ECONOMIC DYNAMICS: THE INTERCONNECTION OF TRADE BALANCE, EXCHANGE RATE, INFLATION, AND IMPORTS IN THE CONTEXT OF EMPIRICAL DATA

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ABSTRACT

This study investigates the dynamics and interrelationships among trade balance, exchange rates, inflation, and imports within an empirical data context. Vector Error Correction Estimates are employed to analyze the dataset comprising 55 observations. The cointegrating equation suggests a significant association between lagged values of trade balance, exchange rates, inflation, and imports. For LN_IMPOR, the ADF test statistic is -2.47078, with a p-value of 0.1278. This indicates that LN_IMPOR may have a unit root, although the evidence is not strong enough to reject the null hypothesis of a unit root. Similarly, the ADF test for LN_INFLASI yields a test statistic of -1.5503, with a p-value of 0.5013. Again, there is not sufficient evidence to reject the null hypothesis of a unit root for LN_INFLASI. As for LN_KURS, the ADF test statistic for the level and first difference is -1.71583 and -6.8652, respectively. The corresponding p-values are 0.4181 and 0, indicating strong evidence against the presence of a unit root in the first difference of LN_KURS. However, for the level of LN_KURS, the available evidence is not significant enough to reject the null hypothesis. The results indicate that changes in the trade balance from the previous period positively impact exchange rates, while inflation demonstrates a negative influence. Moreover, imports show a strong positive relationship with trade balance. The error correction analysis reveals that deviations from the long-term equilibrium exhibit significant adjustments towards the equilibrium path. Overall, these findings contribute to understanding the complex interactions among economic variables and provide insights for policymakers and researchers in designing effective economic policies.

Keywords: trade balance, foreign exchange rate, inflation, and imports.

1. Introduction

The study of economic dynamics plays a crucial role in understanding the complex interplay between various macroeconomic variables. One of the fundamental aspects of economic dynamics is the interconnection between trade balance, exchange rate, inflation, and imports. These variables are closely intertwined and their relationships have significant implications for the stability and growth of a region, such as the Asian region. Asia is one of the most dynamic economic regions in the world, with many countries interconnected through trade and investment. Understanding the interconnections between trade balance, exchange rate, inflation, and imports in the Asian region is crucial in addressing the complex economic challenges and opportunities in the era of globalization.

(World Bank, 2021) Trade balance is a key indicator for evaluating a country's economic performance in the international market. The difference between exports and imports reflects a

country's ability to compete in the global market and provides insights into the health of domestic industries. The exchange rate, as a measure of the relative value of a country's currency against other currencies, has a significant impact on international trade and investment flows.

(World Trade Organization, 2020) Inflation, which reflects a sustained increase in the general price level of goods and services, is a critical factor that influences the economic dynamics in the Asian region. High inflation can erode the purchasing power of consumers, affect investment decisions, and result in economic instability. Meanwhile, imports in the Asian region play a crucial role in impacting overall economic activity. Imports can make positive contributions to meeting domestic needs but can also have negative effects on local industries.

(IMF, 2021) In 2020, China recorded a positive trade balance of $535 billion. China's export value reached $2.6 trillion, while its import value amounted to $2.1 trillion. China has a significant export surplus and plays a major role in global trade. In the same year, Japan had a positive trade balance of $54 billion. Japan's export value reached $698 billion, while its import value amounted to $644 billion. Japan also has a trade surplus, albeit on a smaller scale compared to China. In 2021, the exchange rate of the Indian rupee against the US dollar fluctuated. At the beginning of the year, the INR/USD exchange rate was around 73. However, by mid-year, the exchange rate weakened to around 75. Such fluctuations can affect the competitiveness of India's exports and imports and impact the country's trade balance. In May 2023, Indonesia's inflation rate reached 1.68% compared to the same period the previous year. This inflation is mainly attributed to the rising prices of food, beverages, and transportation. Controlled inflation is important for maintaining economic stability in a country. South Korea, on the other hand, imports a large amount of electronic goods, such as smartphones and electronic components. South Korea's import value in that year reached $406 billion. Such significant imports can impact the trade balance and the country's dependence on imports. These data provide an overview of the economic conditions in the Asian region in terms of fluctuating trade balances, exchange rates, inflation, and imports.

Identifying the relationships and causalities between trade balance, exchange rate, inflation, and imports in the Asian region is essential for policymakers, economists, and decision-makers in the business sector. Therefore, this research aims to empirically analyze the interconnections between these variables using up-to-date empirical data relevant to the Asian region. By employing appropriate statistical analysis and econometric methods, this study will provide a deep understanding of the economic dynamics in the Asian region and offer valuable insights for formulating effective economic policies and strategies in the region.

2. Literature Review

(Mohd Suki, 2015) The relationship between exchange rates and trade balance in Malaysia: Evidence from nonlinear models. International Journal of Economics, Management and Accounting, 23(1), 49-73.This study examines the relationship between exchange rates and trade balance in Malaysia using nonlinear models. The findings suggest that exchange rate changes have

a significant impact on the trade balance, with both depreciation and appreciation affecting trade balance differently.

(Tang, T. C., Lai, Y. W., & Ozturk, 2016) The linkage between inflation and exchange rates in Malaysia. Economic Modelling, 54, 450-457. This research investigates the relationship between inflation and exchange rates in Malaysia. The results indicate a positive relationship between inflation and exchange rates, implying that changes in inflation rates can influence the exchange rate dynamics.

(Chen, S. W., Chen, Y. T., & Hu, 2017) The relationship between import and export prices: Evidence from China. Emerging Markets Finance and Trade, 53(1), 195-209. This study explores the relationship between import and export prices in China. The findings reveal a strong positive relationship between import and export prices, suggesting that changes in import prices can affect export prices and vice versa, which has implications for trade balance dynamics.

(Abdul-Mohsen, M., & Abdul-Rahman, 2018) The dynamic relationship between inflation, exchange rate, and trade balance in Saudi Arabia. International Journal of Economics, Commerce and Management, 6(1), 43-55. This research investigates the dynamic relationship between inflation, exchange rate, and trade balance in Saudi Arabia. The results show that inflation and exchange rate fluctuations significantly affect the trade balance, indicating the interconnection between these variables.

(Kundu, A., & Mitra, 2019) Exchange rate, inflation, and trade balance nexus: Empirical evidence from India. Global Business Review, 20(1), 63-81. This study analyzes the relationship between exchange rate, inflation, and trade balance in India. The findings suggest a significant impact of exchange rate and inflation on trade balance, indicating the interdependence of these variables in the Indian context.

(Huang, C. J., & Lin, 2020) Does exchange rate uncertainty affect international trade? The role of inflation and economic policy uncertainty. Journal of International Money and Finance, 102, 102181. This research examines the impact of exchange rate uncertainty on international trade, considering the role of inflation and economic policy uncertainty. The study finds that exchange rate uncertainty negatively affects trade, and inflation and economic policy uncertainty mediate this relationship.

3. Research Methodology

This research utilizes a quantitative approach and empirical data to analyze the relationships between the explained economic variables. The analytical method used is Vector Error Correction Estimates (VECM) to analyze the provided data. The data for this study is obtained from relevant empirical sources such as CEIC, the Central Statistics Agency, and the Bank of Indonesia. The data used includes information on trade balance, exchange rates, inflation, and imports from January 2015 to December 2019. After adjustments, there are 55 observations included in the analysis. The obtained data will be analyzed using EViews software.

The model used in this analysis is called CointEq1, which includes several variables:

1. The variable D(NARACA_PERDAGANGAN(-1)), which represents the change in the trade balance variable one period before.
2. The variable D(KURS(-1)), which represents the change in the exchange rate variable one period before.
3. The variable LN_INFLASI(-1), which represents the logarithm of the inflation variable one period before.

4. The variable D(LN_IMPOR(-1)), which represents the change in the logarithm of the import variable one period before.

The estimated coefficients in this model are regression coefficients that depict the relationship between these variables. There is a coefficient for each variable in the CointEq1 equation. Additionally, there is an Error Correction equation that describes the long-term equilibrium relationship between these variables. The Error Correction equation indicates how quickly short-term errors are corrected to achieve long-term equilibrium.

In hypothesis testing, the null and alternative hypotheses are explained for each estimated coefficient in the Vector Error Correction Estimates model. T-statistics are used to test the statistical significance of each coefficient. If the t-statistic value is greater or smaller than 1.96 (at a 5% significance level), the coefficient is considered statistically significant.

Further analysis can be conducted by examining the R-squared measure, which indicates how well the model fits the data, the F-statistic, which tests the overall significance of the model, and information criteria such as Akaike AIC and Schwarz SC, which are used to compare alternative models based on complexity and goodness of fit.

4. Results

Cointegrating Eq:	CointEq1
D(NARACA_PERDAGANGAN(-1))	1
D(KURS(-1))	-403.863
	-426.897
	[-0.94604]
LN_INFLASI(-1)	-40077.5
	-138836
	[-0.28867]
D(LN_IMPOR(-1))	9797213
	-1678231
	[5.83782]
C	38473.66

Error Correction:	D(NARACA_PERDAGANGAN,2)	D(KURS,2)	D(LN_INFLASI)	D(LN_IMPOR,2)

CointEq1	-2.19124	-9.31E-05	-8.11E-08	-9.85E-08
	-0.42476	-0.00014	-6.40E-08	-5.90E-08
	[-5.15877]	[-0.65654]	[-1.26866]	[-1.66072]
D(NARACA_PERDAGANGAN(-1),2)	0.287869	8.15E-05	5.86E-08	1.27E-07
	-0.34431	-0.00011	-5.20E-08	-4.80E-08
	[0.83607]	[0.70936]	[1.13229]	[2.65162]
D(NARACA_PERDAGANGAN(-2),2)	-0.12657	0.000125	6.72E-08	9.03E-08
	-0.24355	-8.10E-05	-3.70E-08	-3.40E-08
	[-0.51968]	[1.53808]	[1.83556]	[2.65534]

D(NARACA_PERDAGANGAN(-3),2)	-0.14137	6.60E-05	3.60E-08	3.59E-08
	-0.13342	-4.50E-05	-2.00E-08	-1.90E-08
	[-1.05956]	[1.48283]	[1.79377]	[1.92692]
D(KURS(-1),2)	-51.7513	-0.9827	-8.48E-05	5.83E-05
	-495.191	-0.16529	-7.40E-05	-6.90E-05
	[-0.10451]	[-5.94525]	[-1.13795]	[0.84283]
D(KURS(-2),2)	299.5239	-0.78366	8.43E-05	-4.17E-05
	-545.837	-0.1822	-8.20E-05	-7.60E-05
	[0.54874]	[-4.30115]	[1.02679]	[-0.54788]
D(KURS(-3),2)	226.5366	-	-0.00014	2.41E-05

		0.46608		
	-522.109	-0.17428	-7.90E-05	-7.30E-05
	[0.43389]	[-2.67439]	[-1.72693]	[0.33035]
D(LN_INFLASI(-1))	-189127	167.9804	-0.0724	-0.10091
	-1006385	-335.924	-0.15139	-0.14049
	[-0.18793]	[0.50005]	[-0.47823]	[-0.71825]
D(LN_INFLASI(-2))	-397958	-38.1429	-0.27214	0.195952
	-914082	-305.114	-0.1375	-0.12761
	[-0.43536]	[-0.12501]	[-1.97915]	[1.53557]
D(LN_INFLASI(-3))	-940266	215.778	-0.0028	0.074806

		5		
	-938962	-313.419	-0.14124	-0.13108
	[-1.00139]	[0.68847]	[-0.01979]	[0.57068]
D(LN_IMPOR(-1),2)	17463301	781.542	0.544784	-0.50377
	-3637063	-1214.03	-0.54711	-0.50774
	[4.80148]	[0.64376]	[0.99575]	[-0.99216]
D(LN_IMPOR(-2),2)	10765478	590.6339	0.381272	-0.48986
	-2521627	-841.701	-0.37932	-0.35203
	[4.26926]	[0.70171]	[1.00515]	[-1.39153]
D(LN_IMPOR(-3),2)	4305229	292.305	0.191236	-0.13773

	-1200746	-400.8	-0.18062	-0.16763
	[3.58546]	[0.72930]	[1.05876]	[-0.82164]
C	-16277.8	12.4702 4	-0.01864	0.003147
	-134440	-44.875	-0.02022	-0.01877
	[-0.12108]	[0.27789]	[-0.92179]	[0.16767]
R-squared	0.866302	0.57390 4	0.335353	0.842427
Adj. R-squared	0.82391	0.43880 1	0.124611	0.792465
Sum sq. resids	3.93E+13	438005 1	0.889546	0.766151
S.E. equation	979198.2	326.849 4	0.147296	0.136699
F-statistic	20.4355	4.24788 4	1.591297	16.86132
Log likelihood	-828.66	-	35.37874	39.48537

		388.386		
Akaike AIC	30.64219	14.63221	-0.77741	-0.92674
Schwarz SC	31.15314	15.14316	-0.26645	-0.41578
Mean dependent	12154.51	9.8	-0.01502	-0.00156
S.D. dependent	2333476	436.3039	0.157432	0.300068
Determinant resid covariance (dof adj.)		3.07E+13		
Determinant resid covariance		9.49E+12		
Log likelihood		-1133.89		
Akaike information criterion		43.41427		
Schwarz criterion		45.60409		
Number of coefficients		60		

This research utilizes estimates from a Vector Error Correction Model (VECM) with four variables: TRADE_BALANCE, EXCHANGE_RATE, LN_INFLATION, and LN_IMPORTS. The model is used to analyze the long-term equilibrium relationship among these variables. Here is the interpretation of the main components:

Cointegration Equation (CointEq1):

CointEq1 represents the long-term equilibrium relationship among the variables. This equation shows the coefficients of the lagged differences of the variables in the cointegration equation. The coefficient for D(TRADE_BALANCE(-1)) is 1, indicating that in the long run, there is a direct relationship between changes in TRADE_BALANCE and the dependent variable (CointEq1). The coefficient for D(EXCHANGE_RATE(-1)) is -403.863 with a standard error of 426.897. This suggests that in the long run, a one-unit increase in the lagged difference of EXCHANGE_RATE leads to a decrease in the dependent variable (CointEq1) by approximately 403.863 units.

Error Correction Coefficients:

The error correction coefficients indicate the speed at which the variables adjust to the long-term equilibrium relationship. These coefficients represent the short-term dynamics of the model. For example, D(TRADE_BALANCE,2) has an error correction coefficient of -2.191242. This means that around 2.19% of deviations from the long-term equilibrium are corrected in one period (lag 2). Similarly, the coefficient for D(EXCHANGE_RATE,2) is approximately -9.31E-05, indicating that around 0.0000931% of deviations from the long-term equilibrium are corrected in one period.

R-squared and Adjusted R-squared:

The R-squared value represents the proportion of variation in the dependent variable (CointEq1, D(EXCHANGE_RATE,2), LN_INFLATION, and D(LN_IMPORTS,2)) that can be explained by the independent variables in the model. A higher R-squared value (close to 1) indicates a better fit of the model to the data.

F-statistic:

The F-statistic is a measure of the overall significance of the model. It tests whether the coefficients of all independent variables in the model are collectively significant. A higher F-statistic indicates that the overall model is statistically significant.

Akaike Information Criterion (AIC) and Schwarz Criterion (SC):

AIC and SC are used to compare the fit of different models. Lower AIC and SC values indicate a better fit of the model. Both criteria consider both model fit and model complexity.

Based on the VECM analysis, several relationships among the economic variables under study were found. There is a cointegration relationship among the trade balance (TRADE_BALANCE), exchange rate (EXCHANGE_RATE), inflation (LN_INFLATION), and imports (LN_IMPORTS) in the empirical data context. The coefficient for D(TRADE_BALANCE(-1)) has a positive value, indicating a long-term positive relationship between the trade balance and other variables. On the other hand, the coefficients for D(EXCHANGE_RATE(-1)) and LN_INFLATION(-1) have

negative values, indicating a long-term negative relationship between the exchange rate and inflation with other variables. The coefficient for D(LN_IMPORTS(-1)) has a large positive value, indicating a strong long-term positive relationship between imports and other variables.

The coefficients in the error correction term (D(TRADE_BALANCE,2), D(EXCHANGE_RATE,2), D(LN_INFLATION), D(LN_IMPORTS,2)) indicate the speed of adjustment of the variables towards the long-term equilibrium after disturbances. Significant coefficient values suggest significant short-term adjustments following disturbances in these variables.

5. Discussion

In this VECM analysis, an estimation has been conducted for the Vector Error Correction Model with four variables: NARACA_PERDAGANGAN (Trade Balance), KURS (Exchange Rate), LN_INFLASI (Natural Log of Inflation), and LN_IMPOR (Natural Log of Imports). The objective of this analysis is to identify the long-term equilibrium relationships among these variables as well as their short-term dynamics through the error correction coefficients.

Cointegrating Equation (CointEq1): The Cointegrating Equation represents the long-term equilibrium relationship among the variables. The coefficients of the observed variable differences in this cointegrating equation can be interpreted. The coefficient for D(NARACA_PERDAGANGAN(-1)) is 1, which means that in the long run, there is a direct relationship between the changes in NARACA_PERDAGANGAN and the dependent variable (CointEq1). The coefficient for D(KURS(-1)) is -403.863 with a standard error of 426.897. This indicates that in the long run, an increase of one unit in the lagged difference of KURS will cause a decrease in the dependent variable (CointEq1) by approximately 403.863 units.

Error Correction Coefficients: The error correction coefficients indicate the speed at which the variables adjust to the long-term equilibrium relationship. These coefficients represent the short-term dynamics of the model. For example, D(NARACA_PERDAGANGAN,2) has an error correction coefficient of -2.191242. This means that around 2.19% of the deviation from the long-term equilibrium is corrected within one period (lag 2). Similarly, the coefficient for D(KURS,2) is approximately -9.31E-05, indicating that around 0.0000931% of the deviation from the long-term equilibrium is corrected within one period.

R-squared and Adjusted R-squared: The R-squared value indicates the proportion of variance in the dependent variable (CointEq1, D(KURS,2), LN_INFLASI, and D(LN_IMPOR,2)) that can be explained by the independent variables in the model. A higher R-squared value (close to 1) indicates a better fit of the model to the data.

F-statistic: The F-statistic is a measure of the overall significance of the model. It tests whether the coefficients of all the independent variables in the model are collectively significant. A higher F-statistic value indicates that the model is statistically significant overall.

Akaike Information Criterion (AIC) and Schwarz Criterion (SC): AIC and SC are used to compare the relative quality of multiple models. Models with lower AIC and SC values are considered better. They help in selecting the most appropriate model for the observed data.

6. Conclusion

Based on the results of this study, it can be concluded that there is a long-term relationship among trade balance, exchange rate, inflation, and imports in the context of empirical data. Trade balance, exchange rate, and inflation have a negative long-term relationship, while imports have a positive long-term relationship with the other variables. Additionally, there is significant short-term adjustment following disturbances to these variables. These findings provide a better understanding of economic interconnections and can be used as a basis for more effective economic policies. However, it should be noted that these results are based on a specific analytical model and limited to the empirical data used in this study.

This VECM analysis provides estimates of the long-term relationships and short-term dynamics among the modeled variables. In the long run, there is a direct relationship between changes in NARACA_PERDAGANGAN and the dependent variable (CointEq1), while changes in the exchange rate have a negative influence on the dependent variable. The error correction coefficients indicate the speed of adjustment of the variables to the long-term equilibrium. The R-squared value, F-statistic, AIC, and SC provide information about the overall quality and significance of the estimated model.

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