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THE ASYMMETRIC IMPACT OF REAL EFFECTIVE EXCHANGE RATE, REAL OIL PRICE AND REAL GOLD PRICE ON REAL STOCK PRICES IN SELECTED EAST ASIAN ECONOMIES

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ABSTRACT

This study examines the impact of the real effective exchange rate, the real oil price and the real gold price on the real stock prices in selected economies, namely Hong Kong, Taiwan and Japan, using a nonlinear autoregressive distributed lag (NARDL) model. This study uses quarterly data from 2003 quarter 1 to 2023 quarter 4. The NARDL results indicate that the positive and negative shocks to the real effective exchange rate, the real oil price and the real gold price have different effects on the real stock prices in the long-run and short-run. Additionally, other factors such as real money supply, real gross domestic product and the Shanghai Stock Exchange significantly influence stock prices in the short-run. Moreover, this study found that major events, including the global financial crisis of 2007-2009 and the coronavirus disease of 2020-2023, can impact stock prices in the short-run. The analysis employing the cumulative dynamic multiplier reveals distinctive trends in the responses of the real effective exchange rate, real oil price and real gold price on real stock prices, providing valuable insights for risk management strategies, particularly in hedging against market fluctuations. This study contributes to a deeper understanding of macroeconomic influences on stock prices and offers practical implications for investors and policymakers navigating the complexities of financial markets in evolving economic landscapes.

KEYWORDS: REAL EFFECTIVE EXCHANGE RATE, REAL OIL PRICE, REAL GOLD PRICE, NON-LINEAR AUTOREGRESSIVE DISTRIBUTED LAG, CUMULATIVE DYNAMIC MULTIPLIER

ABSTRAK

Kajian ini mengkaji kesan kadar pertukaran berkesan sebenar, harga minyak sebenar, dan harga emas sebenar ke atas harga saham sebenar dalam ekonomi terpilih iaitu Hong Kong, Taiwan dan Jepun menggunakan model lag teragih autoregresif bukan linear (NARDL). Kajian ini menggunakan data suku tahunan dari 2003 suku 1 hingga 2023 suku 4. Keputusan NARDL menunjukkan bahawa kejutan positif dan negatif terhadap kadar pertukaran berkesan sebenar, harga minyak sebenar dan harga emas sebenar mempunyai kesan yang berbeza terhadap harga saham sebenar dalam jangka panjang dan jangka pendek. Selain itu, faktor lain seperti bekalan wang sebenar, keluaran dalam negara kasar benar dan Bursa Saham Shanghai mempengaruhi harga saham dengan ketara dalam jangka pendek. Selain itu, kajian ini mendapati bahawa peristiwa besar termasuk krisis kewangan global 2007-2009 dan penyakit koronavirus, 2020-2023 boleh memberi

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kesan kepada harga saham dalam jangka pendek. Analisis yang menggunakan ‘cumulative dynamic multiplier’ mendedahkan arah aliran tersendiri dalam tindak balas kadar pertukaran berkesan sebenar, harga minyak sebenar dan harga emas sebenar pada harga saham sebenar, memberikan pandangan berharga untuk strategi pengurusan risiko, terutamanya dalam melindung nilai terhadap turun naik pasaran. Kajian ini menyumbang kepada pemahaman yang lebih mendalam tentang pengaruh makroekonomi ke atas harga saham dan menawarkan implikasi praktikal untuk pelabur dan penggubal dasar yang mengemudi kerumitan pasaran kewangan dalam landskap ekonomi yang berkembang.

KATA KUNCI: KADAR PERTUKARAN BERKESAN SEBENAR, HARGA MINYAK SEBENAR, HARGA EMAS SEBENAR, KETINGGALAN TERAGIH AUTOREGRESIF BUKAN LINEAR, ‘CUMULATIVE DYNAMIC MULTIPLIER

1. INTRODUCTION

In globalisation and financial market integration, the impacts of the real effective exchange rate, oil price and gold price and factors such as the Shanghai stock price, real money supply and real gross domestic product have become increasingly significant on real stock prices. Exchange rate fluctuations affect a country's stock price (Wong, 2022). The impact of currency depreciation on share prices is multifaceted. Companies involved in international trade may experience enhanced competitiveness, translating into higher profits and share values. Conversely, domestic firms relying on imported inputs may encounter heightened costs and diminished profit margins, leading to lower share prices. Changes in macroeconomic factors like exchange rates, oil prices and gold prices can impact firms that invest in stock. In response, retail investors may consider using financial instruments like futures and options to manage the risks associated with currency fluctuations and commodity price changes.

Consequently, the overall trajectory of the stock prices or market index may exhibit positive or negative fluctuations, mirroring the varied effects on different businesses (Adeniyi & Kumeka, 2020). Fluctuations in oil prices may profoundly impact consumer confidence (Li *et al*., 2021). Gold has long been acknowledged as a safe haven asset, particularly in inflationary environments, where individuals seek to safeguard their wealth against rising inflation rates. Investors often turn to gold as a means of preserving the value of their money amidst inflationary pressures. Additionally, oil and gold prices are considered significant commodities that can influence investment decisions in the stock price (Zeinedini *et al*., 2022).

The United States and China rank among the top 10 largest economies globally (Smart, 2024). Decisions made by the US Federal Reserve and the People's Bank of China regarding interest rates and monetary policy can influence global financial markets. Changes in interest rates can affect borrowing costs, currency values and investor sentiment. The performance of the Shanghai stock price can reflect broader market sentiment and investor confidence in the Chinese economy. Positive trends in Shanghai stocks may boost investor optimism across Asia, potentially benefiting stock prices in Hong Kong, Taiwan and Japan due to regional economic ties and trade relationships.

In particular, stock prices in Hong Kong and Taiwan have close financial ties with mainland China. Changes in Shanghai stock prices can influence cross-border investment flows and trading activity in related sectors. Changes in the real money supply (adjusted for inflation) can impact interest rates and liquidity conditions in financial markets. Increasing the money supply might lower interest rates, making borrowing cheaper and stimulating economic activity and stock price investment. An expansionary monetary policy (increasing money supply) could affect inflation expectations. Inflationary pressures can influence stock price performance as investors assess the future purchasing power of stocks. Strong gross domestic product can indicate a robust economy, leading to higher corporate earnings and potentially boosting stock price performance. For Hong Kong, Taiwan and Japan, which are highly export-oriented economies, global and regional Gross

Domestic Product trends can significantly impact export demand and corporate profitability, thus affecting stock prices.

The tumultuous events of the global financial crisis of 2007-2009 and the coronavirus disease of 2020-2023 have underscored the vulnerability of stock prices to external shocks. Reverberations of these crises have precipitated substantial volatility within domestic markets and accentuated the interconnectedness of global financial systems. The coronavirus pandemic has caused unprecedented disruption to global economic activities, akin to the impact witnessed during the 1918 influenza outbreak (Razzaq *et al*., 2020). The shockwaves of the coronavirus outbreak have reverberated through financial and economic systems, potentially leading to significant instability (Narayan *et al*., 2020). The global financial crisis impacted stock prices worldwide (Kang & Yoon, 2019).

This study examines the selected East Asian economies, namely Hong Kong, Taiwan and Japan, employing the nonlinear autoregressive distributed lag (NARDL) model. This study contributes by estimating the impact of macroeconomic variables, including the effects of the coronavirus disease of 2020-2023 and the global financial crisis of 2007-2009 on real stock prices. Additionally, this study examines the influence of the real effective exchange rate, real oil price and real stock prices over time through a cumulative dynamic multiplier (CDM).

2. LITERATURE REVIEW

Exchange rate, oil price, gold price, gross domestic product, money supply and the Shanghai stock exchange have a significant impact on stock prices (Chang *et al*., 2024; He *et al*., 2020; Javangwe & Takawira, 2022; Kassouri & Altıntaş, 2020; Kelikume & Muritala, 2019; Kushwah & Siddiqui, 2023; Narayan *et al*., 2020; Parvin, 2022; Sinlapates & Chancharat, 2024; Sreenu, 2023; Tweneboah *et al*., 2020; Verma & Bansal, 2021; Zhong & Liu, 2021). Parvin (2022) utilised a Nonlinear Autoregressive Distributed Lag (NARDL) model to demonstrate the significant impact of exchange rates on stock prices. Chang *et al*. (2024) employed a cross-quantilogram analysis from January 30, 2020, to December 30, 2022, revealing a significant influence of exchange rate fluctuations on stock prices. Javangwe and Takawira (2022) applied the autoregressive distributed lag (ARDL) model and emphasised the significant impact of exchange rates on stock prices, suggesting implications for policy interventions. Narayan *et al*. (2020) utilised various GARCH models alongside vector autoregression (VAR), addressing endogeneity concerns and consistently identifying a significant influence of exchange rate fluctuations on stock prices. Sreenu (2023) employed autoregressive distributed lag (ARDL), GARCH and error correction model (ECM) analyses to confirm the significant impact of exchange rates on stock prices.

Kelikume and Muritala (2019) observed that the increase in crude oil prices positively affects national income and government expenditure, fostering conducive economic and investment environments. Tweneboah *et al*. (2020) employed quantile regressions to demonstrate the impact of gold prices on stock prices. He *et al*. (2020) utilised VAR to demonstrate the substantial effects of oil and gold prices on stock prices. Kushwah and Siddiqui (2023) conducted cointegration tests, highlighting the impact of oil prices on stock prices. Sinlapates and Chancharat (2024) employed quantile regression models to study the effects of oil and gold prices on Southeast Asian stock prices.

Verma and Bansal (2021) examined the impact of macroeconomic variables—Gross Domestic Product (GDP), Foreign Direct Investment (FDI), Foreign Institutional Investment (FII), among others—on stock prices, revealing sector-specific effects and the differing impacts of gold and oil prices on economies based on import and export dynamics. Gross domestic product, money supply and China's stock price significantly impact stock prices. Kassouri and Altıntaş (2020); Verma and Bansal (2021); Zhong and Liu (2021) found a significant positive impact of money supply on stock prices. Zhong and Liu (2021) highlighted that the China stock market had a positive impact on Southeast Asian stock markets during the financial crisis.

The impact of the coronavirus pandemic and significant economic events has led to increased volatility and fluctuations in stock prices as investors assess and respond to changing economic conditions and market dynamics. The coronavirus disease and significant economic events have significantly impacted stock prices (Bessler *et al*., 2021; Ji *et al*., 2024).

In general, previous studies have made attempts to study the relationships between macroeconomic variables and stock prices. However, there has been a notable absence of research employing the cumulative dynamic multiplier to capture impacts over time. Understanding these impacts is crucial and can benefit key stakeholders, such as investors, in making informed decisions regarding future hedging and options strategies.

3. METHODOLOGY

This study employs the non-linear autoregressive distributed lag (NARDL) model. The long-run equation and the short-run equation are adopted from Shin *et al*. (2011, 2012, 2014); Ibrahim (2015); Liang *et al*. (2020); Omoregie *et al*. (2020); Wong (2022).

The equation for the long-run NARDL is as follows:

$$\mathrm{logRSP_t} = \beta_1\mathrm{logREER^+_{t-i}} + \beta_2\mathrm{logREER^-_{t-i}} + \beta_3\mathrm{logROIL^+_{t-i}} + \beta_4\mathrm{logROIL^-_{t-i}} + \beta_5\mathrm{logRGOLD^+_{t-i}} + \beta_6\mathrm{logRGOLD^-_{t-i}} + \mathcal{U}_\mathrm{t} \quad (1)$$

where RSP is the real stock price. The Hong Kong stock price is represented by Hang Seng Index (HSI), the Taiwan stock price is represented by Taiwan Stock Exchange (TWSE) and the Japan stock price is represented by Nikkei 225 (NIKKEI). REER is the real effective exchange rate, ROIL is the real oil price and RGOLD is the real gold price. $\mathcal{U}_\mathrm{t}$ is the error term.
The equation for the short-run NARDL is as follows:

$$\Delta logRSP_t = \sum_{i=1}^{q}\beta_{1i}\Delta\mathrm{logRSP_{t-i}} + \sum_{i=0}^{q}\beta_{2i}\Delta\mathrm{logREER^+_{t-i}} + \sum_{i=0}^{q}\beta_{3i}\Delta\mathrm{logREER^-_{t-i}} + \sum_{i=0}^{q}\beta_{4i}\Delta\mathrm{logROIL^+_{t-i}} + \sum_{i=0}^{q}\beta_{5i}\Delta\mathrm{logROIL^-_{t-i}} + \sum_{i=0}^{q}\beta_{6i}\Delta\mathrm{logRGOLD^+_{t-i}} + \sum_{i=0}^{q}\beta_{7i}\Delta\mathrm{logRGOLD^-_{t-i}} + \sum_{i=0}^{q}\beta_8\Delta\mathrm{logCONTROL_{t-i}} + \beta_9 D + \beta_{10}\mathrm{ECT_{t-1}} + \mathcal{U}_\mathrm{t} \quad (2)$$

where CONTROL, representing control variables, includes the real gross domestic product index (RGDP), the real money supply (RM2) and the Shanghai Stock Exchange index (SSE). *D* is a dummy variable representing the global financial crisis (2007-2009) and the coronavirus disease pandemic (2020-2023). ECT is the error correction term, log is the logarithm and $\mathcal{U}_\mathrm{t}$ is the disturbance term. Only the Taiwan stock price uses a constant term. An asymmetric effect is evident when the coefficient of $\sum_{i=0}^{q}\beta_{2i} \neq \sum_{i=0}^{q}\beta_{3i}$ or $\sum_{i=0}^{q}\beta_{4i} \neq \sum_{i=0}^{q}\beta_{5i}$ or $\sum_{i=0}^{q}\beta_{6i} \neq \sum_{i=0}^{q}\beta_{7i}$.
The equation for the cumulative dynamic multipliers (CDM) is as follows:

$$\mathrm{CDM^+_{r,t}(h)} = \sum_{o=0}^{h}\frac{\partial\mathrm{logRSP_{t+o}}}{\partial\mathrm{logY^+_{r,t}}}, \mathrm{CDM^-_{r,t}(h)} = \sum_{o=0}^{h}\frac{\partial\mathrm{logRSP_{t+o}}}{\partial\mathrm{logY^-_{r,t}}} \quad (3)$$

where $\mathrm{Y^+_{r,t}}$ and $\mathrm{Y^-_{r,t}}$ denotes positive or negative real effective exchange rate, real gold price or real oil price, respectively. h denotes time horizon. If the time lag h approaches infinity ($\mathrm{h} \to \infty$), the CDM, denoted as $\mathrm{CDM^+_h}$, $\mathrm{CDM^-_h}$ stabilises toward specific values represented by $\frac{\mathrm{Y^+_r}}{\emptyset}, \frac{\mathrm{Y^-_r}}{\emptyset}$. The absolute difference between $\left|\mathrm{CDM^+_{r,t}(h)} - \mathrm{CDM^-_{r,t}(h)}\right|$ measures the distance between the impacts of $\mathrm{Y^+_{r,t}}$ and $\mathrm{Y^-_{r,t}}$ on the response real stock prices over time (Shin, Yu & Greenwood-Nimmo, 2014).

In this study, a comprehensive evaluation of the model's performance and reliability was conducted using various diagnostic tests to ensure the robustness of the findings. In order to assess the stability of the coefficients over time, the cumulative sum (CUSUM) and cumulative sum of squares (CUSUMSQ) tests were employed, confirming coefficient stability and validating the consistency of the estimated parameters. Heteroskedasticity, which refers to the presence of varying levels of dispersion in the error terms, was examined using the Breusch–Pagan–Godfrey test to detect potential violations of homoskedasticity assumptions. Furthermore, the normality of residuals was assessed to check the distributional assumptions underlying the model. Serial correlation, a potential issue where error terms exhibit correlation with each other over time, was evaluated using the Breusch–Godfrey serial correlation LM test. In order to address the heteroskedasticity concerns, the Ordinary Least Squares (OLS) estimator with Huber-White (or robust) standard errors was employed, providing robust estimates of the model parameters even in the presence of heteroskedasticity.

The control variables used in this study are the real gross domestic product, the M2 money supply and the Shanghai stock exchange, as well as the dummy variables: the global financial crisis of 2007-2009 (Weinberg, 2012) and the coronavirus disease of 2020-2023 (World Health Organization, 2020, 2023). All data, except the dummy variables, were obtained from Bloomberg Terminal.

4. FINDINGS

Table 1 presents the results from the long-run NARDL. The results show that a negative real effective exchange rate leads to a decrease in the Hang Seng Index (HSI) and an increase in the NIKKEI, which is consistent with the observations made by Parvin (2022). Additionally, a positive real oil price is associated with a decrease in the HSI, corroborating the findings of Kelikume and Muritala (2019), while a negative real oil price is linked to an increase in the Taiwan Stock Exchange (TWSE) and the NIKKEI. Furthermore, a positive real gold price is found to decrease the HSI, which aligns with the results of Tweneboah *et al*. (2020) while simultaneously increasing the NIKKEI, as observed by He *et al*. (2020). Conversely, a negative real gold price is associated with a decrease in the NIKKEI, consistent with the findings of Jain and Biswal (2016). Gold is a "safe-haven" asset. When investors move their investments from gold to more risk-sensitive assets like stocks, gold prices tend to fall (Drake, 2022).

TABLE 1: LONG-RUN NONLINEAR AUTOREGRESSIVE DISTRIBUTED LAG RESULTS

RSP	Hong Kong (HIS)	Taiwan (TWSE)	Japan (NIKKEI)
$logREER_t^+$	-5.955034	-0.869527	-0.349839
	(0.5063)	(0.7153)	(0.4708)
$logREER_t^-$	-29.93931	3.118569	2.915997
	(0.0102)**	(0.3777)	(0.0000)***
$logROIL_t^+$	-2.759287	0.087321	-0.024992
	(0.0741)*	(0.5738)	(0.8487)
$logROIL_t^-$	-1.667263	0.250771	0.349374
	(0.2707)	(0.0301)**	(0.0128)**
$logRGOLD_t^+$	-6.273419	1.224865	1.392768
	(0.0443)**	(0.3100)	(0.0006)***
$logRGOLD_t^-$	-1.960338	-0.486979	-2.513785
	(0.4055)	(0.2842)	(0.0000)***

Notes: Values in parentheses indicate p-values. *, **, *** denotes significant level at 10%, 5% and 1%, respectively.
Source: Table by Authors

In general, there is evidence of cointegration across all countries. The stability of coefficients in the models over time is confirmed by CUSUM and CUSUMSQ, with the exception of Taiwan in the CUSUMSQ. The diagnostic tests confirm that the estimated models meet specific conditions.

TABLE 2: DIAGNOSTIC TEST RESULTS

RSP	Hong Kong (HIS)	Taiwan (TWSE)	Japan (NIKKEI)
Bound Test	2.363959 **	2.235739 *	4.417941***
HETERO	0.687351	1.630635	0.709299
	(0.8818)	(0.0593)**	(0.8532)
LM Test	0.308444	10.76717	3.882151
	(0.7362)	(0.0002)***	(0.0368)**
RESET Test	2.314284	0.058096	5.529313
	(0.1353)	(0.8107)	(0.0281)**
CUSUM	STABLE	STABLE	STABLE
CUSUMSQ	STABLE	UNSTABLE	STABLE

Notes: F-statistic from Pesaran *et al*. (2001) bounds testing for cointegration 'HETERO' is the heteroscedasticity test using the White test. LM is the Lagrange multiplier test for disturbance serial correlation. The RESET Test indicates the functional form test and the CUSUM and CUSUMSQ are employed for cumulative sum and cumulative sum of squares test.

Source: Table by Authors

Table 3 presents the results from the short-run NARDL. The negative real effective exchange rate is associated with a decrease in the HSI, which is consistent with the findings of Sreenu (2023). Moreover, positive and negative real oil price shocks have a positive impact on the HSI. Specifically, a positive real oil price shock and a negative real oil price shock are linked to an increase in the HSI. Furthermore, the analysis indicates that a positive real gold price, lagged by two periods, has a positive impact on the HSI. This finding is supported by Verma and Bansal (2021). Conversely, a negative real gold price, lagged by two periods, leads to a decrease in the HSI, which is also consistent with the observations of Verma and Bansal (2021).

Lagged positive real effective exchange rates by five periods exhibit a decrease in TWSE, corroborating the findings of Chang *et al*. (2024), while negative real effective exchange rates lagged by five periods significantly boost TWSE, consistent with Javangwe and Takawira (2022). Furthermore, positive and negative real effective exchange rates lagged by four periods have a negative impact on NIKKEI, aligning with Sreenu (2023). Additionally, positive and negative real oil prices significantly influence TWSE positively, as indicated by Kushwah and Siddiqui (2023). Conversely, when lagged by three periods, positive and negative real oil prices have a notable negative impact on NIKKEI, as evidenced by Kelikume and Muritala (2019). Moreover, positive lagged real gold price by one period decreases TWSE and NIKKEI, aligning with Zeinedini *et al*. (2022), whereas negative lagged real gold price by one period correspond to a significant increase in TWSE and NIKKEI, in line with Narayan *et al*. (2020).

Verma and Bansal (2021) underscore that an increase in real gross domestic product (GDP) has a positive impact on the HSI, indicating that a growing economy correlates with heightened stock prices. This impact reflects the fundamental principle that a robust economy tends to stimulate investor confidence and drive equity market gains. Similarly, Zhong and Liu (2021) reveal that an increase in the Shanghai Stock Exchange (SSE) exerts a substantial positive influence on HSI, highlighting the interconnectedness of regional stock prices within the broader economic landscape. Furthermore, Kassouri and Altıntaş (2020) demonstrate that expansions in real money supply positively impact both HSI and the Taiwan Stock Exchange (TWSE). This finding underscores the role of monetary policy in bolstering liquidity and fostering favourable conditions for stock prices. Conversely, a study conducted by Ji *et al*. (2024) unveils the adverse impact of the coronavirus disease of 2020-2023 on TWSE. The negative effect of the coronavirus disease can be attributed to economic disruptions, market uncertainties and business slowdowns associated with the global health crisis, which eroded investor sentiment and suppressed stock prices during this period. Moreover, the global financial crisis of 2007 to 2009 significantly and negatively impacted TWSE and the NIKKEI. These results are aligned with Bessler *et al*. (2021). The constant term has a significant positive impact on TWSE. Additionally, the coefficients of the error correction models are negative and statistically significant.

TABLE 3: SHORT-RUN NONLINEAR AUTOREGRESSIVE DISTRIBUTED LAG RESULTS

RSP	Hong Kong (HIS)	Taiwan (TWSE)	Japan (NIKKEI)
ECT_{t-1}	-0.057106 (0.0001)***	-0.379786 (0.0001)***	-1.118732 (0.0000)***
$\Delta logSM_{t-1}$	-0.210585 (0.0124)**	0.152294 (0.0882)*	0.336647 (0.0191)**
$\Delta logSM_{t-2}$	0.072099 (0.3318)	0.195685 (0.0429)**	0.457147 (0.0032)***
$\Delta logSM_{t-3}$	0.055261 (0.4802)	0.120355 (0.2240)	0.326008 (0.0217)**
$\Delta logREER_{t}^{+}$	0.785150 (0.1611)	-1.141386 (0.2173)	-0.919515 (0.1127)
$\Delta logREER_{t}^{-}$	-2.181676 (0.0003)***	1.479105 (0.1082)	-0.788807 (0.1465)
$\Delta logREER_{t-1}^{+}$	1.311931 (0.0224)**	-0.185871 (0.8429)	-0.207621 (0.6120)
$\Delta logREER_{t-1}^{-}$	-0.809311 (0.1239)	-0.447176 (0.6395)	-3.094715 (0.0000)***
$\Delta logREER_{t-2}^{+}$	1.780962 (0.0023)**	0.228641 (0.8013)	0.216576 (0.6233)
$\Delta logREER_{t-2}^{-}$	-0.546747 (0.2629)	-1.702440 (0.0481)**	-2.018394 (0.0003)***
$\Delta logREER_{t-3}^{+}$	0.239532 (0.6613)	-0.797216 (0.3842)	-0.328494 (0.3791)
$\Delta logREER_{t-3}^{-}$	0.059129 (0.8863)	-0.744628 (0.3967)	-0.914202 (0.0585)*
$\Delta logREER_{t-4}^{+}$	-	-1.942329 (0.0370)**	-0.726405 (0.0973)*
$\Delta logREER_{t-4}^{-}$	-	0.016731 (0.9857)	-1.557254 (0.0013)***
$\Delta logREER_{t-5}^{+}$	-	-1.503746 (0.0926)*	0.083999 (0.8205)
$\Delta logREER_{t-5}^{-}$	-	2.148890 (0.0064)***	-0.869613 (0.0833)*
$\Delta logREER_{t-6}^{+}$	-	-	0.139438 (0.6994)
$\Delta logREER_{t-6}^{-}$	-	-	-1.364784 (0.0025)***
$\Delta logREER_{t-7}^{+}$	-	-	-0.067600 (0.8506)
$\Delta logREER_{t-7}^{-}$	-	-	-0.424441 (0.3357)
$\Delta logROIL_{t}^{+}$	0.166271 (0.0152)**	0.168820 (0.0380)**	-0.006084 (0.9543)
$\Delta logROIL_{t}^{-}$	0.108707 (0.0162)**	0.283214 (0.0000)***	0.304830 (0.0000)***
$\Delta logROIL_{t-1}^{+}$	0.065916 (0.3765)	-	0.018465 (0.8679)

$\Delta logROIL^{-}_{t-1}$	0.272053	-	-0.070046
	(0.0000)***		(0.3557)
$\Delta logROIL^{+}_{t-2}$	-0.169271	-	-0.058117
	(0.0167)**		(0.6053)
$\Delta logROIL^{-}_{t-2}$	0.186528	-	-0.028449
	(0.0016)***		(0.6996)
$\Delta logROIL^{+}_{t-3}$	-0.053417	-	-0.324895
	(0.3940)		(0.0047)***
$\Delta logROIL^{-}_{t-3}$	-0.066566	-	-0.170175
	(0.2008)		(0.0165)**
$\Delta logROIL^{+}_{t-4}$	-	-	-0.261171
			(0.0219)**
$\Delta logROIL^{-}_{t-4}$	-	-	-0.257034
			(0.0019)***
$\Delta logROIL^{+}_{t-5}$	-	-	0.008641
			(0.9343)
$\Delta logROIL^{-}_{t-5}$	-	-	-0.175999
			(0.0376)**
$\Delta logROIL^{+}_{t-6}$	-	-	0.136931
			(0.1728)
$\Delta logROIL^{-}_{t-6}$	-	-	-0.076463
			(0.3379)
$\Delta logROIL^{+}_{t-7}$	-	-	0.209896
			(0.0329)**
$\Delta logROIL^{-}_{t-7}$	-	-	-0.147316
			(0.0372)**
$\Delta logRGOLD^{+}_{t}$	0.381169	-0.047435	0.601470
	(0.0253)**	(0.8311)	(0.0302)**
$\Delta logRGOLD^{-}_{t}$	0.139942	0.256611	-0.472545
	(0.4318)	(0.2522)	(0.1523)
$\Delta logRGOLD^{+}_{t-}$	-0.304274	-0.560336	-1.448827
	(0.1166)	(0.0170)**	(0.0001)***
$\Delta logRGOLD^{-}_{t-}$	0.170965	0.547724	2.415258
	(0.3351)	(0.0129)**	(0.0000)***
$\Delta logRGOLD^{+}_{t-}$	0.608262	-0.359918	-0.929941
	(0.0021)***	(0.1142)	(0.0038)***
$\Delta logRGOLD^{-}_{t-}$	-0.452560	0.193978	1.224869
	(0.0098)***	(0.3674)	(0.0040)***
$\Delta logRGOLD^{+}_{t-}$	0.277992	0.128597	-0.744701
	(0.1902)	(0.5867)	(0.0211)**
$\Delta logRGOLD^{-}_{t-}$	0.024860	0.033892	1.485694
	(0.8797)	(0.8718)	(0.0003)***
$\Delta logRGOLD^{+}_{t-}$	-	-0.312529	-0.114807
		(0.1863)	(0.6409)
$\Delta logRGOLD^{-}_{t-}$	-	0.204582	1.380636
		(0.3450)	(0.0006)***
$\Delta logRGOLD^{+}_{t-}$	-	-0.002813	0.038420
		(0.9910)	(0.8964)
$\Delta logRGOLD^{-}_{t-}$	-	0.487358	1.537951
		(0.0285)**	(0.0003)***
$\Delta logRGOLD^{+}_{t-}$	-	-	-0.102122
			(0.6997)
$\Delta logRGOLD^{-}_{t-}$	-	-	0.759303
			(0.0307)**
$\Delta logGDP_{t}$	1.464518	0.898560	0.638888

	(0.0100)**	(0.2651)	(0.2014)
$\Delta logSSE_t$	0.387894	0.162573	0.323901
	(0.0000)***	(0.0052)***	(0.4362)
$\Delta logM2_t$	1.185295	1.887113	0.059431
	(0.0000)***	(0.0000)***	(0.4483)
$COVID_t$	-0.013049	-0.037462	-0.005718
	(0.2092)	(0.0046)***	(0.7717)
GFC_t	-0.003255	-0.024642	-0.048596
	(0.7672)	(0.0733)***	(0.0043)***
C	-	0.121072	-
		(0.0001)***	

Notes: Values in parentheses indicate p-values. *, **, *** denotes significant level at 10%, 5% and 1%, respectively. ECT_{t-1} denotes error correction term and c denotes constant term.
Source: Table by Author

Figure 1 illustrated the impact of positive and negative real effective exchange rate, real oil price and real gold price on the Hang Seng Index (HSI), Taiwan Stock Exchange (TWSE) and NIKKEI Index over time. It revealed a notable trend where positive and negative real effective exchange rate, real oil price and real gold price corresponded to declines in the HSI, TWSE and NIKKEI. Moreover, dynamic patterns emerged in the positive and negative real effective exchange rate and real oil price, characterised by periods of fluctuating increases, decreases and eventual stabilisation in the HSI, TWSE and NIKKEI.

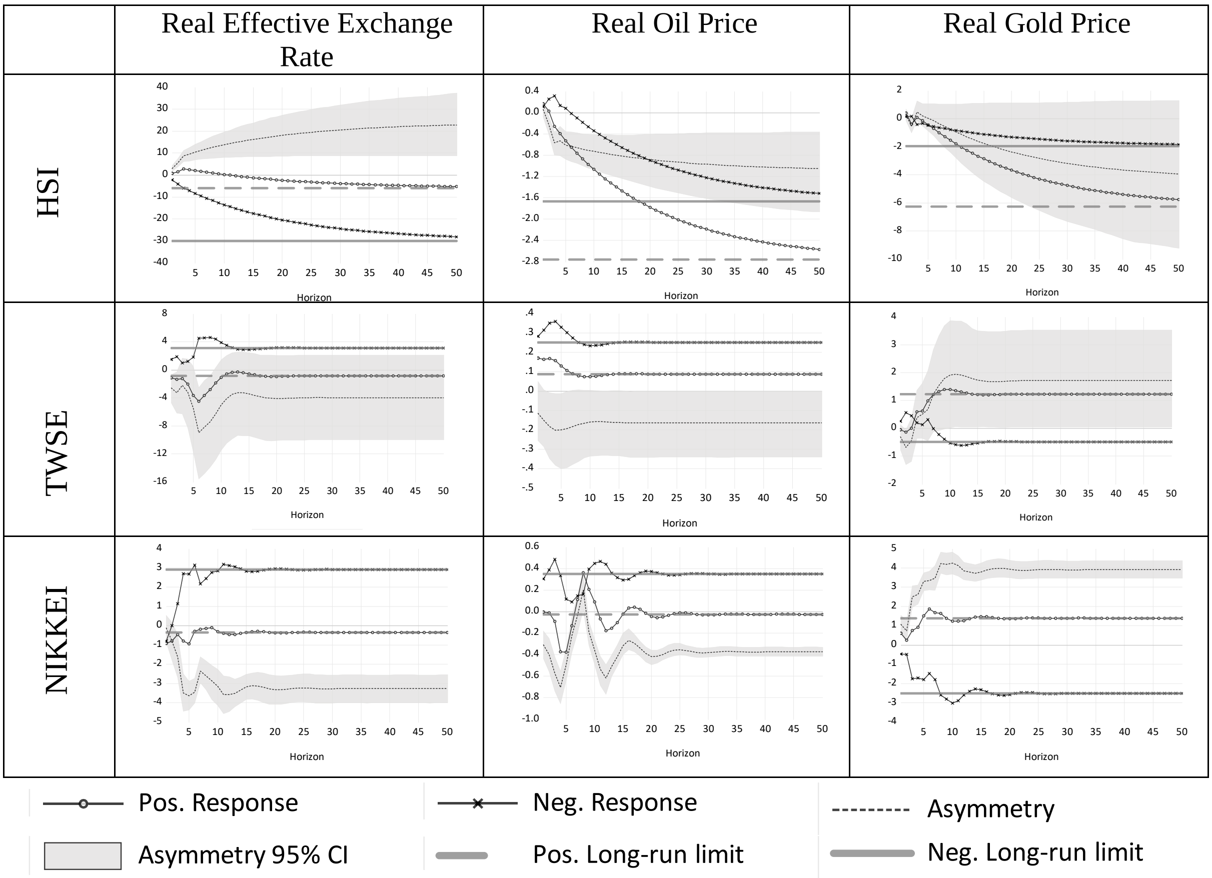

FIGURE 1: CUMULATIVE DYNAMIC MULTIPLIER
Source: Authors' Calculation

5. IMPLICATION

The results from this study offer valuable insights for investors navigating the stock markets of Hong Kong, Taiwan and Japan. This study provides some ideas for hedging strategies. Investors or international traders can use forward market or futures and options to mitigate risks associated with price fluctuation due to exchange rate, oil price or gold price fluctuations.

6. CONCLUSION

In this study, the application of the nonlinear autoregressive distributed lag (NARDL) model revealed findings regarding the differential impacts of positive and negative shocks in real effective exchange rate, real oil price and real gold price on stock prices across Hong Kong, Taiwan and Japan, both in the short-run and long-run. The analysis elucidated that real gross domestic product (GDP) exerts a notable impact on stock prices in Hong Kong, underscoring the significance of economic growth as a key determinant of stock price performance in this region. Furthermore, the study identified additional influential variables, such as the Shanghai Stock Exchange performance and M2 money supply, which exhibit short-run effects on stock prices in Hong Kong and Taiwan.

Moreover, the short-run impacts of significant external events, including the global financial crisis of 2007-2009 and the coronavirus disease spanning from 2020 to 2023, were observed to significantly affect Taiwan and Japan stock prices. These findings highlight the sensitivity of stock prices to macroeconomic shocks and global events, underscoring the importance of understanding and analysing these dynamics for effective investment strategies. The cumulative dynamic multiplier analysis further revealed distinct fluctuating trends in the responses of real effective exchange rate, real oil price and real gold price on stock prices across the studied economies, indicating varying degrees of sensitivity and adaptability within each market.

Despite the valuable insights gained from this study, several limitations should be acknowledged to interpret the findings appropriately and guide future research endeavours. First, the study's scope was constrained to a selected set of variables, focusing primarily on gross domestic product, commodity prices and specific stock price indices. This limited scope may overlook other relevant factors that could potentially influence stock prices, such as interest rates, geopolitical events, or sector-specific dynamics. Additionally, while the study identified short-run impacts of major economic events like the global financial crisis and the coronavirus disease, further investigation is needed to explore the long-term implications and interactions of these events with economic variables.

Furthermore, the generalisability of the findings may be restricted by the specific characteristics and market structures of the studied economies, highlighting the need for caution in applying these results to broader regional or global contexts. Addressing these limitations opens up avenues for future research to expand the scope by incorporating additional variables and exploring broader implications for financial markets. By integrating a more comprehensive set of factors and examining longer-term dynamics, future studies can enhance the robustness and applicability of results, providing deeper insights into the impact of macroeconomic variables on stock prices.

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