The impact of exchange rates on stock market performance of the Emerging 7

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Abstract

Purpose – The purpose of this research is to study the relationship between exchange rate fluctuations and stock market returns of the seven highest economic performing emerging countries (E7).

Design/methodology/approach – The study is conducted using the daily data for exchange rates and stock market returns in each of the E7 countries from January 1, 2019, to January 1, 2022. The study employs the ordinary least squares, autoregressive distributed lag error correction regression and generalized autoregressive conditional heteroskedasticity (GARCH (1,1)) regression models to fully investigate the impact of exchange rate on stock markets. For further investigation, the GARCH (1,1) model is run twice for each country with and without the inclusion of exchange rate to determine its effect on the volatility of stock returns.

Findings – The findings support the presence of cointegration relationship between the variables for all countries. The results reveal significant positive long-run relationship between exchange rates and stock market returns in all countries except for Indonesia, which evidenced a significant negative impact. The results of the GARCH (1,1) add that the inclusion of exchange rate in the model accounts for a slight change in the volatility of stock returns.

Originality/value – The research provides empirical evidence that appreciating currencies are perceived positively by investors leading to better performing capital markets. The outcomes of this study may assist policy makers in understanding to what degree changes in exchange rates can influence capital markets, as well as narrow the gap in literature regarding which theory is more relevant in explaining how exchange rate fluctuations impact market values.

Keywords Exchange rates, Stock market performance, Emerging 7, GARCH (1,1)

Paper type Research paper

1. Introduction

The impact of exchange rate on stock market performance has been widely studied by many academics over the years. Many different outcomes and arguments have been generated while studying this relationship which makes it a topic of great interest. Additional investigations and studies of the association between exchange rate and stock market performance are of significant relevance to investors as well as to policy makers. Generally, exchange rate fluctuations are very important to study as they have great impact on various economic factors.

The purpose of this research is to investigate how exchange rate fluctuations will impact different capital markets, as well as to narrow the gap in the literature with regards to emerging markets. Choosing to apply the study on the Emerging Seven (E7); the seven highest economic performing emerging economies; will provide valuable insights by noting if their stock markets will behave similarly toward exchange rate fluctuations, and if not, what

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may be the reasons. The results of this study will contribute to the literature regarding which theory is more relevant in explaining how exchange rate fluctuations influence market values. Also, conducting the study on emerging markets may provide more insightful results then if applied on developed countries. This is because in developed countries with highly developed financial systems and capital markets; a fluctuation in one factor, such as exchange rate, *ceteris paribus*, will probably not have a great impact on the performance of their stock markets. The results of this research may somehow narrow the gap in literature regarding previously generated mixed results.

The research paper will proceed as follows: The next section will include the theoretical background followed by the literature review and research hypotheses. The research methodology section will then include description of the data, research methods and econometrics models applied in the study. Section 5 will contain a thorough discussion of the results. Lastly, the paper will conclude and provide recommendations for future research.

2. Theoretical background

One of the main factors that cause fluctuations in exchange rate is how strong the country's economy is or how strongly it is perceived. Usually, a stronger economy implies a stronger currency and vice versa. Since, a country's trade balance is a factor of exchange rate fluctuations, and countries with trade surplus are more likely to have stronger currencies then countries with a trade deficit. More precisely, exchange rate fluctuations will greatly impact the foreign exchange transactions of corporations and hence their market value. The value of corporations will be impacted since fluctuations in foreign exchange rates will impact their future cash flows. Subsequently, this will have a great influence on the country's overall stock market performance.

This logic may lead to two conflicting conclusions. First, a stronger currency due to a strong economy will be perceived positively by investors, hence attracting more foreign investors. This will lead to a positive impact on overall market performance including capital markets. Second, the opposite may be true, and a stronger currency may negatively impact stock market performance. This is because, for exporting firms, an appreciation of the domestic currency will cause them to lose their price competitiveness in foreign markets, leading to a reduction in sales and profits causing their stock prices to decline and vice versa. This notion evolved from the goods market theory, which suggests that changes in exchanges rates affect the competitiveness of exporting firms and hence their stock prices (Cakan and Ejara, 2013; Bahmani-Oskooee and Saha, 2015; Lakshmanasamy, 2021).

On the contrary, if the production of such exported products is mainly dependent on imported input, a depreciation of the domestic currency would lead to a higher cost of production and thus a reduction in profitability and stock returns (Jawaid and Ui Haq, 2012). So, this means that the impact of exchange rate on stock market performance may vary from country to country depending on whether this country relies more on importing or exporting.

Before conducting the research, lets first give a quick introduction on the current account balance of the E7 countries. This will give an idea on the trade activity of these countries during the tested period (2019–2021) and whether they were net importers or exporters. Table 1 shows the current account balance for all seven countries from years 2019 to 2021. As provided, most of the E7 countries (Mexico, India, China, Indonesia and Brazil) experienced a drastic increase in their current account balance during 2020. Mexico and India seemed to exhibit a similar trend in their current account balances; they had a deficit in 2019, moved up to a surplus in 2020, and back to a deficit in 2021. China and Indonesia, on the other hand, continued to have an increase in their current account balance during 2021. Indonesia had an increase in its current account balance going from a deficit of $30.28 billion in 2019 to a surplus of $3.43 billion in 2021; an increase of about 111.3%. Brazil experienced a current

account deficit during all three years, while China and Russia had a surplus during all three years. Lastly, Turkey experienced a current account surplus of $5.3 billion in 2019, then a drastic deficit of $35.54 billion in 2020, and reduced this deficit to $13.69 billion in 2021; a reduction of about 358.3% in its current account from 2019 to 2021.

This quick examination of each of the seven countries trade balance will be useful while analyzing the results. This is because the outcomes will reveal whether countries with a similar movement in their trade balance will generate results that support the same relationship between exchange rate and stock market performance.

3. Literature review

Numerous research has studied the impact of exchange rate on stock market performance. This section will provide a discussion of some of these research studies and their outcomes. First, a discussion of the studies that support a positive impact of exchange rate on stock market performance will be provided followed by those who support a negative or no impact.

In their study, Moussa and Delhoumi (2021) examined how exchange rates impact the main stock market index of five countries in the MENA region. The results of their study confirmed the existence of cointegration between stock returns and exchange rates. Their results also supported that the market index is more sensitive to lower than higher exchange rate for Tunisia and Egypt in comparison with Morocco, Turkey, and Jordan. Overall, it was found that an appreciating domestic currency will most likely increase stock market returns in the Middle East/North Africa (MENA) region.

A similar conclusion was reached by Mechri *et al.* (2018) when they applied their study on the Tunisian and Turkish Markets. Their results support a highly significant positive impact of exchange rates on stock market returns in both the Turkish and Tunisian markets. They also evidenced a significant effect of exchange rate volatility on stock market in both countries. They found the presence of volatility clustering for Tunisia but not for Turkey. This means that in Tunisia, the volatility of exchange rate has a significant effect on the fluctuations of stock market prices.

Conducting their study in Singapore, Maysami *et al.* (2004) examined the relationship between various macroeconomic variables and market indices by categorizing these indices into three different sectors. Their results showed that there is a positive relationship between exchange rate and stock market performance. They interpreted this result by saying that a stronger Singapore's dollar limits imported inflation, thus increasing earnings and stock returns. Also, that a strong Singapore's dollar will be positively perceived by foreign investors causing more investments to enter the country, which will positively impact the stock market. Consistent with these results, Hsing's (2011) study revealed that a depreciation in the Bulgarian currency caused a negative impact on the stock market and an appreciation caused a positive impact.

	2019	2020	2021
Mexico	−3.47	26.21	−4.87
India	−29.76	32.73	−34.65
Turkey	5.3	−35.54	−13.69
Russia	65.54	36.03	122.04
China	102.91	248.84	317.3
Indonesia	−30.28	−4.43	3.43
Brazil	−65.03	−24.49	−27.93

Source(s): For the data: the World Bank

Table 1. Current account balance ($ billions)

When Jawaid and Ui Haq (2012) applied their study on the banking industry in Pakistan, the Granger causality results showed the existence of bidirectional causal relation between exchange rate and stock prices. They also found that exchange rate volatility has a significant positive impact on stock prices. They justified this by saying that investors will most likely shift from the high volatile exchange rate market to a more secure market such as the stock market. Khan *et al.* (2012) found contradicting evidence when they applied their research on Pakistan. In their study, they tested the impact of interest rate, exchange rate and inflation on stock market performance. Their results showed that exchange rate has a highly significant negative impact on stock returns. They justified this by saying that foreign investors convert their returns to the currency of their home country. So, an appreciation in Pakistani rupee will lead to lower returns for foreign investors, and this may eventually lead them to exit the Pakistani market (Khan *et al.*, 2012). Still in Pakistan, Suriani *et al.* (2015) found a different result and that is that there is no relationship between exchange rate and stock price and that both are independent of one another. Both their Granger causality test and regression results supported this result. This was also supported by Hunjra *et al.* (2014) that found exchanges rates have insignificant effect on stock prices in Pakistan.

Consistent with Khan *et al.* (2012), it was found that exchange rate has significant negative impact on stock returns in both the short and long terms (Khan, 2019). Khan (2019) investigated the impact of exchange rate on stock returns of Shenzhen Stock Exchange and concluded that an appreciation of the Chinese Yuan will negatively impact stock returns and vice versa. In the United States, Bahmani-Oskooee and Saha (2015) have also supported a negative impact of exchange rates on stock prices in the short run but were unable to support it in the long run. Aftab *et al.* (2015, 2021) have also evidenced a negative correlation between exchange rates and stock returns.

Similarly, Qing and Kusairi (2019) concluded that the weaker the exchange rate, the better the performance of the stock market in Malaysia. They also found that the real effective exchange rate has both long- and short-run effects on the performance of the stock market. Such conclusion is logical since Malaysia is a major exporting country so the weaker the domestic currency, the more competitive their exports become; in terms of prices; the better the performance.

Mouna and Anis (2017) conducted their study on nonfinancial sectors during the financial crisis in eight different countries. The results of their study revealed a significant negative effect of exchange rates on the technological sector for most countries except for Germany, the United States and the United Kingdom, which were positively affected. The researchers also found that the volatility of exchange rates had a bigger impact on the industrial sector in Germany, Greece, China and the United Kingdom in comparison with the other companies that were analyzed.

In Zambia, Sichoongwe (2016) explored how exchange rate volatility impacts the stock market. The results of the study supported a negative impact of exchange rate volatility on stock market capitalization. The researcher justified this result by saying that the greater the volatility in exchange rates, the greater the instability in Zambia's market, discouraging investors from entering. This will consequently lead to serious problems on the stock market. On the other hand, when Mlambo *et al.* (2013) conducted their study on Johannesburg Stock Exchange, they evidenced a very weak relationship between exchange rate fluctuations and stock market performance. They suggested that this result would promote South Africa as a stable and safe market for foreign investors.

In their study, Agrawal *et al.* (2010) tested the relationship between the Indian Stock Index, Nifty and the Rupee/USD exchange rate. They found a negative correlation between the two variables and that there is a unidirectional relationship running from stock returns to exchange rates. Their results supported that an increase in Nifty's returns causes a decrease in exchange rates (Rupee/USD), meaning strengthening of the Indian Rupee. Moreover, when

Cakan and Ejara (2013) studied the association between exchange rates and stock prices of twelve emerging markets, their results reveled a bidirectional causal relationship in most of the tested countries. When Lakshmanasamy (2021) applied his study on the Indian market but on a different Index; BSE SENSEX; he found that the volatility of stock returns is more sensitive to its own lagged values than to changes or surprises in other factors such as exchange rate. So, with regard to India and based on previous research, it is apparent that changes in exchange rates do not significantly impact stock market performance, but the opposite may be true.

Lastly, Dang *et al.* (2010) have supported the existence of asymmetric effect between the two variables in Vietnam. They evidenced an asymmetric effect of exchange rate on stock prices in both the long run and short run. They concluded that stock prices will react differently to different levels of currency appreciation and depreciation, which means that no absolute conclusion regarding the impact of exchange rate on stock prices can be reached. Aftab *et al.* (2021) have also reached the same conclusion, which is that no single theory can explain the association between exchange rates and stock markets and that the support of a particular theory mainly depends on the time varying nature of the relationship. Moreover, Phylaktis and Ravazzolo (2005) have suggested the importance of considering the influence of world markets, such as the US stock market, while studying the relationship between foreign exchange rates and domestic stock markets.

Overall, it is apparent from both the theory and the literature, that there are inconsistent and contradictory outcomes and assumptions regarding the impact of exchange rates on stock market performance. So, according to the literature review, the following research hypotheses are developed:

H0. Exchange rate fluctuations do not have a significant impact on stock market performance.

H1. Exchange rate fluctuations have a significant impact on stock market performance.

4. Research methodology

This research is applied on the E7: Brazil, China, India, Indonesia, Mexico, Russia and Turkey; over a three-year period from January 1, 2019 to January 1, 2022. The study is applied on daily data for exchange rates and major stock market indices from the seven countries. All variables are transformed to their natural logarithm. Exchange rate data are represented as domestic currency to USD, meaning that an increase in the exchange rate means an appreciation of the domestic currency relative to the US dollar and vice versa. Movements in exchange rates will be calculated as follows:

$$\mathrm{ER} = \ln(\mathrm{ER}_t/\mathrm{ER}_{t-1})$$

where

ER = change in exchange rate (domestic currency to USD) for period t

ER_t = domestic currency-USD for period t

ER_{t-1} = domestic currency-USD for period t−1

Stock market performance will be measured by the performance of a major stock market index in each of the seven countries. The stock market indices studied are IBX50 for Brazil, SSE100 for China, Nifty50 for India, IDX Kompas 100 for Indonesia, IPC for Mexico, IMOEX

for Russia and BIST100 for Turkey. The market returns for the stock market indices are calculated as follows:

$$R = \ln(P_t / P_{t-1})$$

where

R = market return for period t

P_t = market price index for period t

P_{t-1} = market price index for period t−1

The research methods applied will begin with providing the descriptive statistics for the data followed by the augmented Dickey–Fuller (ADF) test of stationarity. The study will then proceed with a regression analysis for each country using the ordinary least squares (OLS) and autoregressive distributed lag (ARDL) models. Residuals and coefficients' diagnostics for ARDL's estimates will be provided for each model. The results will show whether the variables are cointegrated in the long-run or just in the short run. If a cointegration is present between the variables, an ARDL error correction regression (ECM) will be run. This model will estimate the long-run relationship between the variables while accounting for the short-term dynamics. The ECM results will also include the error correction term which corrects any deviations from long-run equilibrium in the short run. Additionally, the generalized autoregressive conditional heteroskedasticity (GARCH (1,1)) model will be employed to fully explore the impact of exchange rates on the performance of stock markets. GARCH models are particularly important since they consider the heteroskedasticity property of stock returns, excess kurtosis and volatility clustering. The three regression models employed in the study are developed as follows:

The OLS model:

$$R = \beta_0 + \beta_1 ER_t + \varepsilon_t$$

where

R = market return for period t

ER_t = change in exchange rate for period t

The generalized ARDL model:

$$R = a_0 + \Sigma a_1 R_{t-1} + \Sigma a_2 ER_t + \Sigma a_3 ER_{t-1} + \varepsilon_t$$

where

R = market return for period t

R_{t-1} = market return for period t−1

ER_t = change in exchange rate for period t

ER_{t-1} = change in exchange rate for period t−1

Here, the ARDL model assumed the dependent variable is dependent on its own lagged values as well as on the independent variable. According to the VAR lag order selection criteria in EViews, the optimal lag value will be used for each variable.

The GARCH (1,1) model:

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \beta_1 \left(\sigma_{t-1}^2\right)$$

where

(1) σ_t^2 = resembles variance at time t

(2) α_0 = the unconditional variance

(3) ε_{t-1}^2 = the squared errors at time t−1

(4) α_1 = is the first lag ARCH parameter

(5) β_1 = is the first lag GARCH parameter

Here, the GARCH model also includes past values of the variance not just the squared terms of the residual. The GARCH (1,1) model will be run twice for each country, with and without the inclusion of the exchange rate. This will be performed in order to account for the impact of exchange rate on the persistent of volatility or clustering. Each of the regression models just discussed will be applied on each country individually, and the results will be interpreted and analyzed in the next section.

5. Results and discussion

By referring to the descriptive statistics in Table 2, it is apparent that changes in exchange rates and stock market returns deviate from normality in all seven countries. This is evident by the significant Jarque–Bera statistic as well as by the skewness and kurtosis results. This is totally normal for time series financial data.

Before running the regression models, an ADF test of stationarity is conducted to confirm stationarity of both variables: market returns and exchange rates. The ADF tests the null hypothesis of random walk against a stationary alternative. As provided in Table 3, the ADF test statistic for both variables is highly significant in all countries, hence supporting stationarity at level. Now, the study can proceed with no worries of a unit root problem.

As a preliminary investigation of the impact of exchange rate on stock market performance, an OLS regression is run for all E7 countries. The results provided in Table 4 show that the F-statistic is highly significant (0.000) for all countries except for Indonesia, proving the overall usefulness of the models. Also, the outcomes in Table 4 support a highly significant positive impact of exchange rate on market returns in all E7 countries with the exception of Indonesia. This means that appreciation in exchange rates causes a positive impact on market performance and vice versa.

Before running the ARDL model, it is important to determine the optimum lag value for each variable. This is determined by the VAR lag length criteria in EViews. The optimal lag for each variable is entered while running the ARDL model, which then automatically selects the model with the optimum lag values based on the Akaike information criterion method. By referring to Table 5, it is apparent that three of the seven countries have an optimum lag length of zero for exchange rate (ER). Also, by referring to the results, all the tested models are free from serial correlation. Next, it is very important to determine whether there is a long-run cointegration relation between stock market performance and exchange rate. By referring to Table 5, the results generated by the Bounds test support the existence of cointegration in all seven models. This means that there is a long-run equilibrium relationship between stock market performance and exchange rate in all E7 countries.

Since the empirical results support cointegration, it is more relevant to analyze long-run coefficients rather than the short run. By referring to the results under "long-run coefficient

Table 2.
Descriptive statistics

	Market return						
	IBX50 (Brazil)	*SSE100 (China)*	*Nifty50 (India)*	*IDX Kompas 100 (Indonesia)*	*IPC (Mexico)*	*IMOEX (Russia)*	*BIST100 (Turkey)*
Mean	0.000195	0.000903	0.000626	−0.000104	0.000306	0.000617	0.000984
Std. dev.	0.019767	0.012834	0.013858	0.014580	0.011425	0.011933	0.015490
Skewness	−1.528160	−0.922413	−1.720204	0.296297	−0.448682	−0.888805	−1.417056
Kurtosis	21.52799	7.729371	23.51234	15.67980	6.536155	14.24891	10.81259
Jarque–Bera	10916.76	782.7739	13374.31	4921.133	418.6997	4085.481	2155.519
J-B (Prob.)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
	Exchange rate						
	BRL-USD (Brazil)	*CNY-USD (China)*	*INR-USD (India)*	*IDR-USD (Indonesia)*	*MXN-USD (Mexico)*	*RUB-USD (Russia)*	*TRY-USD (Turkey)*
Mean	−0.000518	0.000104	−0.000094	−0.006271	−0.000062	−0.000111	−0.001207
Std. dev.	0.010877	0.002535	0.003585	0.396028	0.008578	0.007660	0.014856
Skewness	0.084546	−0.479191	−0.185500	−2.101664	−0.587839	−1.369766	2.157444
Kurtosis	3.619185	8.201312	6.046688	195.0469	7.132458	13.64180	53.90999
Jarque–Bera	12.75429	849.6540	291.2334	1126977	580.7028	3803.716	81467.64
J-B (Prob.)	0.001700	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Observations	*743*	*729*	*742*	*733*	*755*	*756*	*749*

Source(s): Author's own work

Table 3. Unit Root/Stationarity test

	Market return						
	IBX50 (Brazil)	*SSE100 (China)*	*Nifty50 (India)*	*IDX Kompas 100 (Indonesia)*	*IPC (Mexico)*	*IMOEX (Russia)*	*BIST100 (Turkey)*
Augmented Dickey–Fuller test statistic	−8.821388 (0.0000)	−26.55532 (0.0000)	−8.828871 (0.0000)	−13.65282 (0.0000)	−27.13920 (0.0000)	−27.83314 (0.0000)	−16.64958 (0.0000)
	Exchange rate						
	BRL-USD (Brazil)	*CNY-USD (China)*	*INR-USD (India)*	*IDR-USD (Indonesia)*	*MXN-USD (Mexico)*	*RUB-USD (Russia)*	*TRY-USD (Turkey)*
Augmented Dickey–Fuller test statistic	−29.35054 (0.0000)	−28.96302 (0.0000)	−28.60055 (0.0000)	−21.41344 (0.0000)	−25.76670 (0.0000)	−27.58748 (0.0000)	−24.13471 (0.0000)

Source(s): Author's own work

	Brazil	*China*	*India*	*Indonesia*	*Mexico*	*Russia*	*Turkey*
C	0.000594	0.000781	0.000751	−0.000117	0.000343	0.000701	0.001195
	(0.3666)	(0.0922)	(0.1164)	(0.8278)	(0.3566)	(0.0647)	(0.0333)
ER	0.769991	1.174136	1.333738	−0.002045	0.596009	0.760794	0.174210
	(0.0000)	(0.0000)	(0.0000)	(0.1329)	(0.0000)	(0.0000)	(0.0000)
Observations	743	729	742	733	755	756	749
R^2	0.179510	0.053771	0.119060	0.003086	0.200248	0.238472	0.027914
Adjusted R^2	0.178402	0.052469	0.117869	0.001722	0.199185	0.237462	0.026613
DW	2.509066	1.995455	2.197249	1.920668	2.009523	2.072872	1.828485
F-statistic	162.1186	41.31259	100.0116	2.262816	188.5413	236.1150	21.45054
Prob. (F)	0.000000	0.000000	0.000000	0.132945	0.000000	0.000000	0.000004

Table 4.
OLS regression

Source(s): Author's own work

results" in Table 5, it is found that changes in exchange rates have a highly significant (0.000) positive impact on the returns of the tested stock indices for all countries except for Indonesia. This means that in the long run, an appreciation in the exchange rate will have a positive impact on stock market returns. This result is consistent with the results generated by Mechri *et al.* (2018), Moussa and Delhoumi (2021) and Maysami *et al.* (2004). On the other hand, regarding Indonesia, the results support a significant negative long-run impact. This negative relationship has been supported by Qing and Kusairi (2019), Khan *et al.* (2012) and by Khan (2019). However, the results generated by this study contradict the results generated by Khan (2019) with respect to China.

The results of the ARDL ECM provided in Table 5 show a highly significant F-statistic for all E7 countries. Also, the adjusted R^2 is greater than 50% for all countries, which means that the models have high predictive power of market performance. Due to the presence of long-run cointegration, it is not relevant to analyze the short-term coefficients provided. But what is important is the error correction term, *ECM(–1)*, provided at the end of Table 5. The error correction term, which shows the speed of adjustment, must be negative and statistically significant for its value to make sense. As can be noted from the results, the value for *ECM(–1)* is negative and significant at the 1% level for all countries. This indicates that deviations of stock returns from the previous period will be converged to the long-run equilibrium. Also, as apparent by the values of EC*M(–1)*, the speed of adjustment is high for all countries.

Table 6 demonstrates the outcomes for the GARCH (1,1) model, which tests for volatility clustering. As provided by the results, both the ARCH and GARCH terms are highly significant and meet the nonnegativity condition with and without the inclusion of exchange rate, which implies persistent volatility clustering. This means that large changes tend to be followed by large changes and small changes tend to be followed by small changes. This is also apparent by the summation of their values, which tend to be very close to 1, meaning that market shocks will have high persistent effects on the volatility of the stock returns. Also as provided in Table 6, the GARCH (−1) value is significantly greater than the ARCH parameter for all countries. This indicates that the volatility of stock returns is highly sensitive to the information on the volatility of their previous or lagged periods rather than on new information.

As evidenced by the results, after the inclusion of exchange rate in the GARCH (1,1) model, the ARCH and GARCH parameters slightly changed. The summation of both values slightly increased for China, Mexico and Turkey, indicating that the inclusion of exchange rate accounted for a slightly greater volatility persistent in stock returns. While, on the other hand, Brazil, India, Indonesia and Russia showed a slightly lower volatility persistent in stock returns after the inclusion of exchange rate. Overall, persistence remained very high and

Table 5.
ARDL regression

Diagnostics tests	*Brazil*	*China*	*India*	*Indonesia*	*Mexico*	*Russia*	*Turkey*
Model with optimum lag[1]	(8,2)	(1,6)	(9,7)	(5,0)	(2,0)	(1,0)	(2,3)
Serial correlation LM test[2] *F*-statistic (Prob.)	0.622314 (0.7595)	1.046355 (0.3938)	0.731190 (0.6805)	1.615961 (0.1534)	0.950904 (0.3869)	0.260510 (0.6099)	1.154535 (0.3263)
Bounds test for cointegration[3]	*F*-statistic value > I(1) at the 1% Sig. Level	*F*-statistic value > I(1) at the 1% Sig. Level	*F*-statistic value > I(1) at the 1% Sig. Level	*F*-statistic value > I(1) at the 1% Sig. Level	*F*-statistic value > I(1) at the 1% Sig. Level	*F*-statistic value > I(1) at the 1% Sig. Level	*F*-statistic value > I(1) at the 1% Sig. Level
Existence of cointegration	Yes	Yes	Yes	Yes	Yes	Yes	Yes
				Long-run coefficient results (total effect)			
	Brazil ARDL (8,2)	China ARDL (1,6)	India ARDL (9,7)	Indonesia ARDL (5,0)	Mexico ARDL (2,0)	Russia ARDL (1,0)	Turkey ARDL (2,3)
ER	0.808705 (0.0000)	1.287180 (0.0081)	1.497940 (0.0001)	−0.002918 (0.0846)	0.548077 (0.0000)	0.740164 (0.0000)	0.152529 (0.0868)
				Error correction model (ECM) and short-run coefficient results			
C	0.000559 (0.3736)	0.000771 (0.0955)	0.000954 (0.0352)	−0.000124 (0.8157)	0.000376 (0.3113)	0.000716 (0.0598)	0.000873 (0.1102)
D(R(−1))	−281216 (0.0012)		0.030835 (0.7541)	−0.135862 (0.0534)	0.090825 (0.0036)		−0.145171 (0.0001)
D(R(−2))	−0.207957 (0.0060)		0.138661 (0.1319)	−0.243175 (0.0001)			
D(R(−3))	−0.137789 (0.0510)		0.082549 (0.3311)	−0.062685 (0.2155)			
D(R(−4))	−0.178579 (0.0058)		0.045771 (0.5551)	−0.100616 (0.0065)			
D(R(−5))	−0.177147 (0.0025)		0.119234 (0.0817)				

(*continued*)

Table 5.

	Long-run coefficient results (total effect)						
	Brazil ARDL (8,2)	China ARDL (1,6)	India ARDL (9,7)	Indonesia ARDL (5,0)	Mexico ARDL (2,0)	Russia ARDL (1,0)	Turkey ARDL (2,3)
D(R(−6))	−0.232578		0.030600				
	(0.0000)		(0.6019)				
D(R−7))	−0.059617		0.014517				
	(0.0673)		(0.7644)				
D(R(−8))			−0.055793				
			(0.1109)				
D(ER)	0.752503	1.177614	1.206257				0.194786
	(0.0000)	(0.0000)	(0.0000)				(0.0000)
D(ER(−1))	0.162431	0.339125	−0.262329				−0.045659
	(0.0060)	(0.1396)	(0.2003)				(0.2141)
D(ER(−2))		0.821457	−0.674017				−0.149737
		(0.0014)	(0.0019)				(0.0000)
D(ER(−3))		0.784278	−0.574561				
		(0.0023)	(0.0080)				
D(ER(−4))		0.797930	−0.712223				
		(0.0005)	(0.0004)				
D(ER(−5))		0.478612	−0.730754				
		(0.0048)	(0.0000)				
D(ER(−6))			−0.254529				
			(0.0456)				
ECM(−1)	−0.943505	−1.009721	−0.966018	−0.801578	−1.105319	−1.028904	−0.776725
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
R^2	0.706281	0.533056	0.576134	0.507366	0.599704	0.624465	0.528240
Adjusted R^2	0.702224	0.528485	0.566649	0.503955	0.598637	0.623966	0.525052
DW	1.999334	1.991435	1.994236	1.994299	1.989891	2.010766	2.014077
F-statistic	174.0944	116.6047	60.74096	148.7184	561.8076	1252.137	165.7188
Prob (F)	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

Note(s): [1] Optimum lag is decided by the VAR lag order selection criteria the final model is based on the Akaike information criterion (AIC) method. [2] Serial correlation is tested using Breusch–Godfrey serial correlation LM test. [3] Bounds test results are generated using the unrestricted constant with no trend option

Source(s): Author's own work

	Brazil	*China*	*India*	*Indonesia*	*Mexico*	*Russia*	*Turkey*
Without the inclusion of exchange rate							
Variance equation							
C	0.000013	0.000085	0.000004	0.000013	0.000005	0.000003	0.000031
	(0.0001)	(0.0006)	(0.0031)	(0.0001)	(0.0065)	(0.0015)	(0.0000)
RESID $(-1)^2$	0.114814	0.121572	0.139041	0.183379	0.110870	0.105155	0.130905
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
GARCH (−1)	0.835250	0.833496	0.834731	0.738831	0.848639	0.872115	0.740075
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Sum (ARCH + GARCH)	*0.950064*	*0.955068*	*0.973772*	*0.922210*	*0.959509*	*0.97727*	*0.870980*
With the inclusion of exchange rate							
ER	0.640677	0.980008	0.763002	−0.001839	0.472487	0.519441	0.505123
	(0.0000)	(0.0000)	(0.0000)	(0.1395)	(0.0000)	(0.0000)	(0.0000)
Variance equation							
C	0.000011	0.000008	0.000463	0.000013	0.000003	0.000003	0.000021
	(0.0003)	(0.0007)	(0.0018)	(0.0000)	(0.0153)	(0.0049)	(0.0003)
RESID $(-1)^2$	0.136377	0.105733	0.136837	0.187003	0.076446	0.110594	0.193017
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
GARCH (−1)	0.806084	0.850082	0.830175	0.731019	0.898930	0.862783	0.716867
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Sum (ARCH + GARCH)	*0.942461*	*0.955815*	*0.967012*	*0.918022*	*0.975376*	*0.973377*	*0.909884*

Source(s): Author's own work

Table 6. GARCH (1,1) regressions

significant after the inclusion of exchange rates, which indicates that the volatility of stock returns is more influenced by its own lagged values. Consistent with the previously generated results, the outcomes in Table 6 still show that changes in exchange rates have a highly significant positive impact on the market returns in all tested countries except for Indonesia.

Overall, the results support a significant positive impact of exchange rates on stock market returns. Furthermore, the conclusion generated from the results of the ARDL's model support a significant long-run relationship between exchange rates and stock performance of the E7. For six of the seven countries, there is a highly significant positive impact of exchange rate on stock market. However, those six countries did not seem to exhibit the same trading pattern during the tested period. Mainly, the outcomes support the notion discussed earlier that a stronger currency will be perceived positively by investors leading to a positive impact on overall market performance, regardless of whether the country is a net exporter or importer. On the other hand, the results conflicted the notion evolving from the goods market theory, which suggests that changes in exchanges rates affect the competitiveness of exporting firms and hence have an inverse impact on stock prices. The only exception here is Indonesia, which supported a significant negative impact of exchange rate fluctuations on stock market performance.

6. Conclusion

As provided by the outcomes of the study, it is evident that changes in exchanges rates have a highly significant impact on stock market performance. This is true for Brazil, China, India, Mexico, Russia and Turkey. This means that it cannot be concluded that trading plays a role in explaining the association between the two variables because all these countries seem to exhibit different trading patterns as evident by the current account balances provided in Table 1. For these countries, the results reject the goods market theory, which suggests that changes in exchanges rates may negatively affect the competitiveness of exporting firms and hence their stock prices. On the other hand, the results support the following notion:

a stronger currency due to a strong economy is perceived positively by investors, hence attracting more domestic/foreign investors leading to a positive impact on the country's capital market. This seems to be true regardless of whether the country is a net exporter or importer.

Indonesia is the only country that showed a significant negative long-run relation between exchange rate and stock market performance. This may be due to the notable transition of the Indonesian economy which is moving from a major current account deficit in 2019 to a surplus in 2021. So, maybe depreciation in the domestic currency is significantly important for countries at the beginning of a transition period from a trade deficit to a surplus, by having more competitive prices.

Regarding volatility clustering of stock returns, it was evident that the volatility of stock returns is mainly due to past information from its own previous periods rather than from other exogenous variables. This means that in the E7 countries, the response function to shocks is likely to die slowly and that overcoming the effects of previous shocks will take a long time.

The results of this study may be of great importance to policy makers while taking decisions regarding monetary and exchange rate policies in the E7 countries. For further research, it is recommended to conduct the study on weekly and monthly data and compare the outcomes. Also, studying the asymmetric effect of exchange rate may provide some other useful insights to the results. Also, it is advisable to compare the results of this study with another during a different time period, since this period included the COVID-19 pandemic, and see if different conclusions will be reached. Also, future studies can account for the trade balance of each country by including it as a variable in the tested model to reach a more precise conclusion.

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