbitrage Pricing Theory (APT), macroeconomic variables played a significant role in determining real stock market movements, and it was essential to examine their impact on selected East Asian stock markets, as increases or decreases in these variables could have different effects on stock market performance. Previous studies in the literature generally found a significant impact of macroeconomic variables on stock markets. The global financial crisis (2007-2009) and the Coronavirus disease (2020-2023) were also found to have a significant impact on stock prices in some economies. The cumulative dynamic multipliers revealed that the adjustment patterns of real effective exchange rates, real gold prices, and real oil prices towards new long-run equilibria exhibited significant differences. By understanding these distinct impacts and adjustment patterns, investors could utilise futures and options as hedging strategies to mitigate potential risks associated with fluctuations in macroeconomic variables. Futures and options provide tools for managing stock market risks, allowing investors to protect their portfolios against adverse movements in real effective exchange rates, commodity prices, and market conditions, thereby enhancing risk management and financial stability.

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References

- Afşar, M., Polat, O., Afşar, A., & Kahraman, G. Ö. (2025). Dynamic interlinkages between oil price shocks and stock markets: A quantile-on-quantile connectedness analysis in emerging economies. *Applied Economics*, 58(11), 2188–2204.
- Agboola, E., Chowdhury, R., & Yang, B. (2024). Oil price fluctuations and their impact on oil-exporting emerging economies. *Economic Modelling*, 132.
- Ahmadian-Yazdi, F., Sokhanvar, A., Roudari, S., & Tiwari, A. K. (2025). Dynamics of the relationship between stock markets and exchange rates during quantitative easing and tightening. *Financial Innovation*, 11(1).
- Aladwani, J. (2025). Asymmetric reactions of the crude oil and natural gas markets on Vietnamese stock markets. *Journal of Economics and Development*, 27(1), 87–109.
- Arisandhi, V. D., & Robiyanto, R. (2022). Exchange rate, gold price and stock price correlation in ASEAN-5: Evidence from the COVID-19 era. *Jurnal Manajemen dan Kewirausahaan [Journal of Management and Entrepreneurship]*, 24(1), 22–32.
- Athari, S. A., Kirikkaleli, D., & Adebayo, T. S. (2023). World pandemic uncertainty and German stock market: Evidence from Markov regime-switching and Fourier based approaches. *Qual Quant*, 57(2), 1923–1936.
- Bahmani-Oskooee, M., & Saha, S. (2015). On the relation between stock prices and exchange rates: A review article. *Journal of Economic Studies*, 42(4), 707–732.
- Bhandari, A. (2020, July 20). *Key difference between R-squared and adjusted R-squared for regression analysis*. Retrieved from Analytics Vidhya <https://www.analyticsvidhya.com/blog/2020/07/difference-between-r-squared-and-adjusted-r-squared/>
- Bhattacharjee, A., & Das, J. (2021a). Investigating the effect of broad money supply on stock market index and market capitalization: Evidence from liberalized India. *Jindal Journal of Business Research*, 10(2), 185–198.
- Bhattacharjee, A., & Das, J. (2021b). Investigating the long-run and the short-run relationship between domestic macroeconomic forces and Indian equity market: Evidence based on ARDL bounds testing approach. *Paradigm*, 25(1), 61–76.
- Bhowmik, R., Debnath, G. C., Debnath, N. C., & Wang, S. (2022). Emerging stock market reactions to shocks during various crisis periods. *PLoS ONE*, 17(9).
- Büyükkara, Z. G., Özgüler, İ. C., & Hepsen, A. (2025). Relationship between housing, oil, gold and stock markets: Evidence from UK and Norway. *International Journal of Housing Markets and Analysis*, 18(2), 518–545.
- Cheah, S.P., Yiew, T.H., & Ng, C.F. (2017). A nonlinear ARDL analysis on the relation between stock price and exchange rate in Malaysia. *Economics Bulletin*, 37(1), 336–346.
- Dang, V.C., Le, T.L., Nguyen, Q.K., & Tran, D.Q. (2020). Linkage between exchange rate and stock prices: Evidence from Vietnam. *The Journal of Asian Finance, Economics and Business*, 7(12), 95–107.
- Danila, N., Bunyamin, D., Djalaluddin, A., & Fathony, Y. (2023). Do foreign fund flows influence the stock market index? Evidence from Indonesia. *SAGE Open*, 13(4).
- Delgado, N. A. B., Delgado, E. B. D., & Saucedo, E. (2018). The relationship between oil prices, the stock market and the exchange rate: Evidence from Mexico. *North American Journal of Economics and Finance*, 45, 266–275.

- Dharani, M., Hassan, M. K., Huda, M., & Abedin, M. Z. (2023). Covid-19 pandemic and stock returns in India. *Journal of Economics and Finance*, 47(1), 251–266.
- Dong, Q., Du, Q., & Min Du, A. (2024). Interplay between oil prices, country risks and stock returns in the context of global conflict: A PVAR approach. *Research in International Business and Finance*, 72.
- El-Diftar, D. (2023). The impact of exchange rates on stock market performance of the Emerging 7. *Journal of Capital Markets Studies*, 7(2), 125–139.
- Erdoğan, L., Ceylan, R., & Abdul-Rahman, M. (2022). The impact of domestic and global risk factors on Turkish stock market: Evidence from the NARDL approach. *Emerging Markets Finance and Trade*, 58(7), 1961–1974.
- Frost, J. (2019). *How to interpret adjusted R-squared and predicted R-squared in regression analysis*. Statistics by Jim. <https://statisticsbyjim.com/regression/interpret-adjusted-r-squared-predicted-r-squared/>
- Fu, S., Liu, C., & Wei, X. (2021). Contagion in global stock markets during the COVID-19 crisis. *Global Challenges*, 5(10).
- Habibullah, M. S., & Baharumshah, A. Z. (1996). Money, output and stock prices in Malaysia: An application of the cointegration tests. *International Economic Journal*, 10(2), 121–130.
- Hadi, N. K. A., & Robiyanto, R. (2025). Volatility of gold and oil prices on the Indonesian stock market in geopolitical crisis. *Among Makarti*, 18(1).
- Hajilee, M., & Al Nasser, O. M. (2014). Exchange rate volatility and stock market development in emerging economies. *Journal of Post Keynesian Economics*, 37(1), 163–180.
- Harnphattanusorn, S. (2024). Spillover effects between oil, gold, stock and exchange rate returns in Thailand: An extended joint connected TVP-VAR approach. *International Journal of Energy Economics and Policy*, 14(5), 62–72.
- Hashmi, S. M., & Chang, B. H. (2023). Asymmetric effect of macroeconomic variables on the emerging stock indices: A quantile ARDL approach. *International Journal of Finance and Economics*, 28(1), 1006–1024.
- Hashmi, S. M., Chang, B. H., Huang, L., & Uche, E. (2022). Revisiting the relationship between oil prices, exchange rate and stock prices: An application of quantile ARDL model. *Resources Policy*, 75 .
- Huang, Q., Li, M., & Wang, B. (2023). The dynamic causality between Chinese and ASEAN stock markets. *Heliyon*, 9(12).
- Ibrahim, M. H. (2015). Oil and food prices in Malaysia: A nonlinear ARDL analysis. *Agricultural and Food Economics*, 3(1).
- Jiang, W., & Liu, Y. (2021). The asymmetric effect of crude oil prices on stock prices in major international financial markets. *North American Journal of Economics and Finance*, 56.
- Javangwe, K. Z., & Takawira, O. (2022). Exchange rate movement and stock market performance: An application of the ARDL model. *Cogent Economics & Finance*, 10(1), 2075520.
- Joo, Y. C., & Park, S. Y. (2021). The impact of oil price volatility on stock markets: Evidences from oil-importing countries. *Energy Economics*, 101.
- Khan, M. A., Husnain, M. I. U., Abbas, Q., & Shah, S. Z. A. (2019). Asymmetric effects of oil price shocks on Asian economies: A nonlinear analysis. *Empirical Economics*, 57(4), 1319–1350.
- Khan, M. K., Teng, J. Z., & Khan, M. I. (2019). Cointegration between macroeconomic factors and the exchange rate USD/CNY. *Financial Innovation*, 5(1).

- Lee, G. H., & Kim, Y. M. (2025). Oil price uncertainty shock and Korean sectoral stock market: The role of common factor and asymmetry. *Research in International Business and Finance*, 78.
- Liang, C. C., Troy, C., & Rouyer, E. (2020). U.S. uncertainty and Asian stock prices: Evidence from the asymmetric NARDL model. *North American Journal of Economics and Finance*, 51.
- Liu, L., Bashir, T., Abdalla, A. A., Salman, A., Ramos-Meza, C. S., Jain, V., & Shabbir, M. S. (2024). Can money supply endogeneity influence bank stock returns? A case study of South Asian economies. *Environment, Development and Sustainability*, 26(2), 2775–2787.
- Lohana, S., Yadav, M. P., & Rekha, A. G. (2024). Volatility spillover from the Chinese stock market to the G20 stock markets in the wake of the pandemic COVID-19. *Review of Pacific Basin Financial Markets and Policies*, 27(2).
- Long, S., Zhang, M., Li, K., & Wu, S. (2021). Do the RMB exchange rate and global commodity prices have asymmetric or symmetric effects on China's stock prices?. *Financial Innovation*, 7(1).
- Loo, A. (2023). *2008–2009 global financial crisis*. Corporate Finance Institute. <https://corporatefinanceinstitute.com/resources/economics/2008-2009-global-financial-crisis/>
- Luchtenberg, K. F., & Vu, Q. V. (2015). The 2008 financial crisis: Stock market contagion and its determinants. *Research in International Business and Finance*, 33, 178–193.
- Maghyreh, A. I., Awartani, B., & Sweidan, O. D. (2019). Oil price uncertainty and real output growth: New evidence from selected oil-importing countries in the Middle East. *Empirical Economics*, 56(5),1601-1621.
- Mensi, W., Ziadat, S. A., Rababa'a, A. R. Al, Vo, X. V., & Kang, S. H. (2024). Oil, gold and international stock markets: Extreme spillovers, connectedness and its determinants. *Quarterly Review of Economics and Finance*, 95, 1–17.
- Musa, D., Awolaja, O., Jerry, K., Okedina, I., Uduakobong, E. E., & Olayinka, I. (2022). Is the influence of oil prices changes on oil and gas stock prices in Nigeria symmetric or asymmetric?. *Cogent Economics and Finance*, 10(1).
- Naidoo, D., Moores-Pitt, P. B. D., & Akande, J. O. (2025). The exchange rates volatilities impact on the stock and real estate markets in South Africa. *International Journal of Housing Markets and Analysis*, 18(3), 598–620.
- Neelam, H., Rajeswari, B., Ramyasri, A., & Kumar, K. K. (2025). An empirical study with panel data: The impact of forex rates, brent crude oil and gold prices on the Indian stock indices. In B. Alareeni (Ed.), *Big data in finance: Transforming the financial landscape* (pp. 607–614). Cham:Springer.
- Nguyen, H., Nguyen, H., & Pham, A. (2020). Oil price declines could hurt U.S. financial markets: The role of oil price level. *The Energy Journal*, 41(5), 1–22.
- O'Neill, A. (2023). *Countries with the largest gross domestic product (GDP) in 2022* [Chart]. Retrieved from Statista <https://www.statista.com/statistics/268173/countries-with-the-largest-gross-domestic-product-gdp/>
- Omoriege, O. K., Olofin, S. A., & Ikpesu, F. (2020). Foreign exchange and the capital market dynamics: New evidence from non-linear autoregressive distributed lag model. *International Journal of Management, Economics and Social Sciences*, 9(1), 1-23.

- Pala, F., Görgün, M. R., Torusdağ, M., Demirtaş, F., & Barut, A. (2025). The impact of uncertainty in global gold and oil prices on stock market index returns: The case of the MIST countries. *Kafkas Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi* [Kafkas University Journal of the Faculty of Economics and Administrative Sciences], 16(31), 550–577.
- Pata, U. K., Usman, O., Olasehinde-Williams, G., & Ozkan, O. (2023). Stock returns, crude oil and gold prices in Turkey: Evidence from rolling window-based nonparametric quantile causality test. *Asia-Pacific Financial Markets*, 31(3), 779–797.
- Pesaran, M. H., & Shin, Y. (1998). An autoregressive distributed lag modelling approach to cointegration analysis. In S. Strøm (Ed.), *Econometrics and economic theory in the 20th century: The Ragnar Frisch centennial symposium* (pp.371–413). Cambridge University Press.
- Prananta, B., & Alexiou, C. (2024). Exchange rates, bond yields and the stock market: Nonlinear evidence of Indonesia during the COVID-19 period. *Asian Journal of Economics and Banking*, 8(1), 83–99.
- Rady, A., Essam, F., Yahia, H., & Shalaby, M. (2024). The dynamic relationship between exchange rate volatility and stock prices in the Egyptian real estate market and the moderating effect of interest rates. *European Journal of Business and Management Research*, 9(5), 31–44.
- Rahim, F., & Hamid, Z. (2020). The effects of crude oil price volatility, stock price, exchange rate and interest rate on Malaysia’s economic growth. In N. Tsounis & A. Vlachvei (Eds.), *Advances in cross-section data methods in applied economic research: ICOAE 2019* (pp. 717–731). Switzerland: Springer.
- Ramelli, S., & Wagner, A. F. (2020). Feverish stock price reactions to COVID-19. *The Review of Corporate Finance Studies*, 9(3), 622–655.
- Razi, U., Cheong, C. W. H., Afshan, S., & Sharif, A. (2025). The ripple effects of energy price volatility on equity and debt markets: A Morlet wavelet analysis. *Eurasian Economic Review*, 15(1), 197–223.
- Rehman, M. Z., & Karimullah. (2023). Black swan events and stock market behaviour in Gulf countries: A comparative analysis of financial crisis (2008) and COVID-19 pandemic. *Arab Gulf Journal of Scientific Research*, 42(3), 805–824.
- Reinganum, M. R. (1981). The arbitrage pricing theory: Some empirical results. *Journal of Finance*, 36(2), 313–321.
- Ro, E., & Oh, H. (2025). Foreign exchange market stress and stock market herding: Evidence from South Korea. *Global Economic Review*, 54(3), 270–284.
- Rodini, L. (2022). *What was the great recession? How did it affect the world?* The Street. <https://www.thestreet.com/dictionary/g/great-recession>
- Sahay, N., Gupta, N., & Rai, K. (2025). Volatility spillovers between exchange rates and stock markets in the BRICS economies: New evidence from COVID-19 and Russian-Ukrainian war. *International Journal of System Assurance Engineering and Management*.
- Sahu, T. N., & Pandey, K. D. (2020). Money supply and equity price movements during the liberalized period in India. *Global Business Review*, 21(1), 108–123.
- Salisu, A. A., Ebuh, G. U., & Usman, N. (2020). Revisiting oil–stock nexus during COVID-19 pandemic: Some preliminary results. *International Review of Economics and Finance*, 69, 280–294.
- Shabbir, A., Kousar, S., & Batool, S. A. (2020). Impact of gold and oil prices on the stock market in Pakistan. *Journal of Economics, Finance and Administrative Science*, 25(50), 279–294.

- Sharma, U., & Karmakar, M. (2023). Are gold, USD and Bitcoin hedge or safe haven against stock? The implication for risk management. *Review of Financial Economics*, 41(1), 43–64.
- Sheikh, U. A., Asad, M., Israr, A., Tabash, M. I., & Ahmed, Z. (2020). Symmetrical cointegrating relationship between money supply, interest rates, consumer price index, terroristic disruptions and Karachi stock exchange: Does global financial crisis matter?. *Cogent Economics & Finance*, 8(1).
- Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework. In R. Sickles & W. Horrace (Eds.), *Festschrift in honor of Peter Schmidt* (pp. 281–314). Springer, New York, NY: Springer.
- Silva, T. C., Wilhelm, P. V. B., & Tabak, B. M. (2023). The effect of interconnectivity on stock returns during the global financial crisis. *The North American Journal of Economics and Finance*, 67.
- Singh, S., Singh, M., & Attri, S. (2026). Dynamic volatility linkages among crude oil, exchange rate, interest rate, gold and equity markets: An empirical Asian perspective. *Managerial Finance*, 52(1), 160–182. *volume(issue if used), pages.*
- Singhal, S., Choudhary, S., & Biswal, P. C. (2019). Return and volatility linkages among international crude oil price, gold price, exchange rate and stock markets: Evidence from Mexico. *Resources Policy*, 60, 255–261.
- Siow, I. W., Leow, H., & Abdul Majed, M. K. (2023). Macroeconomic determinants on Malaysian stock market performance. *E3S Web of Conferences*, 389.
- Sokhanvar, A., Çiftçioglu, S., & Hammoudeh, S. (2024). Comparative analysis of the exchange rates–stock returns nexus in commodity-exporters and -importers before and during the war in Ukraine. *Research in International Business and Finance*, 67.
- Tan, S.-R., & Yeap, X. W. (2026). Asymmetric relationships between crude oil price, palm oil price, and exchange rate: The case of Malaysia. In H. H. Lean & J. H. Chan (Eds.), *Energy economics, finance, and management in developing and emerging economies* (pp. 211–224). Amsterdam, Netherlands: Elsevier.
- Wahyudi, S. T., & Rahmawati, A. (2025). Examining the link between world oil price volatility and sectoral stock performance in Indonesia. *Cogent Economics & Finance*, 13(1).
- Tursoy, T. (2019). The interaction between stock prices and interest rates in Turkey: Empirical evidence from ARDL bounds test cointegration. *Financial Innovation*, 5(1).
- Verma, R. K., & Bansal, R. (2021). Impact of macroeconomic variables on the performance of stock exchange: A systematic review. *International Journal of Emerging Markets*, 16(7), 1291–1329.
- Vo, X. V., & Tran, T. T. A. (2020). Modelling volatility spillovers from the US equity market to ASEAN stock markets. *Pacific-Basin Finance Journal*, 59.
- Wang, B., & Xiao, Y. (2023). Risk spillovers from China’s and the US stock markets during high-volatility periods: Evidence from East Asian stock markets. *International Review of Financial Analysis*, 86.
- Wang, Z., Xing, T., & Wang, X. (2025). Economic uncertainty and stock market asymmetric volatility: Analysis based on the asymmetric GARCH-MIDAS model. *International Journal of Emerging Markets*, 20(8), 3488–3511.
- Weinberg, J. (2012). *The great recession and its aftermath*. Retrieved from Federal Reserve History <https://www.federalreservehistory.org/essays/great-recession-and-its-aftermath>

- Wengerek, S. T., Uhde, A., & Hippert, B. (2025). Share price reactions to tariff imposition announcements during the first Trump administration. *Finance Research Letters*, 80.
- Wong, H. T. (2017). Real exchange rate returns and real stock price returns. *International Review of Economics and Finance*, 49, 340–352.
- Wong, H. T. (2022). The impact of real exchange rates on real stock prices. *Journal of Economics, Finance and Administrative Science*, 27(54), 262–276.
- World Health Organization. (2020, March 11). *WHO Director-General's opening remarks at the media briefing on COVID-19*. Retrieved from World Health Organization <https://www.who.int/news-room/speeches/item/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>
- World Health Organization. (2023, May 5). *WHO Director-General's opening remarks at the media briefing*. Retrieved from World Health Organization <https://www.who.int/news-room/speeches/item/who-director-general-s-opening-remarks-at-the-media-briefing---5-may-2023>
- Zuo, J. (2025). Impact of monetary policy on the stock market volatility: A GARCH-MIDAS approach in Malaysian economy. *Cogent Economics & Finance*, 13(1).