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Analysis of the Effect of Exchange Rates, Inflation, Interest Rates, and Gross Domestic Product on the Balance of Trade in Indonesia

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ABSTRACT

Abstract: The swift growth of economic relations between nations has led to greater participation in expanding trade flows, thereby fostering increased capital exchange among the countries involved. This study aims to analyze the effect of exchange rates, inflation, interest rates, and gross domestic product on Indonesia's trade balance from January 2014 to December 2023. The data used in this study are secondary data with monthly periods obtained from *Badan Pusat Statistik* (*BPS*), *Bank Indonesia* (*BI*), and the Ministry of Trade. The analysis method employed is the Error Correction Model (*ECM*), aimed at examining the short-term and long-term effects of the variables studied. The results indicate that, in the short term, the variables of exchange rate, inflation, interest rates, and gross domestic product have no significant effect on the trade balance. However, in the long term, the variables of inflation, interest rates, and gross domestic product have a significant effect on the trade balance, while the exchange rate variable has no significant effect on the trade balance in the long term.

Keywords: Exchange Rates, Inflation, Interest Rates, Gross Domestic Product, ECM

INTRODUCTION

The rapid development of economic relations between countries leads to greater involvement in expanding trade flows, thereby encouraging the exchange of capital between the nations concerned (Cao et al., 2021; Ergano & Rao, 2019; Hu et al., 2020; Othman & Bello, 2019; Wotango & Ayele, 2023). Economic developments inevitably cause significant changes in macroeconomic parameters, which can in turn impact other countries (Chen et al., 2018; Efiza, 2017; Sitompul & Siahaan, 2020; Tri Murdo & Affan, 2021; Wibowo, 2021; Yudha & Hadi, 2019). One of the main aspects in fostering economic growth within a country is the expansion of trade. Efforts to increase trade that are carried out effectively and efficiently will produce output, which serves as the first step in achieving economic growth. In addition to promoting output, increasing a country's trade aims to generate foreign exchange that can be used as capital for importing raw materials from abroad. These materials are then utilized in production activities with the purpose of creating added value (Sumanaratne, 2023). The advancement of the digital economy increasingly demands the mastery of various technologies, especially those supporting economic and trade activities.

The growing and diverse needs of societies around the world drive countries to strive to meet the needs of their citizens. All countries, particularly developing nations, are continuously developing their traded products to penetrate international markets. International trade is a common activity among most countries in the world to reach

markets globally, meet human needs, and maximize the profits obtained by each nation (Desmintari et al., 2023). This process opens up economies, with global trends and economic developments affecting individual countries—such as Indonesia (Permana et al., 2023). Compared with trade that is limited to a single country, international trade encompasses a broader market scope, which can lead to higher economic growth, job creation, and both large- and small-scale business opportunities to gain profits (Dilanchiev & Taktakishvili, 2022).

In recent years, many countries' economies have experienced an expansion of international trade activities, significantly affecting developing nations. Constant fluctuations in trade balances present challenges, underscoring the importance of having a strong economic structure to take advantage of global trade opportunities. Independent and accountable government institutions are crucial for maintaining internal economic balance. With greater access to international markets, competition between countries has intensified. As a result, many government agencies are now giving serious attention to international trade, recognizing its substantial influence on the global economy.

The trade balance is calculated as the difference between the value of a country's exports and imports. Achieving a favorable trade balance allows a country to secure sufficient foreign currency for acquiring capital, goods, and services. Consequently, the trade balance is a vital component influencing both a country's balance of payments and its economic growth. A trade balance can be in surplus or deficit: a surplus occurs when a country sells more products abroad than it buys, whereas a deficit is the opposite. Although deficits are often seen as negative indicators, they are not always economically detrimental and must be considered in the broader domestic and international context.

Since 2019, Indonesia's trade balance has shown significant fluctuations, with a minor deficit recorded in 2019, followed by a surge in surplus from 2020 to 2022. The government has continued its efforts to boost foreign exchange earnings from trade, and *Bank Indonesia* plays a crucial role in maintaining the stability of the *rupiah* exchange rate to support international trade. While the trade balance surplus contributed to higher foreign exchange reserves, in 2023 a significant deficit emerged due to the depreciation of the *rupiah*, triggered by the strengthening of the United States dollar as a result of the US Federal Reserve's interest rate hikes.

Exchange rates greatly influence the trade balance because they determine the relative prices of goods and services in international trade. When the exchange rate weakens, domestic products become more competitive in the global market due to lower relative prices. Conversely, exchange rate appreciation makes domestic goods more expensive, reducing export competitiveness. On the import side, a weaker domestic currency increases the cost of foreign goods and services. Therefore, exchange rate stability is crucial in international trade, as fluctuations can affect domestic competitiveness in global markets.

A depreciated exchange rate can have a dual effect on the trade balance: domestic goods become relatively cheaper and more competitive internationally, but the cost of importing essential raw materials rises. The government's ongoing efforts to promote

trade are intended to stabilize the trade balance, which in turn supports exchange rate stability. To balance trade flows, an increase in trade volume is necessary. Currency appreciation or depreciation influences macroeconomic conditions, particularly the trade balance and overall output growth, both positively and negatively (Parianom et al., 2024). Devaluation, for instance, can enhance international competitiveness and boost the trade balance by making exports cheaper and imports more expensive.

According to theoretical perspectives, exchange rate depreciation can raise the trade balance, as domestic goods become cheaper internationally (Parray et al., 2022). However, empirical data show that even during times of exchange rate appreciation—such as in 2021—the trade balance in Indonesia also increased. This phenomenon challenges David Ricardo's theory, which suggests that trade activity influences foreign exchange demand and supply, ultimately affecting currency value. Currency depreciation generally makes domestic goods more attractive to foreign buyers, thus boosting the trade balance. Conversely, currency appreciation makes domestic goods more expensive, potentially encouraging consumers to purchase cheaper foreign alternatives, which can harm the trade balance.

Inflation is another factor affecting the trade balance. Inflation refers to a sustained increase in prices, which can impair the competitiveness of Indonesian products in the global market. When Indonesia's inflation rate is higher than that of its trading partners, domestic goods become relatively expensive, reducing their international competitiveness. This can decrease trade volumes, as consumers and producers may favor cheaper imported products. High inflation also creates uncertainty for producers, potentially lowering productivity and reducing purchasing power, which in turn can weaken the position of domestic goods in global trade.

Fluctuating prices of goods and services—particularly during inflationary periods—pose challenges for competitiveness. Despite a decline in Indonesia's inflation rate in recent years, there was a sharp rise in 2022. While the trade balance reached its highest surplus in that year (USD 54.461 billion), this was influenced by surging global commodity prices rather than purely domestic factors. Commodities such as coal, nickel, and palm oil saw significant price spikes, benefiting Indonesia, especially as European countries shifted from natural gas to coal. Additionally, the increasing demand for electric vehicle batteries, which use nickel as a main component, further boosted Indonesia's trade position as one of the largest global nickel producers (Tri & Affan, 2021).

Recognizing the risks of inflation, the government actively implements policies to keep it low and stable. However, controlling inflation is challenging due to the interplay of multiple economic factors. One key variable affecting Indonesia's trade balance is the interest rate, which influences investment and savings decisions. Low interest rates typically encourage investment and boost production, whereas high rates may discourage borrowing and consumption.

Interest rates in Indonesia have shown fluctuations over the years. In 2015, despite high interest rates, the trade balance remained positive, partially due to the US Federal Reserve's near-zero interest rate policy, which supported global economic recovery.

During 2020–2021, interest rates were lowered domestically to stimulate consumption and aid recovery from the pandemic, but they were subsequently raised to curb inflation. Higher interest rates tend to reduce public consumption and borrowing, which can dampen global demand for domestic products, whereas lower rates can improve competitiveness in international markets.

Gross domestic product (GDP) also plays an important role in the trade balance. GDP reflects the total value generated by production activities across economic sectors and is a key indicator of economic development. Higher GDP is often associated with increased demand for goods, both domestic and imported, and greater competitiveness of domestic products. However, as seen in 2018, GDP growth does not always correspond with improvements in the trade balance; that year saw a deficit despite rising GDP.

Based on the discussion above, there is a significant relationship between exchange rates, inflation, interest rates, and GDP, each affecting Indonesia's trade balance differently. This study examines these variables, with GDP included as an important factor often overlooked in earlier research that focused solely on exchange rates, inflation, and interest rates. Using GDP at constant prices strengthens the quantitative analysis, underlining the structural role of domestic production in influencing trade. Amid the challenges of globalization and open markets, Indonesia's trade balance continues to face deficits, highlighting the need to understand how these macroeconomic variables interact in shaping trade performance. Therefore, this research seeks to analyze the impact of each variable on Indonesia's trade balance, aiming to offer both theoretical and practical contributions to economic policy development in the country.

RESEARCH METHOD

Operational Definitions and Variable Measurements

In this study, understanding the variables used is essential. The dependent (bound) variable analyzed is Indonesia's trade balance, while the independent variables include the exchange rate, inflation, interest rates, and gross domestic product (*GDP*). The trade balance serves as a financial indicator showing the difference between exports and imports, with a surplus reflecting positive conditions and a deficit indicating negative conditions. Trade balance data are obtained from official reports for a specific period, namely January 2014 to December 2023.

The exchange rate is defined as a measure used to convert one currency into another, with data obtained from *Badan Pusat Statistik* (*BPS*) and the Ministry of Trade. Inflation is defined as a condition in which the prices of goods and services increase continuously, with inflation data sourced from *Bank Indonesia* (*BI*). Interest rates, which act as indicators of monetary policy, are also obtained from *BPS* and *BI*. Gross domestic product reflects the total value of goods and services produced within the country during a given period, with GDP data collected from the Ministry of Trade and *BPS*.

The measurement of variables in this study uses clear indicators and standard formulas to calculate each variable. The trade balance is calculated as the difference between the value of exports and imports. The exchange rate is expressed as the ratio of

the *rupiah* to the United States dollar (USD), while inflation is measured using the Consumer Price Index (*CPI*). The interest rate is determined based on the policy interest rate set by *Bank Indonesia*. GDP is calculated from the sum of total consumption, investment, government spending, and the net international trade balance.

Determination of Population and Sample

The population in this study encompasses all elements related to the variables examined for Indonesia, with a focus on exchange rate, inflation, interest rate, GDP, and trade balance data over the research period. The sample was determined using a non-probability sampling technique, in which all members of the population do not have an equal chance of being selected. Through purposive sampling, the researcher considered specific factors relevant to the research objectives. The final sample consists of data on trade balance, exchange rate, inflation, interest rates, and GDP, yielding a total of 120 observations drawn from time series data.

Data Collection Techniques

The data used in this study are secondary data obtained from various official sources, including *Badan Pusat Statistik*, *Bank Indonesia*, and the Ministry of Trade, as well as related scientific journals. The type of data collected is time series data, providing valuable insights into trends and patterns in the variables analyzed. Data collection was carried out through documentation, where relevant information was compiled and organized in Microsoft Excel to facilitate further processing using statistical analysis software such as *EViews* 12. In addition, a literature study was conducted using various digital sources, including websites, books, and journal articles.

Data Analysis Techniques

Data analysis was conducted using the Error Correction Model (*ECM*), which aims to examine the short-term and long-term relationships among the research variables. Stationarity testing was carried out to ensure that the time series data met the necessary requirements for analysis. The Augmented Dickey-Fuller (*ADF*) test was employed, with data considered stationary if the probability value was below 0.05. Subsequently, a cointegration test was performed to determine the existence of a long-term relationship between the independent and dependent variables. Classical assumption tests—namely, tests for normality, multicollinearity, heteroscedasticity, and autocorrelation—were also conducted to ensure that the regression model complied with statistical requirements, thereby enhancing the validity of the analysis.

RESULT AND DISCUSSION

Significance Test

Partial Test (T Test)

Partial tests are carried out to be able to understand the influence of each independent variable on the variable that is considered constant. The independent variable has a significant influence on the dependent variable, if the significance score is < 0.05 so that H0 is rejected. The independent variable has no significant influence on the dependent variable, if the significance value $t > 0.05$ so that H0 is accepted.

Table 1. Short-Term T-Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_NT	-3.552039	3.530926	-1.005979	0.3166
LN_I	-0.075768	0.692545	-0.109406	0.9131
LN_TSB	1.745531	2.261148	0.771967	0.4417
LN_PDB	-0.198759	6.984284	-0.028458	0.9773
ECT(-1)	-0.82395	0.093476	-8.814548	0.0000
C	0.020274	0.088270	0.229676	0.8188

Source: Eviews Data Processing Results 12

a. Testing of exchange rate variables
   Based on the findings of the regression analysis carried out, it was observed that the exchange rate variable had a calculation value of < table, a number of (-1.005979) < (1.98081) and a probability score > the level of significance, a number of (0.3166) > (0.05). Therefore, it is possible to share the conclusion that H1 is rejected and H0 is accepted, so that the exchange rate variable has a negative effect on the trade balance in the short term.
b. Testing against inflation variables
   Based on the findings of the regression analysis carried out, it was observed that the inflation variable had a calculated value of < table, a number of (-0.109406) < (1.98081) and a probability score > significance level, a number of (0.9131) > (0.05). Therefore, it is possible to share the conclusion that H2 is rejected and H0 is accepted, so that the inflation variable has a negative effect on the trade balance in the short term.
c. Testing of interest rate variables
   Based on the findings of the regression analysis carried out, it was observed that the interest rate variable had a calculated value of < table, a number of (0.771967) < (1.98081) and a probability score > the level of significance, a number of (0.4417) > (0.05). Therefore, it is possible to distribute the conclusion that H3 is rejected and H0 is accepted, so that the variable interest rate has a positive effect that is not significant on the trade balance through the short term.
d. Testing of the variables of gross domestic product
   Based on the findings of the regression analysis carried out, it was observed that the gross domestic product variable had a calculated value of < table, a number of (-0.028458) < (1.98081) and a probability score > significance level, a number of (0.9773) > (0.05). Therefore, it is possible to share the conclusion that H4 is rejected and H0 is accepted, so that the variable of gross domestic product has a negative effect on the trade balance in the short term.

Table 2. Long-Term T-Test Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_NT	0.852951	2.314844	0.368470	0.7132
LN_I	0.572164	0.276907	2.066266	0.0410
LN_TSB	-1.945615	0.531702	-3.659219	0.0004
LN_PDB	4.07944	1.691633	2.411540	0.0175
C	-54.50323	14.32121	-3.805769	0.0002

Source: Eviews Data Processing Results 12

a. Testing of exchange rate variables
   Based on the findings of the regression analysis carried out, it was observed that the exchange rate variable had a tcal value of < table, a number $_{of\,(}$0.368470) < (1.98081) and a probability score > significance level, a number of (0.7132) > (0.05). Therefore, it is possible to share the conclusion that H1 is rejected and H0 is accepted, so that the exchange rate variable has a positive effect on the trade balance over the long term.
b. Testing against inflation variables
   Based on the findings of the regression analysis carried out, it was observed that the inflation variable had a calculated value of > table, a number of (2.066266) > (1.98081) and a probability score < the level of significance, a number of (0.0410) < (0.05). Therefore, it is possible to distribute the conclusion that H2 is accepted and H0 is rejected, so that the inflation variable has a significant positive effect on the trade balance over the long term.
c. Testing of interest rate variables
   Based on the findings of the regression analysis carried out, it was observed that the interest rate variable had a calculated value of < table, a number of (-3.659219) < (1.98081) and a probability score < significance level, a number of (0.0004) > (0.05). Therefore, it is possible to distribute the conclusion that H3 is accepted and H0 is rejected, so that the interest rate variable has a significant negative effect on the trade balance over the long term.
d. Testing of the variables of gross domestic product
   Based on the findings of the regression analysis carried out, it was observed that the gross domestic product variable had a calculated value of > table, a number of (2.411540) > (1.98081) and a probability score < the level of significance, a number of (0.0175) < (0.05). Therefore, it is possible to distribute the conclusion that H4 is accepted and H0 is rejected, so that the variable of gross domestic product has a significant positive effect on the trade balance in the long term.

2. *R-Squared* Test and *R-Squared Adjusted Test*

Table 3. *R-Squared* Test and *Short-Term* R-Squared Adjusted Test

R-Squared	**0.436066**
Adjusted R-Squared	0.411114

Source: Eviews Data Processing Results 12

The results of *the R-Squared* test and the short-term *Adjusted R-Squared* test showed an *R-Squared* value = 0.436066 and *an Adjusted R-Squared test value* of 0.411114. Therefore, being able to share the conclusion of exchange rates, inflation, interest rates, and gross domestic product can define the trade balance through *R-Squared* of 43.6%, and 56.4% of external variables, while *Adjusted R-Squared* of 41.11%, and 58.89% of external variables.

Table 4. *R-Squared* Test and *Long-Term* R-Squared Adjusted Test

R-Squared	**0.386306**
Adjusted R-Squared	0.364960

Source: Eviews Data Processing Results 12

The results of *the R-Squared* test and the long-term *Adjusted R-Squared* test showed an *R-Squared* value = 0.386306 and *an Adjusted R-Squared test value* of 0.364960. Therefore, being able to share the conclusion of exchange rates, inflation, interest rates, and gross domestic product can define the trade balance through *R-Squared* of 38.63%, and 61.37% of external variables, while *Adjusted R-Squared* is 36.49%, and 63.51% of external variables.

Economic Analysis and Discussion

Analysis of the Influence of Exchange Rates on Trade Balance

Based on the findings of data processing in the short-term estimation research that has been carried out, it shows that H1 is rejected and H0 is accepted, so it can be interpreted as having a negative effect that is not significant. While the test results were in long-term estimation, showing H1 rejected and H0 accepted, which means that the positive effect was not significant. Through these findings, they are in line with the findings of Riana Widyasari and Raden Parianom (Widyasari & Parianom, 2024), resulting that the exchange rate through the short and long term has an insignificant effect on the trade balance.

When observed through existing theories, the relationship that occurs between the exchange rate and the trade balance has a positive effect or can be said to be significant. However, the study's findings show the resulting influence is not statistically significant. Therefore, there is a phenomenon that can push the exchange rate to have no effect on the trade balance. This is assumed because the goods traded are inelastic to the price, so that when the prices of goods and services fluctuate either significantly or not, it is unlikely to affect the trade balance. In addition, the existence of government intervention makes the exchange rate move not in accordance with the market mechanism.

The intervention carried out aims to stabilize the exchange rate in the form of foreign exchange market operations and the use of foreign exchange reserves, especially if there are external influences such as changes in the monetary policy of the United States. Such interventions will reduce the influence of exchange rates, because the rupiah

exchange rate is not fully used as a fundamental condition for international trade. The exchange rate will tend to be nominally stable, but it will result in the loss of the main function of the exchange rate as a tool of adjustment to the trade balance.

Analysis of the Influence of Inflation on the Trade Balance

Based on the findings of data processing through short-term estimation research that has been carried out, it shows that H2 is rejected and H0 is accepted, so that it can be interpreted as having a negative effect that is not significant. Meanwhile, the test results in long-term estimation show that H2 is accepted and H0 is rejected, which means that it has a significant positive effect. With these results, in line with the findings of Nenden Yushinta Puri and Ima Amaliah (2021), it appears that inflation has a significant effect on the trade balance. Through the short term, inflation does not directly affect trading activities in the global market significantly. This is due to the existence of agreements in the form of contracts in carrying out international trade.

However, in the long term, sustained inflation will have an impact on decreasing competition for domestic products in the global market. The increase in product prices will have an impact on the lack of interest in the global market in domestic goods, which directly worsens the performance of the trade balance. Higher inflation will also have an impact on increasing demand for foreign goods and services, because the production of domestic goods and services that are considered too expensive is not proportional to the quality produced.

Analysis of the Effect of Interest Rates on Trade Balance

Based on the findings of the short-term estimation test that has been carried out, showing H3 rejected and H0 accepted, so that it can be interpreted as having a positive effect not significant. Meanwhile, the test results in long-term estimation show that H3 is accepted and H0 is rejected, which means that it has a significant negative effect. With these results, it is different from the research carried out by Tasya Vannezia and Renea Shinta Aminda (2023), which results that interest rates have an insignificant effect on the trade balance in the short term or through the long term. The insignificant result is assumed to be due to uncertainty in the global financial market, lower inflation rate than in the previous period, and uneven global economic growth.

But in the long term, interest rates have a significant negative effect. This is in line with the research findings of Nenden Yushinta Puri and Ima Amaliah (Puri & Amaliah, 2021), resulting in a significant effect on the trade balance. This result is also supported by open macroeconomic theory which argues that interest rates are closely related to a country's trade balance. When viewed based on the data on interest rates set by the government, the amount of interest rates that rise can have an impact through declining domestic consumption and investment. So that it will affect the demand for goods and services of foreign products to decrease and have a positive impact on the trade balance. In the long run, the decline in demand will have a significant impact on the improvement of the trade balance. In addition, the steps taken by Bank Indonesia in setting interest rates

tend to be stable which aims to control inflation and maintain economic stability, so that in the long term it will share a positive response for the trade sector to adapt.

Analysis of the Influence of Gross Domestic Product on Trade Balance

Based on the findings of the short-term estimation testing that has been carried out, it shows that H4 is rejected and H0 is accepted, so it can be interpreted as having a negative effect that is not significant. Meanwhile, the test results in long-term estimation show that H4 is accepted and H0 is rejected, which means that it has a significant positive effect. With the results of these tests, in line with research conducted by Tasya Vannezia and Renea Shinta Aminda (2023), gross domestic product has a significant effect on the trade balance in the short term and gross domestic product has a significant effect on the trade balance over the long term.

Through the short term, the increase in GDP that occurred can be assumed to occur due to a boost in domestic demand for goods and services that could come from foreign products. Therefore, the increase in GDP that occurs will be in line with the level of consumption of goods and services produced abroad, because the domestic industry is not able to meet the needs of consumption in large quantities and in a short time. The result is that short-term economic growth contributes directly to foreign-produced goods which has an impact on Indonesia's trade balance deficit.

But through long-term results, the increase in GDP can reflect the level of efficiency and effectiveness of domestic production of goods and services so that it is able to compete in the global market. This will ultimately encourage an improvement in the trade balance, especially if the increase that occurs is focused on down streaming. The difference in influence over the short and long term shows that it is important to maintain a balance of quality economic growth to support external resilience through a longer period of time.

CONCLUSION

Based on the results of the study, it can be concluded that, in the short term, the exchange rate has a negative but not significant effect on Indonesia’s trade balance, while in the long term it has a positive but still not significant influence. This condition is attributed to the inelasticity of goods and services to price changes, as well as government interventions that disrupt market mechanisms. Inflation, on the other hand, shows a negative but not significant influence in the short term, yet has a significant positive effect in the long term, as rising inflation increases the prices of goods and services, thereby reducing the global market’s interest in domestic products.

For interest rates, the effect is positive but not significant in the short term, while in the long term it becomes negative, as high interest rates can reduce domestic consumption and investment, which in turn directly impacts the trade balance. Lastly, gross domestic product (*GDP*) demonstrates a negative but not significant influence in the short term, whereas in the long term it exerts a significant positive effect, indicating that economic growth can support improvements in the trade balance.

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