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Analysis of oil price, trade openness and business cycle on exchange rate in Indonesia

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Abstract: The importance of exchange rate stability in achieving macroeconomic policy objec-tives cannot be ignored by developed or developing countries, including Indonesia. The adaptability of exchange rate management policies in achieving the macroeco-nomic policy goals is a testament to the resilience of the system. However, exchange rate stability cannot occur by itself, it depends on macroeconomic conditions. The research applies the ARDL method to analyze the short and long term influence of macroeconomic variables on exchange rates. The research results show that oil pric-es have a negative and significant impact on the rupiah exchange rate in the long term, while trade openness has no effect in the short and long term. The ARDL model consistently shows the negative influence of business cycle variables on ex-change rates in the short and long term.The implication of the research is that maintaining the stability of domestic macroeconomic conditions through increasing people's purchasing power, encouraging exports and export diversification, especial-ly in the manufacturing sector, which not only has a large multiplier effect in ab-sorbing labor but also can be a significant tool for stabilizing the exchange rate.

Keywords: Oil Price; Trade Openness; Business Cycle; Exchange Rate; ARDL
JEL Classification: E32; E50; E60

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Introduction

Indonesia has experienced several changes in exchange rate regimes which were followed by changes in the period of leadership of the Republic of Indonesia. The change in the exchange rate system in Indonesia was due to specific policy adjustments, such as changes in interest rates or currency interventions, to macroeconomic conditions in Indonesia (Arifin & Mayasya, 2018). These adjustments were made in response to factors such as inflation, economic growth, and balance of payments. Changes in a country's economic system that occur quickly can affect the economy of other countries, especially countries that are economic partners or that have close economic relations. Changes in demand and supply occur as a result of trade in goods or services, changes in capital flows, government activities, changes in foreign exchange reserves, as well as changes in social and political conditions in a country (Silitonga et al., 2017).

The adaptability of exchange rate management policies in achieving the macroeconomic policy goals is a testament to the resilience of the system, and this cannot be overlooked by developed or developing countries. The exchange rate is a key factor in assessing the performance of an economy (Salim & Soelistyo, 2024). To achieve a stable exchange rate, governments, especially in developing countries, have implemented various exchange rate management policies. Since 1997, the government, through Bank Indonesia, has decided to adopt a free floating exchange rate system in response to the currency turmoil in Thailand that affected ASEAN countries and the diminishing foreign exchange reserves. Even though a freely floating exchange rate system is in place, foreign exchange intervention activities are still being carried out to eliminate distortions in the foreign exchange market, showcasing the adaptability of the system.

The floating exchange rate regime can absorb shocks in the long term but becomes a source of shocks in the short term (De, 2024). These findings were proven by Miteza et al (2023) in Albania, that the freely floating exchange rate was able to absorb shocks and act as a buffer for the Albanian economy, in addition to their findings that monetary and supply side shocks had a small contribution to exchange rate volatility. Neaime & Gaysset (2023) found that implementing a floating exchange rate regime in Egypt could reduce the debt-to-GDP ratio to below 100 percent. Egypt has also succeeded in controlling the budget and current account deficits and re-establishing financial stability and economic growth. Implementing a floating regime on the exchange rate also causes the exchange rate to be unstable (Basri & Sumartono, 2023). The cause of unstable exchange rates is due to changes in demand and supply resulting from trade in goods or services, changes that occur in capital flows, government activities, changes in foreign exchange reserves, as well as changes in social and political conditions in a country (Silitonga et al., 2017).

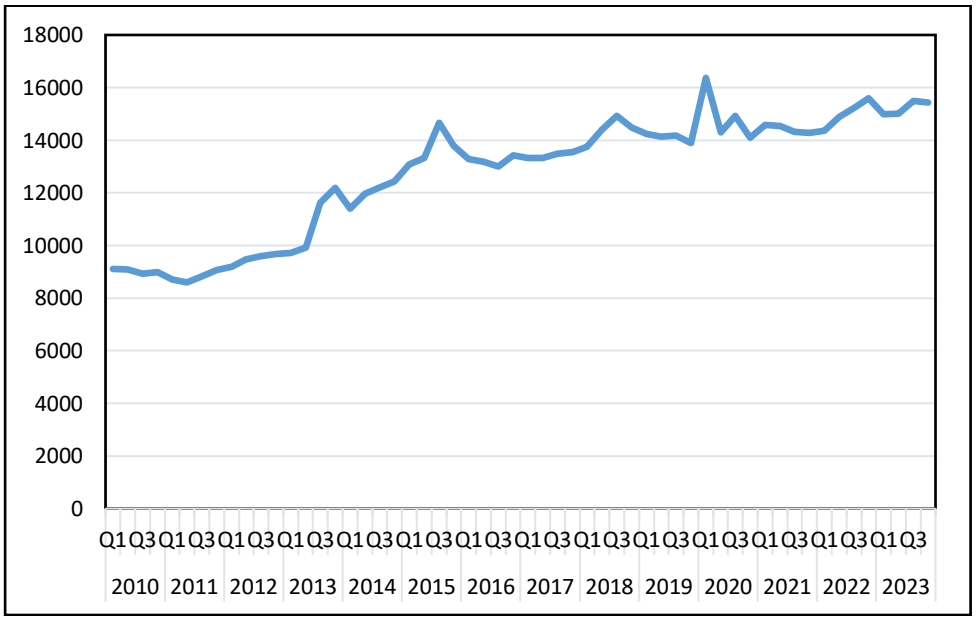

Figure 1 Fluctuation of Exchange rate in Indonesia

Figure 1 shows that the exchange rate in Indonesia from 2010 to 2020 continued to increase, and there was also a spike in 2015 in September, namely 14,657.00 per US dollar. In 2020, in March, there was an increase of 16,367.00 per US dollar due to waves *of capital outflow* in Indonesia, but this is normal due to global panic. Wave *capital outflow* due to global panic due to the pandemic, the value of the rupiah was depressed, and the exchange rates of all countries rose. This figure makes the rupiah tend to weaken compared to 2019 in the fourth quarter, to be precise in December, at 13,901.00 per US dollar. This figure is far higher than the following year, which was affected by the pandemic in 2020. Exchange rate fluctuations in recent years were due to increasing global uncertainty, which impacted the domestic economy (Kurniawan et al., 2022).

For oil exporting countries, rising oil prices can have an impact on the economy in two ways, namely first, through increasing revenue and welfare. The increase in oil prices shows a transfer of welfare from oil importers to oil exporters. In the medium to long term, the impact depends on what oil producers (in this case the government) will do with the additional revenue. If these revenues are used to purchase goods or services in the country concerned, it is certain that an increase in oil prices will lead to higher domestic economic activity (Hakim & Pangestuti, 2013). Changes in oil prices can affect the US dollar exchange rate through their impact on industrial production, stock market performance and economic growth. However, as a country that has an oil and gas sector, the increase in world oil prices increases export revenues from oil and gas. This increase means that more foreign currency will enter Indonesia, then demand for the rupiah will increase. An increase in oil exports helps improve the balance of payments, reducing the deficit or creating a surplus. And the rupiah exchange rate will tend to appreciate (Musa et al., 2020).

Study from Nandi et al (2024) states that oil price shocks have a long-term impact on exchange rate volatility and exchange rate volatility has an asymmetric effect, where negative effects cause higher exchange rate volatility compared to positive shocks. Kisswani & Fikru (2023) using the Quantile Regression (QR) approach shows that there is an asymmetric effect triggered by oil prices on all exchange rate quantiles in 5 ASEAN countries. Zorgati (2023) emphasizes that there are indications of dependency and asymmetric effects between oil prices and the exchange rate, besides that oil prices have a stronger spillover effect on oil exporting countries than on oil importing countries. The use of oil price variables has attracted the attention of academics, especially in Indonesia, where Indonesia is a crude oil exporting country and an oil importing country, in this case it shows that global oil price shocks can have an impact on the rupiah exchange rate.

Calderón & Kubota (2018) analyzed variables that can reduce exchange rate volatility, the research results show that trade composition is important for exchange rate stabilization, and manufacturing sector trade helps reduce exchange rate volatility while non-manufacturing trade can contribute to higher exchange rate volatility. Kim Lien et al (2022) states there is a causal relationship between trade openness and the exchange rate in Vietnam, where there is a positive relationship between trade openness and the exchange rate and a negative relationship between the exchange rate and trade openness. Hau (2002) also analyzed in 48 countries the relationship between trade

openness and exchange rate volatility. The results of the study showed that measures of trade openness explained most of the variation between countries in exchange rate volatility. The relationship between trade openness and the exchange rate has been widely developed by previous researchers. This research explores how much influence trade openness has on the exchange rate in Indonesia.

Baxter & Stockman (1989) show that stronger exchange rates are often associated with the expansion phase of the business cycle. Frankel & Rose (1996) state that economic integration and stable exchange rates can support a positive relationship between business cycles in various countries. If a country experiences expansion and its currency appreciates, countries with trading partners whose economies are related can also experience growth, driven by increased investment and trade. In this way, the relationship between business cycles in various countries can be strengthened by exchange rates. Baxter & Stockman (1989) states while the economy is in a contraction or recession phase, the exchange rate will tend to weaken or experience depreciation. During an economic contraction, economic activity will decrease and companies and consumers reduce purchases of goods and services. This may reduce demand for domestic currency as transactions decrease. Decreased domestic product can also cause a decrease in exports, a decrease in exports which means that income from abroad in the form of foreign money also decreases.

To encourage economic growth during a recession the central bank will lower interest rates, so low interest rates can make investments in domestic currency less attractive for foreign investors which causes depreciation of the exchange rate. This is in line with Menzie (2008) research that the business cycle has a positive and significant influence on the exchange rate. To bridge the gap between previous studies this study conducted the relationship between the business cycle and exchange rates. in a freely floating exchange rate regime, exchange rate fluctuations can occur under the conditions of the business cycle itself. The use of business cycle variables as a proxy for income is because it can review the contraction phase of the expansion of economic activity (Melati & Kurniawan, 2023). The research contribution to the literature is 1) examining the dynamic relationship between oil prices, trade openness and the business cycle on the exchange rate in Indonesia; 2) The dynamic relationship is tested using the autoregressive distributed lag model (ARDL) method approach. This cannot be separated from the fact that some regression or vector autoregressive (VAR) models cannot explain the alleged relationship due to misidentification of exogenous shocks (Christiano et al., 1999); 3) application of business cycles to determine exchange rate patterns when the economy is in contraction and expansion phases and 4) strengthening existing literature regarding the role of oil prices and trade openness on exchange rates in Indonesia.

Theoretical Framework and Hypotheses

The relationship between the exchange rate and macroeconomic variables can be explained through the IS-LM curve that connects the exchange rate and its relationship with the open economy through the balance of payments with the assumption of purchasing power parity (PPP) and interest rate parity (IRP) (Warjiyo, 2005). In addition,

in developing countries such as Indonesia, the most prominent challenge is related to controlling exchange rate stability because it affects domestic macroeconomic conditions such as weak international competitiveness, declining foreign exchange reserves, import growth, unstable capital account, and the emergence of debt crises (Jebeniani & Trabelsi, 2022). The exchange rate regime plays a role in the depreciation and appreciation of the exchange rate. Warjiyo (2005) explains that monetary policy strongly influences actual output in a flexible regime but not in a fixed exchange rate regime, while the opposite is true for fiscal policy. Since the collapse of Breton Wood, many countries have adopted flexible exchange rate regimes that have resulted in exchange rate volatility.

Andersson et al (2009) state that the business cycle is essential in exchange rate movements and domestic price increases in Euro-denominated countries. Therefore, research applying the business cycle is attractive in addition to the fact that there has been an increase in economic uncertainty in the last decade, which has caused exchange rate fluctuations. There are indications of divergence in economic growth and unsynchronized business cycles, so it is essential to investigate economic activity throughout the business cycle and its effect on exchange rates. Cheikh et al (2018) stated that the transmission of the exchange rate to inflation responds to economic activity non-linearly, and exchange rate fluctuations are higher during the expansion phase than the recession phase of the business cycle. McCarthy (2007) states that changes in aggregate demand (proxied by the output gap) are related to exchange rate fluctuations, and countries with unstable aggregate demand have lower exchange rate fluctuations.

Jašová et al (2016) stated that after the global financial crisis, exchange rate fluctuations are more synchronized with the business cycle in some countries. This synchronization has a significant impact on the stability of the domestic economy, as extreme depreciation can be neutralized and adjustments for consumers and companies in financial planning are more stable, thereby increasing purchasing power. However, such synchronization is rare, especially in developing countries and countries that adopt a free-floating exchange rate regime. Therefore, the urgency of applying business cycle research to understand the pattern of exchange rate fluctuations and its response to the influence of the business cycle in the short and long term cannot be overstated. Jebeniani & Trabelsi (2022) explained that exchange rate stability has a crucial impact on export competitiveness. This occurs when exchange rate depreciation encourages exports, but long-term depreciation can significantly impact domestic economic stability. Seftarita et al (2020) stated that in an open economy and free floating exchange rate regime, it has a profound impact on international market volatility, which in turn affects trade and investment decisions.

Kim Lien et al (2022) stated that trade openness has a two-way relationship with exchange rates in Vietnam. Kacaribu et al (2021) with a panel data approach on 52 countries stated that trade openness has a negative effect on exchange rate volatility. Countries with competitive exchange rates are easier to compete in the international market, but countries that are oriented towards an open economy and have uncompetitive exchange rates will find it difficult to compete in the international market. Trade openness itself has advantages in increasing competitiveness, applying renewable technology and resource efficiency (Taiwo & Olalekan, 2021). However, the negative impact of extreme exchange

rate fluctuations cannot be overstated. It leads to trade deficits, intense competition in international markets and the emergence of global risks through global economic dependence (Yang & Liu, 2024). Addressing this issue is of utmost importance for maintaining global economic stability through exchange rate stability.

Research Method

Research on exchange rates has been widely developed by previous researchers, such as research by Carissa & Khoirudin (2020) which applies import variables and domestic interest rates in the model and shows that these two variables have an effect on the exchange rate. Pratiwik & Prajanti (2023) who analyzed monetary variables on the exchange rate and found that inflation and the money supply had a positive effect on the exchange rate in the short and long term and domestic interest rates had a negative effect. Safitri et al (2021) found that remittances have an effect on the exchange rate in Indonesia. Salim & Soelistyo (2024) apply economic uncertainty variables with dummy variables and show that economic uncertainty has an effect on exchange rates. Kacaribu et al (2021) stated that trade openness plays an important role in exchange rate volatility in 52 countries including Indonesia.

Research data sources were taken from Bank Indonesia, Central Statistics Agency, Brent oil price and International Financial Statistics. The analysis uses the ARDL method to test the variables used in the model against exchange rates and their short and long term estimates. In simple terms, the model equation developed is as follows:

$$LnEr_t = \alpha_0 + \beta_1 LnOp_t + \beta_2 To_t + \beta_3 Inf_t + \beta_4 FDI_t + \beta_5 Bc_t + \varepsilon_t$$

Where Er is the rupiah exchange rate against the US dollar; Op is the price of oil; To is trade openness; Inf is inflation; FDI is foreign direct investment; Bc is the business cycle; Ln is the logarithmic form. Long-term existence in the ARDL model uses the bound test approach. Pesaran, Shin, and Smith (2001) applied the bound test as a cointegration test to handle differences in the level of integration between variables. The ARDL model developed is as follows:

$$\begin{aligned} LnEr_t = a_0 + a_{1i} \sum_{i=1}^{n} \Delta LnEr_{t-1} + a_{2i} \sum_{i=1}^{n} \Delta LnOp_{t-1} + a_{3i} \sum_{i=1}^{n} \Delta To_{t-1} \\ + a_{4i} \sum_{i=1}^{n} \Delta Inf_{t-1} + a_{5i} \sum_{i=1}^{n} \Delta FDI_{t-1} + a_{6i} \sum_{i=1}^{n} \Delta Bc_{t-1} \\ + \beta_1 LnOp_t + \beta_2 To_t + \beta_3 Inf_t + \beta_4 FDI_t + \beta_5 Bc_t + e_t \end{aligned}$$

Where the bound cointegration test uses the calculated t-statistic and H0 states that there is no cointegration in the model or is explained by (H0:δ1 = δ2 = δ3 = δ4 = δ5 = 0). The F-statistics is tested and compared with the lower and upper limit values or those classified by I(0) and I(1). If the F-calculated value is greater than the critical lower and upper limit values then H0 is rejected, which means that the research model contains cointegration. The research applies the filter method to form cycles. Application of cycles in research

models to analyze the pattern of a variable in the expansion and contraction phases of the economy (Melati & Kurniawan, 2023). The research applies the Band Pass filter method from Christiano & Fitzgerald (2003) which has several advantages, namely: 1) Considering the assumed spectral density of the original data and 2) eliminating stagnation and symmetry conditions in the filter coefficients. According to Iacobucci & Noullez (2005) there is an optimization of the coefficients of the band pass filter to separate the spectral density from the original data with the following equation:

$$\min_{\{g_j\}} \int_{-(2\Delta t)^{-1}}^{(2\Delta t)^{-1}} dv \left| \sum_{\{j\}} \left(g_j - g_j^{ideal}\right) e^{-12\,\pi\, jv\Delta t} \right|^2 |U^{exact}(v)|^2$$

If the exact spectral density of the original data $U^{exact}(V)U^{exact}(V)$ previously known, the set of coefficients $\{g_j\}\{g_j\}$ given by the solution of the optimization problem, coefficients $\{g_j\}\{g_j\}$ used is the GDP variable which is filtered into the business cycle. Melike & Selçuk (2012) argue that the filters used in econometric models enable the construction of multivariate economic models and allow model data parameters to be adjusted to form a certain pattern.

Result and Discussion

Business Cycle

This business cycle shows fluctuations in gross domestic product (GDP). During the expansion period the economy grew very quickly. Conversely, during a period of contraction, it will experience stagnation or decline. Figure 2 shows the stages of economic expansion and contraction from year to year, after the 2008-2009 global crisis, the economy began to recover in 2010 and this year Indonesia experienced an increase in investment, both domestic and foreign as well as demand for Indonesian commodities such as palm oil, figs and rubber will increase, which will increase economic growth and expansion will occur in 2010Q3. In 2012Q1, the economy experienced a contraction in the value of GDP, a decline in which the contraction was not very deep but occurred over a relatively long period of time. Then followed in 2013Q3, there was a contraction caused by the weakening of the rupiah exchange rate which had an impact on Indonesian trade, the increase in the BI rate had an effect on investment in production costs, and high inflation. Long after years of contraction in 2016Q3, Indonesia experienced quite high expansion under the leadership of President Joko Widodo in 2016 focusing on massive infrastructure development, including toll roads, ports and airports which can help economic growth.

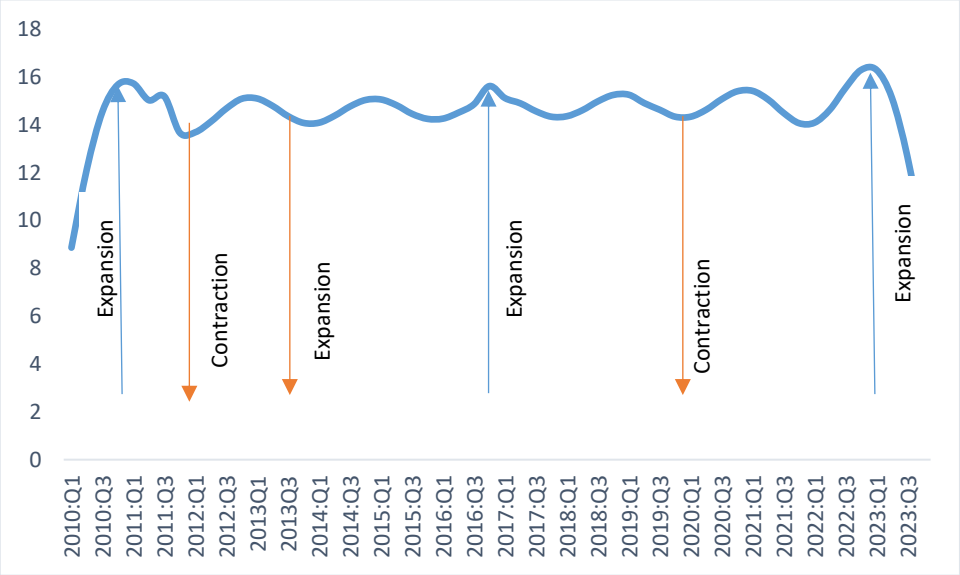

Figure 2 Graph of Business Cycle based on Christiano and Fitzgerald Filter

This year several commodities experienced a recovery after sharp declines in previous years. Furthermore, in 2020Q1 Indonesia also experienced a contraction in economic growth and this caused Indonesia to experience deflation and a drastic decline due to unstable economic development. The changes that occurred were influenced by the Covid-19 pandemic. Seeing this contraction, the government issued a strategy to restore the economy, namely physical policy and monetary policy. During the Covid-19 crisis, the government also carried out fiscal stimulus through providing assistance to poor families, people affected by layoffs and credit relaxation. The fiscal stimulus disbursed by the government is large enough to withstand a more severe crisis. The Indonesian economy began to recover in 2023Q1, the tourism sector showed significant recovery this year. And Bank Indonesia maintains monetary policy by keeping interest rates at a relatively low level. The Indonesian government has begun to continue investing heavily in infrastructure projects.

Autoregressive Distributed Lag (ARDL) Model

This research applies a stationarity test using the Philips-perron (PP) approach. This is necessary because fluctuations in exchange rates, oil prices and business cycles can make the variance distribution unstable, making it prone to heteroscedasticity problems in the data. The stationarity test applies the intercept and non-intercept equations. Table 1 shows that in level form all variables except FDI and Bc produce data that is not stationary at I(0). Level I(0) shows that the data is not stationary, so it is transformed in first difference form. In the first difference form I(1) shows that all variables used in the model are stationary with the PP approach. In the stationarity test, it can be concluded that all variables used in the model are stationary at first difference or I(1). The research did not apply the stationarity test to the second difference I(2) because it could produce spurious regressions (Kurniawan & Khasanah, 2023).

Table 1 Stationery Test

Variable	Philips-Perron	
	Intercept	**None**
Er	Level	
	-1.268	1.953
Op	-2.635**	-0.175
To	-1.978	-0.391
Inf	-2.426**	-0.917
FDI	-6.195***	1.448
Bc	-4.319***	-0.257
Er	First Difference	
	-9.720***	-9.014***
Op	-9.623***	-9.719***
To	-8.454***	-8.542***
Inf	-8.462***	-8.531***
FDI	-27.393***	-22.028***
Bc	-3.163***	-3.300***

Note: The ***, **, and * indicate the statistically significant level at 1%, 5%, and 10%, respectively.

Pesaran et al (2001) applied the bound test as a cointegration test to test the stability of the model in long-term estimation. The model of the effect of monetary variables on exchange rates applies the Akaike Information Criterion (AIC) as the optimal lag test. Table 2. Shows that the model uses lag in the model (3, 4, 0, 2, 4, 1). The bound test results show that the calculated f-value is greater than the lower limit I(0) and the upper limit I(1) so that it rejects H0, which means that the model developed has cointegration.

Tabel 2 Cointegration Test

	Value	K
F-Statistic	10.86530***	5
	Critical Value Bounds	
Significance	I(0)	I(I)
10%	2.08	3
5%	2.39	3.38
2.5%	2.7	3.73
1%	3.06	4.15

Note: The ***, **, and * indicate the statistically significant level at 1%, 5%, and 10%, respectively.

Tables 3 and 4 show that in the short term, the coefficient obtained is 0.141, this means that if the price of oil increases by 1%, the rupiah exchange rate will appreciate by 0.14% and for the long term the coefficient value is -0.455, which means that if the price of oil increases by 1% then the rupiah exchange rate will depreciate by 0.45%. Oil prices have a positive effect on the exchange rate in the short term because Indonesia is one of the crude oil producing countries, if world oil prices rise, export revenues and related products will increase. So an increase in income results in an increase in foreign exchange receipts, which can strengthen the rupiah exchange rate against foreign currencies. High oil prices can improve Indonesia's trade balance, where exports increase faster than

imports. Improvements in the trade balance can increase demand for the rupiah in the short term. Oil prices have a negative and significant impact on the rupiah exchange rate in the long term, this is due to the increase in the cost of oil imports, Indonesia is one of the largest oil importing countries, resulting in pressure on inflation, and also the potential for capital outflow. Indonesia imports part of its oil needs and when oil prices rise, the increased import costs can worsen the performance of the trade balance because the country has to spend more rupiah to buy oil. Pressure on inflation that occurs due to rising oil prices can increase the costs of production and distribution of domestic goods and services, and that can cause inflation to rise and reduce purchasing power (Hakim & Pangestuti, 2013).

The trade openness variable has a lag value in the model of 0, short and long term estimates show that the trade openness variable has no effect on the exchange rate, this shows that trade activities and measures of trade openness in Indonesia have not been able to reduce exchange rate volatility. These findings contrast with research Calderón & Kubota (2018) states that trade composition is a tool for stabilizing the exchange rate. This could happen because manufacturing trade activity as the main component in exchange rate stabilization has not become a primary sector trade activity in Indonesia and greater trade activity occurs in the non-manufacturing sector. which in this sector can contribute to higher exchange rate volatility, secondly, the size of Indonesia's trade openness is still relatively smaller among regional countries.

Tabel 3 ARDL Estimation for Short and Long run

Variable	Coeffisient	t-Statistic
KURS(-1)*	-0.215	-5.839***
OP(-1)	-0.098	-2.967***
TO**	-0.005	-1.548
INF(-1)	0.018	4.850***
FDI(-1)	0.305	6.324***
SB(-1)	-0.016	-2.529**
D(KURS(-1))	-0.348	-3.013***
D(KURS(-2))	-0.439	-3.491***
D(OP)	-0.052	-2.596**
D(OP(-1))	0.141	5.229***
D(OP(-2))	0.072	2.740**
D(OP(-3))	0.117	5.244***
D(INF)	0.019	4.990***
D(INF(-1))	0.009	2.464**
D(FDI)	0.023	1.102
D(FDI(-1))	-0.273	-7.278***
D(FDI(-2))	-0.184	-6.637***
D(FDI(-3))	-0.125	-6.512***
D(SB)	-0.007	-1.173

Note: The ***, **, and * indicate the statistically significant level at 1%, 5%, and 10%, respectively.

Tables 3 and 4 show that the inflation variable has a positive and significant effect on the rupiah exchange rate in Indonesia. High inflation causes depreciation of the exchange rate. High prices cause people's purchasing power to fall, rising prices can be caused by a shortage of supplies of necessities thus encouraging imports to come in, imports that are higher than exports cause a trade balance deficit which can have an impact on exchange rate fluctuations. These findings are in line with research by Carissa & Khoirudin (2020) that inflation affects the exchange rate. Another way that inflation causes the exchange rate to depreciate is because when prices increase, the government, through Bank Indonesia, implements a contractionary monetary policy by increasing interest rates. The increase in interest rates aims to normalize rising prices (Warjiyo, 2013), resulting in capital outflows being greater than capital inflows which can cause the exchange rate to depreciate (Arifin & Mayasya, 2018). Several studies explain the relationship between inflation and the economy, especially economic growth, is becoming more complex, research by Kurniawan & Prawoto (2014) states that inflation levels 1-20 have no effect on economic growth, but the relationship between inflation and exchange rates is not as complex as on economic growth. Research by Afriyanti & Prasetiyo (2021) states that there is a relationship between inflation and the exchange rate. Kano (2024) argued variation of inflation including the trend of inflation as the primary driver of volatile and presistent exchange rate fluctuations. In term of trend inflation, and under positive trend of inflation, markets and policy maker's can adjust of the long term policy goal of the central bank for stability of exchange rate.

Tabel 4 Long-Run ARDL Estimation

Variable	Coefficient	t-Statistic
OP	-0.455	-3.229***
TO	-0.021	-1.569
INF	0.085	3.869***
FDI	1.420	7.346***
SB	-0.077	-2.356**
C	3.588	2.403

Note: The ***, **, and * indicate the statistically significant level at 1%, 5%, and 10%, respectively.

There are differences in the short and long term estimates of the ARDL model of the FDI variable, where in the short term the foreign direct investment variable has a negative effect on the rupiah exchange rate, this is because FDI is often influenced by global economic conditions, if there are changes in the monetary policy of developed countries that For example, if interest rates increase in the US, investors will withdraw their investments from Indonesia in search of higher returns elsewhere, withdrawals can cause depreciation of the rupiah exchange rate. These findings are in line with research by Prasetyawan (2016) Estimates in the long term show that FDI has a positive effect on the exchange rate, this occurs because an increase in incoming investment means an increase in demand for domestic currency. Likewise, an increase in net exports will result in the domestic currency exchange rate appreciating against foreign currencies. An increase in net exports means an increase in foreign exchange supply (Hodijah, 2015).

Tables 3 and 4 show that the business cycle has a negative effect on the exchange rate in the short and long term. During periods of recession or economic contraction, the rupiah exchange rate tends to weaken. Baxter & Stockman (1989) stated that when the economy is in a contraction or recession phase, the exchange rate will tend to weaken or experience depreciation. During an economic contraction, economic activity will decrease and companies and consumers reduce purchases of goods and services which has an impact on reducing demand for domestic currency because transactions decrease. Decreased domestic product can also cause a decrease in exports, a decrease in exports which means that income from abroad in the form of foreign money also decreases and the exchange rate depreciates. Chinn (2008) business cycles can influence exchange rates through changes in the demand and supply of domestic currency caused by fluctuations in economic activity. An economic improvement tends to cause an appreciation of the exchange rate, but an economic downturn tends to cause a depreciation of the exchange rate.

Conclusion

The importance of exchange rate stability in achieving macroeconomic policy objectives cannot be ignored by developed or developing countries, including Indonesia. However, exchange rate stability cannot occur by itself, exchange rate stability depends on macroeconomic conditions. The research applies the ARDL method to analyze the short and long term influence of macroeconomic variables on exchange rates. The research results show that oil prices have a negative and significant impact on the rupiah exchange rate in the long term, while trade openness has no effect in the short and long term. Consistency of the negative influence of business cycle variables on exchange rates in the short and long term in the ARDL model. The implication of the research is that maintaining the stability of domestic macroeconomic conditions through increasing people's purchasing power, encouraging exports and export diversification, especially in the manufacturing sector, because the manufacturing sector apart from having a large multiplier effect in absorbing labor, can also be a tool for stabilizing the exchange rate. Maintaining the business cycle in a stable condition, especially during the contraction phase because it can cause the exchange rate to depreciate which has an impact on the domestic economy. The weakness of the research is that it does not apply the Quantile Regression test to analyze in detail the conditions of the contraction and expansion phases and their influence on the exchange rate.

Author Contributions

Conceptualisation, M.L.A.K and C.T; Methodology, M.L.A.K and C.T; Investigation, C. T and S; Analysis, M.L.A.K and C.T; Original draft preparation, M.L.A.K; Reviewing and editing; M.L.A.K and S; Visualization, C.T. All authors have read and agreed to the published version of the manuscript.

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Conflict of Interest

The authors declare no conflict of interest.

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