DETERMINANTS OF INDONESIA'S TRADE BALANCE: A VECM MODEL APPROACH

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ABSTRACT

Trade Balance is the main indicator in external competitiveness. The condition of the trade balance in Indonesia tends to experience unbalanced conditions every year, so this study aims to see the relationship between the variables of Exchange Rate, FDI and GDP to the Trade Balance in Indonesia. The data used is a time series for 43 years (1980-2022) using the Vector Error Correction Model (VECM) method to analyze the relationship and response between variables in the term short and long term. Short-term results show that the Exchange Rate, Foreign Direct Investment (FDI) and Gross Domestic Product (GDP) do not affect the surplus or deficit of Indonesia's Trade Balance. While in the long run, Exchange Rate appreciation has a negative effect on the Trade Balance, the amount of FDI has a positive impact on the Trade Balance, and the amount of Gross Domestic Product (GDP) affects the deficit in the Trade Balance. The use of monetary policy can help stabilize exchange rates, increase exports through increased foreign investment, maintain the value of exports, and reduce trade deficits. Rephrase

Keywords: Trade Balance, Exchange Rate, FDI, GDP

ABSTRAK

Neraca perdagangan merupakan indikator utama daya saing eksternal. neraca perdagangan Indonesia mengalami ketidakseimbangan selama bertahun-tahun, penelitian ini bertujuan untuk menyelidiki bagaimana variabel nilai tukar, investasi asing langsung, dan PDB berhubungan dengan neraca perdagangan Indonesia. Data yang digunakan adalah time series 43 tahun (1980-2022), dan teknik vector error Correction Model (VECM) digunakan untuk menganalisis hubungan dan respon antara variabel jangka pendek dan jangka panjang. Hasil jangka pendek menunjukkan Nilai Tukar, Foreign Direct Investmen(FDI) dan Gross Domestik Product(GDP) tidak mempengaruhi surplus atau deficit Neraca Perdagangan Indonesia, sedangkan pada jangka panjang, apresiasi Nilai Tukar berpengaruh negative terhadap Neraca Perdagangan, besarnya FDI berdampak positif pada Neraca Perdagangan, dan besarnya Gross Domestik Product(GDP) mempengaruhi deficit pada Neraca Perdagangan. Penggunaan kebijakan moneter dapat membantu menstabilkan nilai tukar, meningkatkan ekspor melalui peningkatan investasi asing, menjaga nilai ekspor, dan mengurangi defisit perdagangan.
Rephrase

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Kata Kunci: Neraca Perdagangan, Nilai Tukar, FDI GDP, VECM

INTRODUCTION

Indonesia Becomes the country with the largest economy (Erika, 2022). Today, the development of Indonesia's economic development is increasingly showing very positive changes, with the increasing integration with the outside world economy (Adini, 2023). This has become a consequence where Indonesia adheres to an open economic system, which in its activities cannot be separated from international relations (Semančíková, 2016).

In the theory of "Comparative Advantage" proposed by David Ricardo (1817) explained that the basic concept of international trade is based on the comparative advantage possessed by a country in the form of commodities that have high productivity and are more efficient than other countries (Dinda Anggraini et al, 2022 & Marganus, 2021). International trade activity can be recorded in a trade balance (Abasimi & Salim, 2022). The high trade volume is expected to reduce the gap in trade balance conditions. According to Puri & Ima Amaliah (2021), a country's economy is said to be positive, one of which is if the trade balance is optimistic or surplus and is said to be negative if the trade balance is in deficit.

Figure 1. Value of Indonesia's Trade Balance in 1980-2022

Source : World Bank (Processed), 2024

Figure 1, explains the value of Indonesia's trade balance in 1980-2022 experienced significant fluctuations. In 1980, the trade balance amounted to 6 billion US$, but in the following year Indonesia's trade balance decreased until 1981 until 1982 to a deficit of 3.5 billion US$. The level of trade balance began to increase in 2007 by 17 billion US dollars, then in 2008 to 5 billion US $, although not deficit, but this figure decreased drastically from the previous year. This happened due to the economic crisis in 2008, at which time the economic sector experienced a shock that resulted in recession in all economic lines including the trade balance. The significant decline in the trade balance also occurred consecutively in 2012-2014, starting in 2011 the level of the trade balance was at a value of 22 billion US $ then fell to a deficit of 6 billion US $ in 2014. The main cause was the slump in export commodity prices and the soaring imports of fuel oil (BBM) at that time.

Furthermore, the slump also occurred in 2018 which experienced a deficit of 11 billion US $ until 2019 experienced a deficit of 4 billion US$. However, in 2018 and 2019, the slump was not due to the slump in export prices or soaring imports, but more because at that time there was an oil and gas and non-oil and gas deficit. In addition, in 2020 it diminished to US$ 17 billion, due to the effect of the COVID-19 widespread, hence hampering financial exercises and affecting the decrease within the Trade Balance.

From the point of view of Exchange Rate theory, there is a Marshall-Lerner theory which states "A depreciating Exchange Rate can help increase the Trade Balance surplus if the amount of price elasticity is more than one(Jiang & Liu, 2023 & Soelistyo, 2022) In previous studies there have been studies that prove the existence of the Marshall-Lerner effect or J-Curve and there have been previous studies that have argued otherwise. As a study conducted by Tarawalie & Kpana (2022) using the Autoregressive Distribution Lag (ARDL) method found that the Exchange Rate had a negative impact on determining the Trade Balance in Sierra Leone for the period 1980-2020, According to Kaya research (2020), the Exchange Rate had a significant influence on the Trade Balance in the long run, but had no effect in the short term in Turkey during the period 1996-2015.

Cristanto & Bowo (2021)research with the Vector Error Correction Model (VECM) analysis tool, proving that FDI has a significant positive impact on Indonesia's Trade Balance in 2010-2019. Meanwhile, Nepal & Thapa (2021) in South Asian countries: Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka, using the Panel, it shows that FDI does not have an impact on the Trade Balance in the long and short term. Followed by Purnamasari et al (2022), Nguyen et al. (2020) & Maolana Hidayat et al. (2021)investigated uncovered that GDP features a positive and significant affect on the Trade Balance. Another opinion is Keho (2020) & Manual & San (2019)examining the negative but significant relationship between GDP and Trade Balance in the long run, where an increment in household GDP will decrease the Trade Balance. On the other hand, the opinion of Ektiarnanti et al, (2023)explores that GDP does not have a noteworthy impact on the Trade Balance in Indonesia utilizing Multiple Linear Multiple and Path Analysis in the 2014-2019 period.

From several arguments in previous studies, Exchange Rate, FDI, and GDP provide results that are not always consistent, so in this study further research is carried out to understand more deeply the dynamics of the relationship between these variables to the Trade Balance, especially in the long and short term. This study aims to analyze the relationship between Exchange Rate, FDI and GDP on Indonesia's Trade Balance in the long and short term in 1980-2022.

METHOD

This study uses annual time series data with a vulnerable time of 43 years from 1980 to 2022 in Indonesia from the world bank. The variables used in this study are Trade Balance, Exchange Rate, Foreign Direct Investment (FDI) and Gross Domestic Product (GDP) using E-Views 12 software. To use the VECM method, stationary tests must be performed first to see if the data occurs stationary at the level or stationary at the first difference (Gujarati, 2003).After conducting a stationary test, the next step is to test the optimal lag length(Khurshid, 2023). In the VECM test, the cointegration test is the main determinant in determining the long-term relationship and balance(Apostu et al., 2022). VECM considers all variables as endogenous variables(Nkalu et al., 2020). In this analysis, it focuses on analyzing the relationship caused by Exchange Rates, FDI, and GDP to the Trade Balance. The equation of the VECM model as follows:

$$\Delta TB_{it} = \alpha_i - \sum_{K=1}^{P} B_1 \log \Delta EXR_{i,t-k} + \sum_{K=1}^{P} B_2 \log \Delta FDI_{i,t-k} - \sum_{K=1}^{P} B_3 \log \Delta GDP_{i,t-k} + \varepsilon_{it} \quad (1)$$

Where, Δ shows the first difference, *log* shows the logarithm, *k* represents the length of lag, *t* indicates the time period covered 1980-2022, I indicates the country covered (Indonesia,), Y_{it} shows the Trade Balance in Indonesia, β_1, β_2, β_3 explain the matrix of variable coefficients, EXT_{it} indicates Exchange Rate, GDP_{it} indicates Gross Domestic Product, FDI_{it} indicates Foreign Direct Investment, and ε_{it} shows residual vector.

In its analysis, VECM has a special instrument that has a function in describing the relationship between variables. IRF aims to determine the dynamics in the form of shock or shock in the variable under study. While Variance decomposition (VD) aims to see how much influence is exerted on each variable (Fuddin & Anindyntha, 2023).

RESULT AND DISCUSSION

The stationary test in this study used the stationary test categories Augmented Dickey Fuller (ADF test) and Philips – Perron (PP) based on the condition that each variable has a probability value of less than 0.05 or 5%

Table 1. Level and First Difference Panel (Root Unit) Stationary Test

Variable	Critical Value	Level		First Difference	
		ADF-Fisher Chi-square Probality	PP - Fisher Chi-square Probality	ADF-Fisher Chi-square Probality	PP-Fisher Chi-square Probality
logTB	5%	0.6157	0.5611	0.0000	0.0001
logEXR	5%	0.9057	0.9057	0.0000	0.0000
logFDI	5%	0.7150	0.7149	0.0000	0.0000
logGDP	5%	0.9999	0.9835	0.9999	0.0014

Source : Output E-Views 12

From table 1, it is known that at the level in the ADF-Fisher and PP-Fisher tests, each variable does not experience stationary because it has a probability value of 0.05. Then at the first different level, each variable has been stationary with a value below 0.05, so that in this study the data occurred stationary at the first different level.

Furthermore, conducting a lag length test with several choice tests, namely Likelihood Ratio (LR), Final Prediction (FPE), Akaike Information Critic (AIC), Schwarz Information Criterion (SC), and Hannan-Quin Criterion (HQ). This study used the smallest value from the Akaike Information Criterion (AIC) as the best lag length value(Danish et al., 2018). Based on the smallest AIC value, it is found in the first lag of 1.35604*, so the first lag was chosen in this study.

Table 2. Optimum Lag Length Test

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-165.1508	NA	0.109902	9.143288	9.317441	9.204685
1	-5.263681	276.5615*	4.64e-05*	1.365604*	2.236371*	1.672590*
2	3.587709	13.39670	7.05e-05	1.752016	3.319395	2.304590
3	12.70226	11.82428	0.000111	2.124202	4.388195	2.922366
4	26.18350	14.57432	0.000152	2.260351	5.220957	3.304104
5	41.14526	12.93990	0.000219	2.316472	5.973691	3.605813
6	64.00547	14.82824	0.000263	1.945650	6.299482	3.480580

Source : Output E-Views 12

After finding the best lag length, you must check whether the selected lag is stable or not based on the indigo modulus < 1. In table 3, based on the first lag there is a modulus value of less than 1 in each root. Thus, the first lag has stabilized and is suitable for use in subsequent tests.

Table 3. Optimal Lag Stability Test

Root	Modulus
0.982908	0.982908
0.775104	0.775104
0.281649	0.281649
0.259237	0.259237

Source : Output E-Views 12

Figure. 2 Inverse Roots of AR Characteristic Polynomial
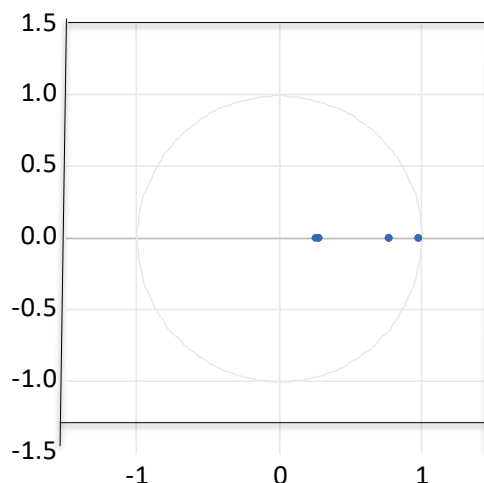
Source : Output E-Views 12

In this study there has been a stationary level of first different, so cointegration needs to be done to analyze the variables in the long term and find out the balance with the provisions of the Statistical Trace value > Critical Value (0.05). In this study using a cointegration test from In this study using a cointegration test from Maximum Eigenvalue Test and Trace Test(Shao et al., 2019). Table 4, describes that in the Johansen Trace and Max-Eignvalue tests there are all Statistical Trace values > Critical Values of 0.05 supported by a sign (*). With this study, all variables have been cointegrated and can be continued on the VECM test.

Table 4. Johansen Trace and Maximum Eignvalue Cointegration Test

Hypothesisized No. of CE(s)	Johansen Trace			Max-Eignvalue		
	Trace Statistic	0.05 Critical Value	Prob.**	Trace Statistic	0.05 Critical Value	Prob.**
None*	106.0503	47.85613	0.0000	49.32001	27.58434	0.0000
At Most 1*	56.73033	29.79707	0.0000	30.80815	21.13162	0.0016
At Most 2*	25.92218	15.49471	0.0000	20.24784	14.26460	0.0050
At Most 3*	5.674348	3.841465	0.0172	5.674348	3.841465	0.0172

Source : Output E-views 12

After doing some tests done before, as the data has been stationary on the first difference and there was a cointegration that symbolized a long-term relationship, the VECM method was used in this study with the applicable provisions being t-Statistical values > t-table values [2.01670]. Presented VECM results in table 5.

Table 5. VECM Output in the Short and Long Term

| Cointegrating Eq:	CointEq1		
Variable	**Coefficient**	**Std. Error**	**t-Statistic**
Short Run			
CointEq1	-0.682155	(0.22137)	**[-3.08150]**
D(logTB(-1))	-0.156530	(0.16800)	[-0.93171]
D(logEXR(-1))	6.542144	(3.36081)	[1.94660]
D(logFDI(-1))	0.253569	(0.25024)	[1.01331]
D(logGDP(-1))	6.771388	(4.12770)	[1.64048]
C	-0.953072	(0.48227)	[-1.97623]
Long Run			
logEXR(-1)	-0.573803	(0.22775)	**[-2.51943]**
logFDI(-1)	1.115220	(0.56554)	**[5.45377]**
logGDP(-1)	-2.184709	(0.43419)	**[-5.03171]**
C	6.065241		

Source : Output E-Views 12

The results of VECM explain that in the short term, the Exchange Rate (EXR) has no significant effect on the Trade Balance (TB) as evidenced by the lag value with the value of t-Statistic [1.94660] less than t-Table [2.01670]. This explains that the decline and increase in the rupiah exchange rate has no impact on changes in Indonesia's trade balance in the present. Cheaper prices in Indonesia and abroad do not affect the increase in exports and imports in international trade activities in Indonesia. Supported by research found by (Nepal & Thapa, 2021), in their research Exchange Rate in the short term has no impact on the Trade Balance. While in the long run, the Exchange Rate (EXR) has a significant and negative effect in determining the Trade Balance as evidenced by the value of t-Statistic [-2.51943] more than t-Table [2.01670]. This explains that when the rupiah exchange rate decreases, it will help improve the deficit in the long run and lead to a surplus in Indonesia's Trade Balance. Long-term results, in accordance with the Marshall-Lerner theory or J-curve work in this analysis and supported by Genemo (2017) study, which found facts related to negative relationships between the two in East Africa.

In the short term, the FDI does not have a significant impact on Indonesia's Trade Balance with the t-Statistic value at lag-1 of [1.01331] smaller than the t-Table of 5% [2.01670], meaning that in the past period, large or small foreign direct investment entering each country, did not affect the good or bad condition of the Trade Balance in Indonesia today. This result is supported by research by Ousseini et al. (2017) that FDI has no significant effect on the Trade Balance. Meanwhile, in the long run, FDI has a significant positive impact on the Trade Balance with a t-Statistic value of [5.45377] greater than t-Table 5% [2.01670]. This is supported by research (Cristanto & Bowo, 2021; Nguyen et al., 2020; Tarawalie & Kpana, 2022). The study found the FDI significant positive impact on the Trade Balance In this case, when a lot of foreign investment value enters domestic companies, it

can be used to increase production which will later be able to improve the condition of the Trade Balance in Indonesia.

In Short term, explaining that the size or size of GDP in the past period did not have a significant impact on Indonesia's current Trade Balance, as evidenced by the value of t-Statistics GDP lag 1 of [1.64048] less than t-Table (2.01670). This research is supported by Ektiarnanti et al (2023) who investigated the relationship between GDP and has no impact on the Trade Balance in Indonesia. In the long run, GDP has a significant negative impact on the Trade Balance in Indonesia with the value of t-Statistic [-5.03171] greater than t-Table (2.01670). When the community of income owned will stimulate the demand for imported goods, which in turn supports import activity and may contribute to Indonesia's trade deficit. According to Keynes's theory of expenditure approach, "domestic income increases, consumption power increases, and imports increase" resulting in a trade deficit. This is supported by Keho (2020) research which found a negative and significant relationship with the Trade Balance in Côte d'Ivoire from 1980 to 2017.

Figure 3. IRF (Impulse Response Function) Test
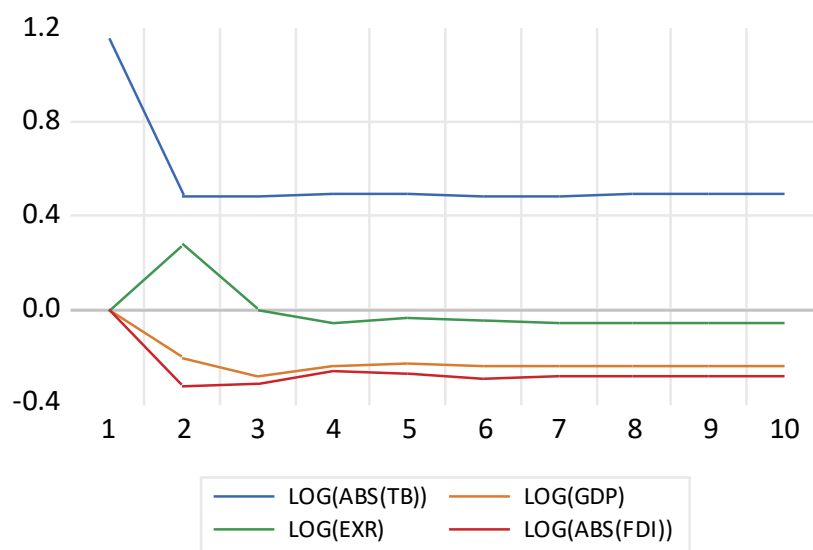
Source : Output E-views 12

Based on figure 3, in the 10-period period have significant changes, due to the response given by the Exchange Rate, FDI and GDP to Indonesia's Trade Balance. Fluctuations that occur until the fourth period, the next period in the long term fluctuations begin to decrease, meaning that the IRF chart is said to be stable. In this study, the analysis of Decomposition Variance (VD) aims to see the magnitude of the composition or contribution of the influence of Exchange Rate variables, GDP and FDI in influencing Indonesia's Trade Balance. The following presents the variance of decomposition over 10 years in table 9.

Table 6. Variance Decomposition

Variance Decomposition of TB :				
Period	S.E	TB	EXR	GDP	FDI
1	1.149263	100.0000	0.000000	0.00000	0.00000
2	1.334092	86.70533	4.392597	2.858597	6.043477
3	1.476808	80.71680	3.589416	5.992271	9.701517
4	1.598224	78.45324	3.193506	7.423803	10.92946
5	1.712886	76.63987	2.838975	8.316558	12.20460
6	1.819363	74.76403	2.583542	9.195547	13.45688
7	1.919586	73.29625	2.414952	9.907698	14.38110
8	2.014843	72.15683	2.279044	10.45620	15.10792
9	2.105813	71.18723	2.163288	10.91519	15.73429
10	2.192980	70.35576	2.067493	11.30911	16.26763

Source : Output E-Views 12

In table 6, it explains that in the first period of the Exchange Rate variable, Gross Domestic Product (GDP) and Foreign Direct Investment (FDI) did not contribute 0% to Indonesia's Trade Balance. In the future period, the Trade Balance is influenced by the Exchange Rate, FDI, and GDP with an increasing value and varying every period up to a period of up to 70%.

CONCLUSION

This study is to analyze the Exchange Rate, FDI and GDP variables to Indonesia's Trade Balance period 1980-2022. In the short term, there is no influence of exchange rate, FDI and GDP on Indonesia's Trade Balance. In the long run, Exchange Rate variables negatively affect the trade balance, the J-curve works on this study. FDI variables have a positive impact on the Trade Balance in Indonesia. GDP variables have a negative but significant impact on Indonesia's Trade Balance. These results support Keynes's contention that when incomes increase will be followed by increased consumption, and imports will increase.

The monetary policy transmission mechanism can strive for to stimulate trade balance growth. In addition, monetary policy is pursued in order to maintain exchange rate stability, where appropriate exchange rate policy can affect the production plan, increasing the effectiveness of the Trade Balance. Policy encourages domestic GDP by determining leading sectors or commodities that are oriented, but still increases export activities that have comparative advantages and emphasizes excess import activities in order to maintain a surplus Trade Balance value. Monetary policy is needed as a reference in maintaining exchange rate stability. This study has not seen the response of broader macroeconomic variables to the performance of a trade balance, so further research is recommended to include other macroeconomic variables to investigate further what variables have a relationship and affect performance on a country's trade balance. In addition, future studies can use longer time series to better see the long and short term effects and responses of

each variable

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