ANALYSIS OF TWO EMERGING MARKETS EXCHANGE RATE LEVEL DURING THE COVID-19 OUTBREAK

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ABSTRACT

This study investigates the influences of the COVID-19 Outbreak on exchange rate level in two emerging countries, India and Indonesia, using ARDL Model with time series data from 2020 to 2022. The research examines how these two countries' the exchange rate level changed during pandemic, and how the factors affected their sovereign bond yields and capital flows. Furthermore, this study compares and contrasts the exchange rate performance of these two countries with different macroeconomic vulnerabilities, such as Interest Rate Differential, Inflation Rate Differential, Industrial Production Index, and Stock Market. The findings reveal that the interest rate differential is the most significant factor influencing exchange rates for these countries in the short run and long run, while inflation rate differential and industrial production index are also important for Indonesia. Overall, these two countries should adopt monetary and fiscal policies that maintain a competitive interest rate level, control inflation rate, stimulate industrial production, and enhance the transparency and the efficiency of their stock markets. This paper provides policy implications and recommendations for financial stability in the post-pandemic.

Keywords : Exchange rate level; ARDL Model; Covid-19 Pandemic; emerging markets

ABSTRAK

Studi ini menyelidiki pengaruh Pandemi COVID-19 terhadap tingkat nilai tukar di dua negara emerging market, India dan Indonesia, menggunakan Model ARDL dengan data time series dari tahun 2020 hingga 2022. Penelitian ini mengkaji bagaimana tingkat nilai tukar negara-negara tersebut kedua negara berubah selama pandemi ini, dan bagaimana faktor-faktor ini memengaruhi imbal hasil obligasi negara dan aliran modal mereka. Lebih lanjut, penelitian ini membandingkan dan membedakan kinerja nilai tukar kedua negara dengan kerentanan makroekonomi yang berbeda, seperti perbedaan suku bunga, perbedaan tingkat inflasi, indeks produksi industri, dan pasar saham. Temuan menunjukkan bahwa perbedaan tingkat suku bunga merupakan faktor paling signifikan yang mempengaruhi nilai tukar kedua negara dalam jangka pendek dan jangka panjang, sedangkan perbedaan tingkat inflasi dan indeks produksi industri juga penting bagi Indonesia. Secara keseluruhan, kedua negara ini harus mengadopsi kebijakan moneter dan fiskal yang mempertahankan tingkat suku bunga yang kompetitif, mengendalikan tingkat inflasi, merangsang produksi industri, dan meningkatkan transparansi dan efisiensi pasar saham mereka. Tulisan ini memberikan implikasi kebijakan dan rekomendasi terhadap stabilitas keuangan di era pascapandemi.

Kata Kunci : Tingkat Nilai Tukar; Model ARDL; Pandemi Covid-19; Negara emerging market

INTRODUCTION

The COVID-19 pandemic, emerged in Wuhan, China in December 2019 and expeditiously spread to other regions, has had a devastating consequence on the worldwide economy, triggering financial market turmoil and economic recessions. Developing countries, which have limited fiscal capacity and rely heavily on global markets, have been particularly vulnerable to pandemic's shocks. Therefore, it is essential for policymakers and investors to understand the implications of COVID-19 for the financial market instability that occurred in developing countries. The COVID-19 in China and its diffusion to other countries have had severe consequences for the world economy.

The pandemic has generated widespread uncertainty and volatility in the financial markets, leading to sharp declines in stock prices, exchange rates, and bond yields. As the virus reached other countries, emerging economies, which have constrained fiscal space and are dependent on global markets, faced significant challenges (Guliyev, 2022).

The pandemic has underscored the need for policymakers in these countries to implement appropriate measures to mitigate the pandemic's impact on the financial sector and facilitate economic recovery. One of the main channels through which COVID-19 has affected emerging economies is the movement of capital. The pandemic has caused a substantial reduction in the amount of money flowing to emerging markets, especially portfolio flows. The economies of countries with weaker fundamentals and greater exposure to global risk factors have suffered more, and as a result, they have experienced more pronounced outflows of capital. This has resulted in increased volatility and decreases in asset prices in these countries due to the considerable pressure exerted on exchange rates and sovereign bond yields.

The Indian Rupee experienced fluctuations in its exchange rate against the US Dollar, shown in the Figure 1. In early 2020, the Rupee depreciated due to market uncertainties and capital outflows, reaching a low point of 76.22 Rupees per USD in March. However, as the global economic situation improved, the Rupee gradually appreciated and stabilized around 74 -75 Rupees per USD by the end of 2021 and into 2022, reflecting increased investor confidence and market stability.

The Indonesian Rupiah (IDR) exchange rate faced fluctuations. In early 2020, the Indonesian rupiah weakened against the US dollar due to uncertainties caused by the pandemic. However, as the situation stabilized and global market sentiments improved, the IDR gradually recovered. Despite intermittent fluctuations, the IDR remained relatively stable in 2021 and 2022. Overall, Figure 1 demonstrates that the pandemic-induced uncertainties initially impacted two countries exchange rate negatively, but it later regained stability as the global situation improved.

The COVID-19 has underlined the relevance of the third-generation currency crisis model, which stresses the role of expectations in exchange rate stability. This model, developed in the 1990s, acknowledges the macroeconomic fundamentals effect on exchange rates. The pandemic has revealed the impact of self-fulfilling expectations, where agents' beliefs about the sustainability of exchange rate regimes differ from reality, triggering speculative attacks and exchange rate collapses. Krugman's concept of multiple equilibria implies that different expectations among market actors can generate various equilibrium exchange rates. A stable exchange rate can be attained when the government's credibility to maintain the current regime is high, but if doubts emerge, the exchange rate can drop. Moreover, the incorporation of capital flows into the model, as emphasized by Obstfeld, shows how capital outflows motivated by overvaluation perceptions can raise the probability of a breakdown in the exchange rate regime (P. R. Krugman, 1991). The Corona Virus Disease pandemic, or better known as the COVID-19 virus, has had such a big impact on changes in the world today. Starting from various economic, social, cultural, and political fields. The COVID-19 virus cannot be avoided in the slightest, and Indonesia is no exception (Rahadian, F., & Zulkarnaen, W., 2021)

LITERATURE REVIEW AND HYPOTHESIS

Exchange rate volatility

Exchange rate volatility is the degree of variation in the value of one currency relative to another over time. One of the seminal papers on this topic is by Meese and Rogoff (1983), who tested the forecasting performance of several economic models, such as the purchasing power parity (PPP) and the monetary model, against a naive random walk model (Meese & Rogoff, 1983). Finding says, one of the models could

outperform the random walk model, suggesting that exchange rates are highly unpredictable.

A key innovation in modelling exchange rate volatility was introduced by Hsieh (1988), who developed the GARCH (Generalized Autoregressive Conditional Heteroskedasticity) model. This model captures the changing variance of exchange rate returns over time and has become widely used in empirical studies on exchange rate volatility. Several researchers have investigated the exchange rate volatility effect on economic findings. For example, Bahmani-Oskooee and Aftab (2017) examined the asymmetric impact of exchange rate volatility on US-Malaysian trade flows at the industry level, using NARDL and ARDL models. Findings reveal, volatility of the exchange rate had a negative influence on trade, especially in the short-run, and that this effect varied across industries, with manufacturing and mining being the most affected (Bahmani-Oskooee & Aftab, 2017).

Broner et al. (2013) argued that exchange rate volatility reduces FDI flows, especially in high technology and knowledge-intensive sectors, as these sectors face more risk and uncertainty. They suggested that more stable exchange rates would foster more investment in these sectors(Broner et al., n.d. 2013).

Finally, Barguellil, Ben-Salha, and Zmami (2018) analysed the exchange rate volatility effect on economic growth, employing a panel data set of 63 countries from 1990-2014. The outcomes showed that exchange rate volatility had a negative effect on growth, and that this effect was stronger in developing countries than in developed ones (Barguellil et al., 2018).

Overall, exchange rate volatility is a complex phenomenon that can have significant consequences for economic performance. Although it is difficult to forecast, some models, such as the GARCH model, can help estimate its magnitude. The literature review has highlighted some of the main findings and contributions of research on exchange rate volatility and its effects.

Exchange rate Shocks

The impact of exchange rates' unexpected fluctuations on both domestic and international investment has been the subject of other research. Forbes and Warnock found that exchange rate shocks can significantly affect the investment decisions of multinational corporations because they alter the relative profitability of various

investment opportunities in various countries. Forbes and Warnock (Forbes & Warnock, 2012) demonstrated, fluctuations in the value of a currency's exchange rate can change the nature and destination of incoming foreign direct investment.

Some research has also looked at the smaller scale exchange rate shocks effect on individual businesses and families. Goldberg and Tille (L. S. Goldberg & Tille, 2008) found that fluctuations in the value of the currency can cause shifts in the cost of imported goods, which in turn can influence consumer behavior. Goldberg and Khandelwal (P. K. Goldberg et al., 2010) found similar results, demonstrating how unexpected changes in exchange rates can influence the exporting behavior of businesses, especially those with less experience in global markets.

The fluctuating exchange rates impact on global commerce has been the subject of another substantial body of study. An example of this is Rose's work (Rose et al., 2000), in which she employs a "gravity model" of trade to demonstrate how fluctuations in the value of one country's currency can have a dramatic effect on the volume of its bilateral trade with another. The results of this study have significant implications for policymakers because they suggest that reducing exchange rate volatility may be an efficient way to promote international trade.

Exchange Rate during the Covid-19 Pandemic

Aloui (2021) explores how quantitative easing influenced the exchange rate during the COVID-19 pandemic (Aloui, 2021) . The study finds that the pandemic increased the demand for safe-haven currencies, for instance , Euro, the US. Dollar and the Swiss franc, as investors sought to hedge against uncertainty. Wei and Han (2021) analyze how monetary policy transmission was affected by the pandemic (Wei & Han, 2021) . The study shows that the pandemic reduced investors' risk appetite and led to lower asset prices and tighter financial conditions.

Beckmann and Czudaj (2022) investigate how exchange rate expectations were formed and how they affected abnormal returns in the foreign exchange market thoughout the pandemic. The study reveals that exchange rate expectations were driven by pandemic-related news, such as the number of infections and deaths, and by global risk sentiment, as measured by the VIX index (Beckmann & Czudaj, 2022). The study also finds that abnormal returns were positively correlated with the deviation of

exchange rate expectations from fundamentals, indicating that market sentiment was a key factor in exchange rate movements during the pandemic.

Narayan (2022) identifies the determinants of exchange rate shocks during the pandemic. The study suggests that exchange rate shocks were influenced by both global and domestic factors (Narayan, 2022) . Global factors include changes in global risk sentiment and the US dollar exchange rate, while domestic factors include changes in interest rates and inflation expectations.

Boubaker et al. (2021) provide evidence of interdependence among exchange rates during the financial crisis and the COVID-19 outbreak. The study notes that the degree of interdependence increased during the COVID-19 crisis compared to the financial crisis (Boubaker et al., 2021). Thai Hung et al. (2022) examine the relationship between exchange rate volatility and the COVID-19 pandemic using DECO-GARCH and Transfer Entropy methods. The study finds significant links between the currency volatility and the COVID-19 pandemic.

Amewu et al. (2022) study the relationship between equity index and exchange rate throughout the COVID-19 period. The study shows evidence of bidirectional causality between the variables, implying a long-run equilibrium correlation between equity index and exchange rate in four out of five countries studied (Amewu et al., 2022).

Kapalu and Kodongo (2022) compare the responses of financial markets in six African countries to the COVID-19 pandemic. The study concludes that the pandemic had a severe impact on the financial markets of these countries, resulting in sharp declines in stock prices and exchange rates. The study also suggests that financial markets play a crucial role in the occurrence of currency crises, and that the third-generation model of exchange rate crises is relevant for the African context (Kapalu & Kodongo, 2022).

RESEARCH METHODS

Research Methods

This study employs a quantitative approach and employs the Autoregressive Distributed Lag Model (ARDL). The data is secondary and is a time series from January 2020 to December 2022. This investigation has several data sources, including the World Bank, Bank Indonesia (B.I.), World Bank GEM, and OECD Statistics.

The exchange Rate Level Model

This research employs Exchange rate of two different emerging countries as an independent variable, while Interest rate differential, Inflation rate differential, GDP, Stock Market are the independent variables. (Bahmani-Oskooee & Aftab, 2018) , the ARDL Long-run model can be written as:

$$LnE_{jt} = \alpha_t + \beta_{0t} LnE_{t-1} + \beta_1 IRD_t + \beta_2 INFD_t + \beta_3 IPI_t + \beta_4 STM_t + \mathcal{E}_t \qquad \text{(Eq 1)}$$

Where LnE_{jt} denotes the natural logarithm of the country's exchange rate j at time t, α_t a Constant, β the coefficients of the independent variables, LnE_{jt-I} the natural logarithm of the country's exchange rate j in the $-i^{th}$ lag, IRD_t the logarithm of interest rate differential, $INFD_t$ the logarithm of inflation rate differential, IPI_t the logarithm of Industrial Production Index, STM_t the logarithm of stock market index, $\mathcal{E}_t$ the error term at time t.

The Short-Run of ARDL estimation is as follows:

$$\Delta LnE_{jt} = \alpha_t + \Sigma_{i=1}^{n1}\beta_{0i} \Delta LnE_{jt-i} + \Sigma_{i=0}^{n2}\beta_{1i} \Delta IRD_{t-i} + \Sigma_{i=0}^{n3}\beta_{2i} \Delta INFD_{t-i} + \Sigma_{i=0}^{n4}\beta_{3i} \Delta IPI_{t-i} +$$

$$\Sigma_{i=0}^{n5}\beta_{4i} \Delta STM_{t-i} + \lambda_0 LnE_{t-1} + \lambda_1 IRD_{t-1} + \lambda_2 INFD_{t-1} + \lambda_3 IPI_{t-1} + \lambda_4 STM_{t-1} + \mathcal{E}_t \quad \text{(Eq 2)}$$

Where ΔLnE_{jt} is a change in the natural logarithm of the country's exchange rate j at time t, α_t Constant, β the coefficients of the independent variables, ΔLnE_{jt-i} a change in the logarithm of the country's exchange rate j in the $-i^{th}$ lag ΔIRD_{t-i} change in the interest rate differential in the $-i^{th}$ lag, $\Delta INFD_{t-i}$ change in inflation rate differential in the $-i^{th}$ lag, ΔIPI_{t-I} changes in the GDP of the domestic country in the $-i^{th}$ lag, ΔSTM_{t-i} a change in the stock market in the $-i^{th}$ lag, LnE_{jt-1} the logarithm of the country's exchange rate j at time t in the -1th lag, IRD_{t-1} the logarithm of interest rate differential in the -1th lag, $INFD_{t-1}$ the logarithm of inflation rate differential in the -1th lag, IPI_{t-1} the logarithm of IPI in the -1th lag, STM_{t-1} the logarithm of Stock Market index in the -1th lag, and $\mathcal{E}_t$ the error term at time t.

The main assumption in equations (Eq 1) and (Eq 2) demonstrate the elasticity of the exchange rate is considered the same for depreciation and appreciation. (Bahmani-Oskooee et al., 2016) argue that the expectations and reactions of 'traders' regarding depreciation can be different from appreciation. (Shin et al., 2012) , who developed asymmetric cointegration concept, presented decomposing the concern variables into positive and negative changes.

Overall, the ARDL equation can be used to estimate the short-run and long-run relationships between the exchange rate and the independent variables, taking into account the possible non-linear effects and asymmetries in the relationship, as well as the potential impact of the Covid-19 pandemic on the exchange rate.

Hypothesis

Ha: $\beta_1 < 0$; If β_1 is statistically less than zero, the changes in the value of interest rate differential (IRD_t) will negatively influence on the exchange rate (LnE_t).

Ha: $\beta_2 > 0$; If β_2 is statistically greater than zero, indicates that the changes in value of inflation rate differential ($INFD_t$) will have a positive impact on the exchange rate (LnE_t).

Ha: $\beta_3 < 0$;   If β_3 is less than zero, the changes in Industrial Production Exchange (IPI) will negatively affect the exchange rate (LnE_t).

Ha: $\beta_4 > 0$;   If β_4 is greater than zero, indicating a positive impact of the stock market ($X4t$) index on the exchange rate (LnE_t).

EMPIRICAL RESULTS

This study examines how the exchange rate level of India and Indonesia changed during the covid-19 pandemic, and what factors influenced these changes. Compare and contrast the exchange rate performance of six Emerging Market with different macroeconomic variables, such as interest rate differential, inflation rate differential, industrial production index, and stock market. According to the findings in Table 2, the optimal lag for both emerging markets are 4.

Cointegration Bound test

The cointegration test used in this research uses the Bound Test approach. The results of this approach are exhibit in the table below. Table 4.1 demonstrates, there are 2 countries including India and Indonesia are cointegrated due to the F-statistics exceed the upper bound value I(1) at lag L_2. Therefore, this study confirms the sufficient evidence to support the long-run relationship among the variables in this regression model.

Short-Run Exchange Rate Level Estimation

The findings of the short-run exchange rate level estimation for India and Indonesia reveal that the negative and significant ECT (-) coefficients indicate a long-run equilibrium relationship between the exchange rate and the exogenous factors in

both Emerging Market countries. It also means that any deviation from the equilibrium will be corrected in the next period by the adjustment factor of -0.3899 for India and -2.5592 for Indonesia.

The findings of the short-run exchange rate level estimation in Table 2 shows that the Interest rate differential (IRD) negatively affects the exchange rate level of both India and Indonesia. A negative coefficient means that an increase in the IRD during the COVID-19 period led to a depreciation of both domestic currency India and Indonesia. The findings align with Bahmani-Oskooee & Aftab (2018) studies; in the short-run, lower interest rate in India led to Indian Rupee and Indonesian Rupiah less attractive to investors, then the Indian rupee loses value against the US dollar. The IRD coefficients are significant for both countries, indicating that in the short run, the IRD is a critical determinant of the exchange rate the COVID-19 period.

Indonesia's inflation rate differential (INFD) positively affected the exchange rate during the COVID-19 Outbreak. This means that in the short-run, an increase in the INFD led the Indonesia Rupiah against the US Dollar to a depreciation throughout the Pandemic. For example, if inflation rate in Indonesia is higher than the US, the Indonesian Rupiah will lose value against the US dollar. The INFD coefficient is insignificant for India, and the finding shows the significance in the p-value.

Indonesia's Industrial Production Index (IPI) negatively influences the exchange rate during the Global Pandemic. This denotes that in the short-run, a decline in the IPI led the Indonesian Rupiah against the US Dollar to depreciate during the COVID-19 pandemic. Conversely, IPI of India did not affect the exchange rate throughout the COVID-19 pandemic due to insignificance in the p-value.

The Stock Market (STM) of India and Indonesia negatively impact the exchange rate during Pandemic. This implies that a decrease in STM led the Indian Rupee and Indonesian Rupiah against the US Dollar to depreciate during Pandemic.

Long-Run Exchange Rate Level

The findings in Table 4, the Long-run exchange rate level estimation for India and Indonesia demonstrate that the negative and significant ECT (-) coefficients. Meaning, there is a long-run equilibrium correlation between the exchange rate level and the exogenous factors in both Emerging Market countries. Any deviation from the

equilibrium will be corrected in the next period by the adjustment factor of -0.3899 for India and -2.5592 for Indonesia, shown in Table 4.

The results presented in Table 4 indicate that over a prolonged period, the IRD of India and Indonesia has a negative impact on the exchange rate levels of both countries. Meaning, the decrease in interest rates in India over time has resulted in Indian Rupee and Indonesian Rupiah becoming less attractive to investors, causing the Indian rupee to depreciate against the US dollar. Both countries exhibit significant IRD coefficients, suggesting that the IRD plays a crucial role in determining the exchange rate in the long run, particularly during COVID-19.

INFD of both India and Indonesia did not impact the exchange rate during the COVID-19 pandemic despite the negative findings and the significance of the p-value. Based on the findings, Indonesia's IPI negatively impacts the exchange rate in the long-run, particularly during the Global Pandemic era. Indicating that a decrease in Indonesia's IPI between 2020 and 2022 resulted the Indonesian Rupiah against the US Dollar depreciation in the long-term. In contrast, the Indian IPI did not impact the exchange rate during the COVID-19 pandemic because it was deemed statistically insignificant based on the p-value.

According to Table 4, both countries exhibit negative and statistically significant STM coefficients, suggesting that the STM negatively affects the exchange rate in the long-run during the Global Pandemic. Meaning, decreased in STM during from 2020 to 2022 caused Indian Rupee and Indonesian Rupiah to depreciate.

CUSUM & CUSUMQ Test

The CUSUM and CUSUMQ test are used to examine the stability of exchange rate models during the covid-19 era and to compare the cumulative sum or squared residuals of exchange rate level with a critical line and reject the null hypothesis of stationarity if they cross it. Based on the test results in Figure 3, both Emerging Market countries, namely India and Indonesia have exhibited stable models.

CONCLUSION AND RECOMMENDATION

Conclusion

The short-run and long-run findings reveal that the Interest rate differential (IRD) and Stock Market (STM) negatively affect the exchange rate level of India and Indonesia, causing a depreciation of this Emerging Market domestic currency against

the US Dollar. Moreover, Indonesia's inflation rate differential (INFD) positively affected the exchange rate in the short-run, leading the Indonesia Rupiah against the US Dollar to depreciate during Pandemic. The IPI negatively impacts the exchange rate of India and Indonesia in the short run and long run during the COVID-19 outbreak. Overall, this study demonstrates that the interest rate differential (IRD) is the most significant factor influencing exchange rates for both countries in the short-run and long-run, as it reflects the attractiveness of their currencies to foreign investors. Inflation rate differential (INFD) and industrial production index (IPI) are also important for Indonesia, as they indicate the country's purchasing power and economic activity. The stock market (STM) is another factor that affects both Emerging Market countries, India and Indonesia, as it represents the confidence and the expectations of the market participants.

Recommendations

Based on the conclusion, in the short-run and long-run, both India and Indonesia should adopt monetary policies that maintain a competitive interest rate level and stabilize the exchange rate fluctuations. Indonesia should also implement fiscal policies that control inflation rate and stimulate industrial production. Moreover, India and Indonesia, should monitor inflation rate and industrial production index and implement measures to stimulate economic growth and reduce price volatility. Both countries should enhance the transparency and the efficiency of their stock markets to attract more domestic and foreign investors.

Research limitation

This study has some limitations that should be acknowledged: The sample period is relatively short and may not capture the full influence of COVID-19 on the exchange rate level and volatility of two emerging countries. This investigation only considers four macroeconomic variables as determinants of exchange rate fluctuations while ignoring other factors such as trade balance, fiscal policy, and political stability.

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TABLES

Table 1 - Cointegration Bound test for Exchange Rate Level

Cointegration Bound test		
	India	Indonesia
F-Statistic	1.229	3.624
I(0), L_1	2.45	2.45
I(1), L_2	3.52	3.52

Source: Stata 17 (Processed data)

Table 2 – Optimal Lags Selection

Optimal Lag Selection		
	India	Indonesia
AIC (*)	4	4

Source: Stata 17 (Processed data)

Table 3 - Short-Run Exchange Rate Level

| Short-Run Exchange Rate Level Estimation		
	India	Indonesia
Variables	Coefficient	Coefficient
ECT(-)	-0.3899314*	-2.559205*
IRD	-0.0144411*	-0.0364475*
INFD	-0.0038651	0.0329871*
IPI	-9.14e-14	-2.04e-11*
STM	-0.0008207*	-0.0029661*

Source: Stata 17 (Processed data)

Table 4 - Long-Run Exchange Rate Level

Long-Run Exchange Rate Level Estimation		
	India	Indonesia
Variables	Coefficient	Coefficient
ECT(-)	-0.3899314*	-2.559205*
IRD	-0.0576804*	-0.0240156*
INFD	-0.029048*	-0.022378*
IPI	-2.34e-13	-6.10e-12*
STM	-0.0021048*	-0.001159*

Source: Stata 17 (Processed data)

FIGURES
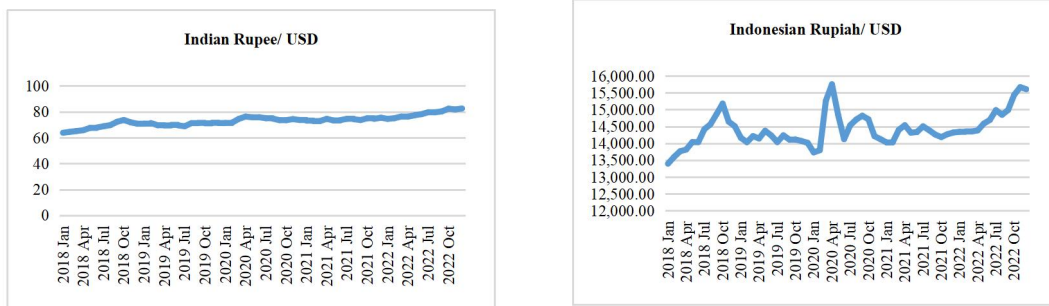
Source: OECD Statistic (Processed data)

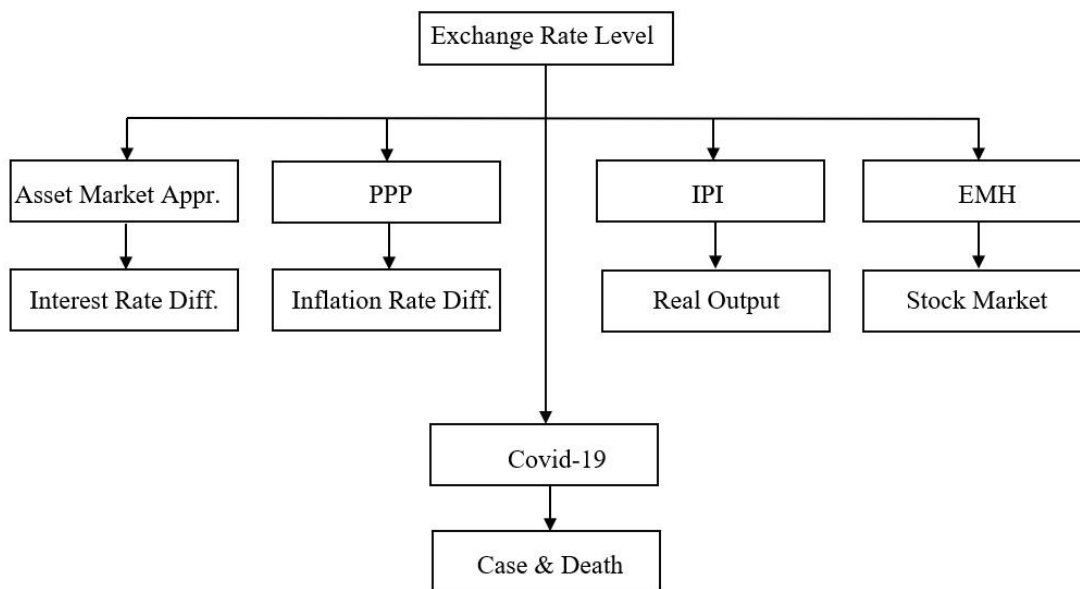Figure 1 - Emerging Markets' Exchange Rates 2018 - 2022
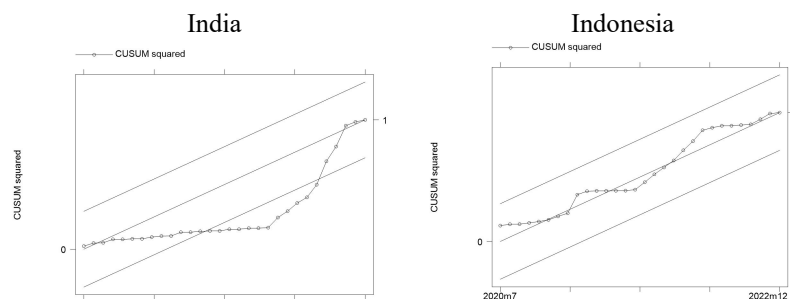

Figure 2 - Theoretical Framework

Figure 3 - CUSUM & CUSUMQ Test

Source: Stata 17 (Processed data)