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Determinants of Short and Long-Term Exchange Market Pressure in Indonesia

Abstract

A decrease in a country's export prices and a decrease in foreign exchange reserves are indicative of exchange rate market pressures, which would be described as the presence of oversupply or disequilibrium in the money market. The method used in this study is the Vector Error Correction Model (VECM) to investigate Exchange Market Pressure (EMP) in Indonesia. The data in this study is secondary data sourced from Central Bureau of Statistics and Bank Indonesia (BI) website. The findings of this study show a strong positive long-term relationship between domestic credit growth and the BI rate, a large negative long-term relationship between GDP growth and the BI rate, and no significant relationship between the current account balance and the exchange rate.

Keywords: Exchange Market Pressure, Vector Error Correction Model, Impulse Response Function, Variance Decomposition

JEL Classification: E4 and E5

Introduction

Exchange rate pressure, often referred to as market pressure (EMP), It has evolved to be a topic that has drawn a lot of interest from various researchers up to this point. EMP is a broad term for market disequilibrium. The Exchange Market Pressure (EMP) index measures the impact of global economic pressure on a nation's finances (Sulaeman and Lisna, 2016) . Girton and Roper (1977) first proposed Exchange Market Pressure (EMP) by fusing variations in exchange rates and changes in foreign exchange reserves, which are scaled with base money. Research from Girton and Roper concluded that when there is excessive demand for foreign exchange, EMP puts pressure on foreign exchange reserves and exchange rates. EMP is defined by Ozcelebi (2019) as the rate of exchange rate depreciation as a result of capital.

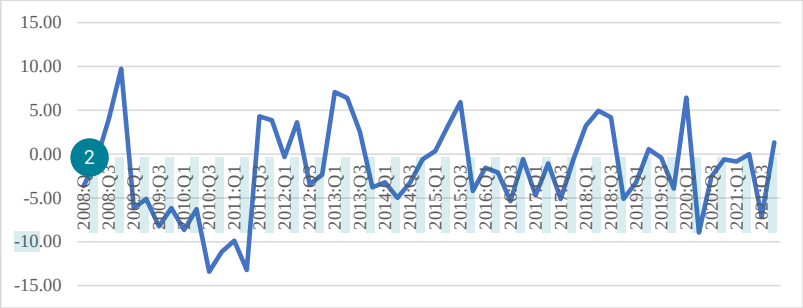

Figure 1. Exchange Market Pressure (EMP) Development from 2008:Q1 to 2021:Q4

Source: Bank Indonesia (data processed)

Figure 1 depicts changes in Indonesia's EMP values from 2008:Q1 to 2021:Q4. An EMP value above zero, according to Sulaeman and Lisna (2016), suggests that there is depreciation pressure on the Indonesian currency market. In the meantime, a negative EMP number or one below zero implies that Indonesia's foreign exchange market appreciated during that time. High volatility can be seen in the EMP value's movement in Indonesia from 2008:Q1 to 2021:Q4. The 2008:Q4 period had the highest EMP value in this time period (9.74%), while the 2010:Q3 period had the lowest EMP value (-13.41%). Additionally, with the exception of the period from 2009 to 2021, the EMP value typically falls below zero.

The EMP index is crucial to the research of Feldkircher, M., Horvath, R., and Rusnak (2014) for two reasons. First, it is simple to calculate mathematically and to analyze an economy. Second, the Exchange Market Strain (EMP) index can be used to gauge the pressure on a nation's foreign exchange market. The factors of the level of change in foreign exchange reserves (official reserves) and the pace of change in currency values explain the base rate that is decreased to relieve pressure on the EMP (exchange rate). Global economic unrest can put a lot of pressure on the Forex markets in a developing nation like Indonesia. The real sector was impacted by excessive pressure on the exchange rate, which also created issues in

the monetary sector. Additionally, pressure on the foreign exchange market can result in an excessive appreciation or depreciation of the exchange rate, which would upset the economic situation in Indonesia (Falianty and Andhony, 2012).

In a study conducted by Kyin et al., (2013) explained that one of the variables that can explain the amount of EMP is domestic credit growth. It is impossible to disregard the importance of domestic credit development for an economy. When domestic credit growth develops and foreign exchange reserves fall or diminish, it may put more pressure on the foreign exchange market or result in a depreciation of the exchange rate. Lestano (2010) discovered that the amount of domestic money in circulation increased in direct proportion to the rise of domestic credit distributed by the monetary authority. This will undoubtedly have a detrimental effect on the stability of the local currency, particularly if the monetary authority does not exercise any control over the distribution of domestic credit growth. It is demonstrated by García, C. and Malet (2007), that domestic credit development has a favorable impact on EMP.

It will be simple for developing nations like Indonesia, which has a modest open economy and is one of the world's largest, to be impacted by the unrest in a big nation like the United States. According to the IMF, during the American recession of 2008, a 1% fall in American economic growth would result in a 0.5–1% reduction in Asian economic growth. The economic forecasts of Asian nations, especially Indonesia, would be impacted by the global recession that resulted from the American recession. As a result, the demands on the foreign exchange market could be significantly impacted by Indonesia's GDP growth. The current account balance is yet another factor with a significant impact on EMP. One of the most crucial macroeconomic indicators of the economy is the current account balance variable.

This indicator is provided by Bank Indonesia (2018) to measure a country's economic strength based on trade in commodities and services, income from production inputs owned, and money transfers such as remittances of workers and

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grants. This means that the greater the proportion of the current account balance to the economy, the more signs of domestic and international economic growth, an increase in income from investment, and an increase in income from foreign workers. In order to strengthen the domestic currency, one of the efforts made by the government is to raise interest rates or run foreign exchange reserves. So that in doing so, the weighted average of the exchange rate and foreign exchange reserves can be used to produce the assessment of the EMP index (Pontines, V., dan Siregar, 2008). According to research Ozcelebi (2019) some monetary authorities will loosen by boosting domestic credit growth as the EMP increases, domestic credit growth increases, and interest rates fall. This difference is in response to a bigger EMP value increase.

Jing (2015) demonstrates how the commencement of the banking crisis has an impact on the onset of the currency crisis and vice versa. Exchange Market Pressure (EMP), a dependent variable, is used in this study to quantify the pressure on the FX market. The factors taken into account for calculating the EMP data for Indonesia from 2008:Q1 to 2021:Q4 include domestic credit growth, domestic credit growth, GDP growth, current account balance, and BI rate. Based on this context, the authors will examine the long- and short-term relationships between domestic credit growth, GDP growth, current account balance, and the BI rate of the EMP in this study. They will then examine how the EMP reacts to shocks from domestic credit growth, GDP growth, current account balance, and BI rate, as well as their relative contributions to the EMP. Only a few studies on EMP in Indonesia have used the current account balance and domestic credit growth variables, the novelty of this study is the combination of independent variables used as well as the year of study.

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Research Method

The type of data used in this study is quantitative secondary data obtained from Bank Indonesia (BI) and the Badan Pusat Statistik (BPS). A time series methodology using a Vector Autoregression (VAR) approach was used for the

analysis in this study. The Unrestricted VAR and the Vector Error Correction Model are two other models for the Vector Autoregression method (VECM). If the data are stationary at the level the Unrestricted VAR model is employed, if all variables are cointegrated and the data is stationary at the first difference level but not at the level, the vector error correction model is utilized (Widarjono, 2018) . Research conducted by Sulistiana (2017) suggests that VECM offers an easy work procedure to separate long-run components and short-run components from the data formation process, so VECM is different from VAR where VECM can be used to model cointegrated and non-stationary time series data. The VECM model was chosen in this study because it is expected to be able to explain behavioral research variables in the long term (Mardiana & Prawoto, 2016).

To determine how shocks brought on by the EMP variable will affect the domestic credit growth variables, GDP growth, current account balance, and BI rate, impulse response function analysis was done. Along with the examination of the impulse response function, variance decomposition analysis is also performed to determine the relative weights of the various variables, including the development of domestic credit, GDP, the current account balance, and the BI rate as a result of EMP shocks. Volatility decomposition is useful for estimating the percentage of each variable's variance that is attributable to changes in other variables. The equation for the study's Vector Error Correction Model (VECM) is as follows:

Long Run Equation

$$EMP_t = \alpha_0 + \lambda_1 DC_{t-j} - \lambda_2 PDB_{t-j} - \lambda_3 CA_{t-j} - \lambda_4 IR_{t-j} + \varepsilon_t \quad (1)$$

Short Run Equation:

$$\Delta\, EMP_t = \alpha_0 + \sum_{i=1}^{p} \beta_1 \,\Delta\, DC_{1t-j} - \sum_{i=1}^{p} \beta_2 \,\Delta\, PDB_{2t-j} - \sum_{i=1}^{p} \beta_3 \,\Delta\, CA_{3t-j} - \sum_{i=1}^{p} \beta_4 \,\Delta\, IR_{4t-j} + \varepsilon_t \quad (2)$$

In order to determine how shocks brought on by the EMP variable would affect the domestic credit growth variables, GDP growth, current account balance, and BI rate, impulse response function analysis was carried out. Where EMP stands for

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That article is also using VECM

Exchange Market Pressure, DC for domestic credit growth, GDP for GDP growth, CA for current account balance, IR for BI rate, 1, 2 for long-term relationship coefficients, 1 2 for short-term relationship coefficients, 0 for regression constants, and ECT for error correction (lag 1, 2,....etc).

Results and Discussion

Stationarity Test

Perform a stationarity test utilizing the root test (unit root test) and the Augmented Dickey Fuller Test (ADF test) method to determine whether one of the assumptions in the time series data test using the VECM model analysis is true. Non-stationary data results in false regression, that is, regression that describes the relationship between two or more statistically significant visible variables, when in fact it is not (Johari et al., 2022). The results are as follows:

Table 1. Augmented Dickey-Fuller (ADF) Level Unit Root Test

Variable	ADF T-statistic	Critical Value 1%	5%	10%	Conclusion
EMP	-4.9285	-3.5550	-2.9155	-2.5955	Stationary
DC	-1.1704	-3.5550	-2.9155	-2.5955	Not Stationary
PDB	-0.9047	-3.5550	-2.9155	-2.5955	Not Stationary
CA	-2.0378	-3.5550	-2.9155	-2.5955	Not Stationary
IR	-3.2376	-3.5550	-2.9155	-2.5955	Stationary

Source: Results of data processing on Eviews 10, (2022)

The ADF method at the level level is used to calculate the unit root test results in Table 1 above. T-count value is compared to the critical values for each variable, which are 1%, 5%, and 10%, respectively. Conclusion: The DC, PDB, and CA variables are not stationary at the level level, however the EMP and IR variables exhibit stationary data. In order to repeat the unit root test on the initial difference for each variable, the outcomes are as follows:

Table 2. Augmented Dickey-Fuller (ADF) First Difference Unit Root Test

Variable	ADF T-statistic	Critical Value 1%	5%	10%	Conclusion
EMP	-10.5072	-3.5550	-2.9155	-2.5955	Stasionary
DC	-4.9234	-3.5550	-2.9155	-2.5955	Stasionary
PDB	-7.3142	-3.5550	-2.9155	-2.5955	Stasionary
CA	-8.6203	-3.5550	-2.9155	-2.5955	Stasionary
IR	-6.3365	-3.5550	-2.9155	-2.5955	Stasionary

Source: Results of data processing on Eviews 10, (2022)

For all stationary variables in the aforementioned results, Table 2 displays the outcomes of the unit root at the first difference level. As a result, the information used in this study is organized in chronological order, or I (1). The following stage of data processing can be completed now that the stationary requirements have been met.

Optimum Lag Determination

The Akaike Information Criterion (AIC) value, which has a minimum absolute value, is a widely utilized methodology in this study. The table below displays the least Akaike Information Criterion (AIC) value at lag 2 based on the results of the optimal lag test conducted in this study utilizing Eviews 10. Based on Table 3 above, the determination of the optimum lag used in this study is lag 2 for the VAR/VECM equation model in this study, then the lag used in the next test is lag 2.

Table 3. Results of Determination of Optimum Lag

Lag	Akaike Information Criterion (AIC)
0	37.57512
1	33.53573
2	33.49814*
3	33.76744

Source : Results of data processing on Eviews 10, (2022)

Information (*) : The smallest Akaike Information Criterion (AIC) value

Stability Test

The stability of the estimated VECM equation system needs to be checked using a predefined lag and the VECM stability condition check, which looks for roots of characteristic polynomials and inverse roots of AR characteristic polynomials for all variables employed. A VECM system is deemed stable based on the test findings if all of its roots have a modulus that is less than one. Based on the results of the VECM stability test in Table 4 for this study, it can be said that the estimated VECM stability that will be utilized for the analysis of the impulse response function has been stable. This is because the modulus range is less than one. Table 4 indicates that all equation models' modulus values are smaller than 1, supporting the validity of the VECM model.

Table 4. Test Results for the AR Characteristic Polynomial's Roots

Root	Modulus
0.851350 - 0.239838i	0.884488
0.851350 + 0.239838i	0.884488
0.813049	0.813049
-0.662094	0.662094
0.444432	0.444432
0.325669 - 0.250804i	0.411051
0.325669 + 0.250804i	0.411051
-0.184160	0.184160
0.055487 - 0.172849i	0.181537
0.055487 + 0.172849i	0.181537

Source : The results of data processing on Eviews 10, (2022)

Cointegration Test

The model employed in this work can be estimated using VECM if cointegration at the level of differentiation exists; otherwise, it can be calculated using VAR. The Johansen cointegration test was employed in this investigation. The Johansen cointegration test's findings are as follows:

Table 5. Cointegration Test Results

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.431039	87.25904	69.81889	0.0011
At most 1 *	0.395603	57.37001	47.85613	0.0050
At most 2 *	0.276786	30.68326	29.79707	0.0394
At most 3	0.136580	13.50861	15.49471	0.0974
At most 4 *	0.102395	5.725347	3.841466	0.0167

Source : Results of data processing on Eviews 10, (2022)

Information

(*) : The trace statistic value is greater than the critical value (0.05)

Inferred from Table 5 above, the null hypothesis that there is no cointegration exists is rejected, and the alternative hypothesis—that there is cointegration—is accepted. The trace statistic and maximum eigenvalue at r = 0 are greater than the critical value with a significant level of 5 percent, which is 87.2590 greater than 69.8188. As a result, the results of the cointegration test show that there is a relationship of stability or balance and similarity of movements among the movements of the variables EMP, DC, PDB, CA, and IR over the long term. To put it another way, all variables have a tendency to adjust to one another during each short-run period in order to reach their long-run equilibrium. As a result, the Vector Error Correction Model (VECM) rather than the Variance Autoregressive (VAR) should be utilized in this investigation because the variables are cointegrated and stationary at the first difference level.

Results of the Vector Error Correction Model Estimation

A vector error correction model is used to estimate the data when it is stationary on the order of first difference, stable, and cointegrated based on the test findings (VECM).

Long-Term Forecast

Based on the finding that the link between these variables is significant if the t-count > t-table, at a significance level of 10% (1.6752), 5% (2.0075), and 1% (2.6757).

Table 6. Long-Term VECM Estimation Results

Variable	Coefficient	t-statistics	Information
EMP(-1)	1.000000		
DC(-1)	**5.722454**	**[1.95842]*** **	**Significant**
PDB(-1)	**-12.01779**	**[-4.69888]***	**Significant**
CA(-1)	-0.001048	[-0.84356]	Not Significant
IR(-1)	**8.901398**	**[2.76938]***	**Significant**
C		-10.14666	

Source : Results of data processing on Eviews 10, (202 2)

Information

[ ] : Shows t-count

* : Based on the confidence level 9 0 % (α=1 0 %)

** : Based on 95% confidence level (α=5%)

*** : Based on 99 % confidence level (α=1%)

The results of the long-term VECM estimation (3) are:

$$\mathrm{EMP_t} = -10.1466 + 1.0000\mathrm{EMP_{t-1}} + 5.7224\mathrm{DC_{t-1}} - 12.0178\mathrm{PDB_{t-1}} - 0.0010\mathrm{CA_{t-1}} + 8.9014\mathrm{IR_{t-1}} \quad (3)$$

The dependent variable EMP and the independent factors provide the long-term estimate results (DC, PDB, CA, and IR). While the current account (CA) variable is not significant over the long term, the domestic credit growth variable (DC) is significant at a 90% level of confidence, the GDP growth variable and the BI rate (IR) are significant at a 99% level of confidence. The DC coefficient or domestic

credit growth is 5.7224 and the coefficient has a significant positive relationship at the 90% confidence level or (=10%). It can be said that when there is an increase in domestic credit growth of 1 percent, it will cause an increase in EMP by 5.7224 percent, ceteris paribus. The coefficient on GDP growth is 12.0178 percent, and has a significant negative relationship at the 99% confidence level or (α=1%). It can be said that when there is an increase in GDP growth of 1 percent, it will cause a decrease in forex market pressure or EMP of 12.0178 percent, assuming other variables are ceteris paribus.

At the 90% confidence level, or (=10%), the DC coefficient, or domestic credit growth, is 5.7224 and exhibits a strong positive association. If all other factors remain constant, it may be claimed that a 1% increase in domestic credit growth will result in an increase in EMP of 5.7224 percent. At the 99% confidence level or (α=1%), the GDP growth coefficient, which is 12.0178 percent, shows a significant negative connection. If all other factors remain constant, it may be claimed that an increase in GDP growth of 1% will result in a reduction in foreign exchange market pressure, or EMP, of 12.0178 percent. The current account balance's coefficient is 0.0010 percent. The results of the long-term estimation of the current account balance are not significant for the EMP, which means that under the ceteris paribus assumption, a rise in the current account balance of 1 percent will only indirectly result in a fall in the EMP of 0.0010 percent. At the 99% confidence level or (α=1%), the results of the long-term estimation of the BI rate or IR have a coefficient value of 8.9014 percent and significantly positively relate to the EMP. This suggests that, assuming ceteris paribus, a one percent increase in the BI rate will result in an increase in EMP of 8.9014 percent.

Short Term Estimate

Table 7. Short-Term VECM Estimation

Variable	Coefficient	t-statistics	Information
ECT	**-0.103906**	**[-2.48960]****	**Significant**
DEMP(-1)	**-0.4073**	**[-2.98967]*****	**Significant**

DEMP(-2)	-0.094986	[-0.63615]	Not Significant
DDC(-1)	**1.161172**	**[2.66862]****	**Significant**
DDC(-2)	**1.209388**	**[3.04031]*****	**Significant**
DPDB(-1)	**-0.868449**	**[-1.69314]***	**Significant**
DPDB(-2)	-0.504526	[-0.92928]	Not Significant
DCA(-1)	-4.59E-05	[-0.12110]	Not Significant
DCA(-2)	**-0.001041**	**[-2.45426]****	**Significant**
DIR(-1)	**-3.351686**	**[-1.87605]***	**Significant**
DIR(-2)	**-3.864726**	**[-2.70437]*****	**Significant**
C		0.123920	

Source: Results of data processing on Eviews 10, (202 2)

Information

[ ] : Shows t-count

* : Based on the level of confidence n 9 0 % (α=1 0 %)

** : Based on 95% confidence level (α=5%)

*** : Based on 9 9 % confidence level (α=1%)

If the t-count is higher than the t-table value with a significance level of 10% (1.6752), 5% (2.0075), and 1%, the estimation results on the collected research variables are considered to have a significant influence (2.6757).

As for short-term VECM estimation results equation:

$$\Delta \text{EMP}_t = 0{,}1239 - 0{,}4073\text{DEMP}_{t-1} - 0{,}0949\text{DEMP}_{t-2} + 1{,}1611\text{DDC}_{t-1} + 1{,}2093\text{DDC}_{t-2} - 0{,}8684\text{DPDB}_{t-1} - 0{,}05035\text{DPDB}_{t-2} - 0{,}00004\text{DCA}_{t-1} - 0{,}00104\text{DCA}_{t-2} - 3{,}3516\text{DIR}_{t-1} - 3{,}8647\text{DIR}_{t-2} \quad (4)$$

Based on the short-term VECM estimation outcomes, the estimated error correction parameter (ECT) was statistically significant with a coefficient of -0.103906 and a significance level of 95%. The coefficient's negative sign implies that quarterly error corrections are made to the equation to test the long-run equilibrium. The

purportedly important error correction parameter establishes that there is a method for adjusting from the short to the long term. 10%, or 10 quarterly, should be modified in order to achieve long-term equilibrium. The short-term estimation of the domestic credit growth variable (DC) yielded results with coefficients of 1.16117 in lag 1 and 1.209388 in lag 2. In other words, if domestic credit growth increases by 1% in the most recent quarter, the EMP will increase by 1.161172% during the most recent quarter, and if domestic credit growth increases by 1% during the most recent two quarters, the EMP will increase by 1.20938% in the most past 2 quarters, assuming ceteris paribus.

With a coefficient value of 0.868449, the short-term estimation of the GDP growth variable at lag 1 shows a negative and significant relationship with the EMP at the 90% confidence level. This relationship implies that, assuming ceteris paribus, when GDP growth rises by 1% in the prior quarter, the EMP will fall by 0.868449 % in the prior period. In contrast, there is no link for lag 2, which means that, under the assumption of ceteris paribus, an increase in GDP growth has no impact on EMP for the two prior quarters. The short-term VECM estimation of the current account variable at lag 1 yielded results that are not statistically significant, indicating that when the current account balance increases, the EMP for the preceding quarter is unaffected. With a coefficient value of 0.001041 percent, lag 2 has a significant negative relationship at the 95% confidence level, which means that under the ceteris paribus assumption, an increase in the current account balance of one percent will result in an increase in the EMP of 0.001041 percent over the preceding two quarters.

According to the short-term VECM estimation of the BI rate variable (IR) at lag 1, the coefficient of 3.351686 indicates a substantial negative association with ceteris paribus, which means that when the BI rate increases by 1%, the EMP decreases by 3.351686 percentage in the preceding period. Assuming ceteris paribus, the IR variable has a coefficient value of 3.864726 at lag 2 and a significant negative association at the 99% confidence level, which means that an increase of 1% in the

BI rate will decrease the EMP by 3.864726 percentage points in the preceding two quarters.

Discussion of the Relationships between Variables across the Long and Short Term

Domestic Credit Growth's Impact on Exchange Market Pressure

The findings of this study's long-term and short-term VECM estimations demonstrate that the expansion of domestic credit has a sizable favorable impact. According to Girton & Roper (1977) EMP theory, if domestic credit growth picks up, the EMP value will rise or the currency market will experience depreciation pressure. According to Lestano (2010) study, "A Structural VAR Model of Exchange Rate Market Pressure : The Case of Indonesia" domestic credit growth and exchange market pressure have a sizable positive association. As well as in the research of Ayuningtyas & Purwono (2020) entitled "Analisis Exchange Market Pressure di Indonesia Periode Setelah Krisis Moneter" shows the relationship of significant and positive domestic credit growth to EMP in the long and short term. The research results obtained in this study are in accordance with the research hypothesis so that the hypothesis can be accepted.

GDP Growth's Impact on Exchange Market Pressure

Growth GDP has a negative and significant impact, notably lag 1, according to the findings of the long-term and short-term VECM estimation in this study. Countries are trying to boost economic growth by manufacturing and consuming products and services (Ali et al., 2019). This outcome supports the study's prediction that the exchange rate will increase with greater GDP growth, easing the burden on the foreign currency market. This study is also consistent with Panday's (2015) study, "Impact of Monetary Policy on Exchange Market Pressure:The Case of Nepal" which demonstrated a strong inverse link between GDP growth and EMP. The findings of a different study by Abdul Aziz & Widodo (2017), titled "Exchange Market Pressure: Evidences from ASEAN Inflation Targeting Countries" are consistent with the findings of García & Malet (2007) study, "Exchange Market

Pressure, Monetary Policy, and Economic Growth: Argentina" in that Indonesia's GDP growth coefficient is significantly negatively correlated with exchange market pressure. Reduced EMP will result in a gain in foreign exchange reserves, appreciation of the home currency, and a drop in relative interest rates. GDP Growth and EMP have a negative association because when GDP growth increases, the exchange rate or domestic exchange rate rises, which lowers EMP or the pressure on the forex market. EMP or depreciation pressure on the Currency market results if both the GDP growth and depreciation rate slow down.

Current Account's Impact on Exchange Market Pressure

The investigation of the long-term VECM estimation in this study's results revealed that the current account balance has no discernible impact on the EMP, indicating that the pressure on the Indonesian forex market is not affected by changes in the country's current account balance. The findings of this study do not support the research hypothesis, but they are consistent with Hegerty (2018) which claims that due to specific circumstances in the country during the research period, the current account balance, which is affected by exports and imports, is not actually able to have a significant long-term impact on EMP. When the global financial crisis first hit Indonesia in 2008, exports there saw a sharp decrease, which was accompanied by a substantial capital outflow in the capital account sector. Even in 2020, Indonesia's exports' value fell by 2.68 percent from 2019. Additionally, imports saw a significant drop, even as high as 17.34% less than in 2019 (Badan Pusat Statistik, 2020).

The Covid-19 epidemic, which slowed down the world economy, was the primary cause of the reduction in the value of exports and imports. These factors prevent the current account balance from having a long-term, meaningful impact on Indonesia's EMP. According to the results of the short-term VECM estimation, the current account balance has a negligible impact on the EMP at lag 2 but is not significant at lag 1 relative to the EMP. According to research by (Ozcelebi, 2019) "Assessment of Asymmetric Effects on Exchange Market Pressure: Empirical

Evidence From Emerging Countries" there is a short-term, significant negative correlation between the current account balance and the EMP. The pressure on the foreign exchange market or EMP will decrease as the current account balance rises. The current account balance is also utilized internally to calculate the EMP and indicate the necessity for borrowing foreign money.

BI Rate's impact on the pressure on the exchange market

The results of the VECM BI rate estimation have a considerable favorable impact on EMP over time. The research hypothesis does not match the findings of the study. The estimation findings in this study, however, are consistent with (Amiruddin, 2014) paper, "Tekanan Nilai Tukar dan Intervensi Bank Sentral di Tiga Negara ASEAN". Rising interest rates may have an impact on excessive demand in the FX market. Since depreciation also causes inflation, the monetary authority must raise interest rates to control inflation, according to research by Khawaja & Din (2007) titled "Instrument of Managing Exchange Market Pressure: Money Supply or Interest Rate" which found a positive relationship between interest rates and exchange market pressure.

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The short-term VECM estimation's findings about the BI rate have a very detrimental impact on the EMP. The research hypothesis is supported by the findings of the study. The estimation findings in this study are consistent with Ratnasari & Widodo (2007) paper, "Exchange Market Pressure and Monetary Policies in ASEAN5" which asserts that a rise in interest rates will lessen exchange market pressure during times of crisis. The value of the EMP declines in response to an increase in interest rates. This is because pressure on the foreign exchange market will lessen when interest rates rise since capital inflows will lead the rupiah/USD exchange rate to gain (Ratnasari & Widodo, 2007). Both the short-term and long-term findings of the VECM estimation indicate valid results. The change in the dependent variable, EMP, can be explained by the independent variables, which include domestic credit growth, GDP growth, current account balance, and the BI rate of 62.10%, as shown by the coefficient of determination R-squares value,

which is worth 0.621084. The impulse response function and variance decomposition tests will be the following ones run as part of this investigation.

Impulse Response Function (IRF) Results

The outcomes of the influence of a shock on one variable on another variable are explained by the impulse response function analysis, which in this analysis is not only in a short period but can analyze for numerous horizons to future as long-term information. It is used in this study to examine the Exchange Market Pressure (EMP) reaction to shocks in domestic credit growth (DC), GDP growth (GDP), current account balance (CA), and BI rate (IR).

Table 8. Results of Impulse Response Function

Period	EMP	DC	PDB	CA	IR
1	5.052703	0.000000	0.000000	0.000000	0.000000
2	2.745133	0.746012	0.304915	0.032416	-1.79632
3	2.666316	0.207653	0.367707	2.138370	-0.60631
4	2.835382	0.360451	1.635837	1.267833	-0.81906
5	2.551915	0.869658	1.862027	0.511398	-1.12682
6	2.978707	0.621433	1.728209	0.636174	-1.18667
7	2.861030	0.768610	1.344660	0.793525	-1.41044
8	2.781673	0.620712	1.169199	0.909043	-1.28966
9	2.788567	0.640054	1.044093	0.969115	-1.22174
10	2.779176	0.586108	1.061511	0.889952	-1.19001

Source: Results of data processing on Eviews 10, (2022)

Exchange Market Pressure Response to Domestic Credit Growth Shock

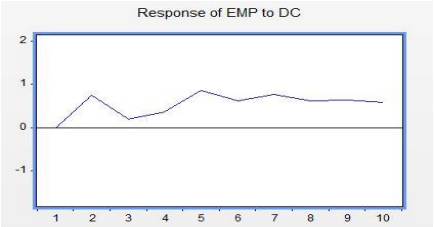

Figure 2. IRF EMP Test Results against DC shock
Source : Results of data processing on Eviews 10, (2022)

Table 8 shows the positive response of the EMP to DC shocks or domestic credit growth in periods 2 to 10 at one standard deviation. This positive response indicates that there is a decline in the value of the EMP below zero from shocks to domestic credit growth. The EMP reaction fluctuated from the second to the tenth period, with the second period's response size being 0.7460 percent rising to 0.8696 percent in the fifth period. The sixth to tenth period also displayed oscillations, with the tenth period's response size being 0.5861 percent. The findings of this study show that the EMP responded favorably to the shock of credit growth. Accordingly, if there is an increase in domestic credit growth as indicated by an excess demand for money, foreign exchange reserves will rise, the exchange rate will appreciate, and EMP, or pressures on the forex market, will be reduced.

1 Lestano (2010) study, "A Structural VAR Model of Exchange Rate Market Pressure: The Case of Indonesia" found that the EMP responded favorably to shocks to domestic credit growth in Indonesia. These findings are consistent with the results of the EMP. According to Lestano (2010) , increasing capital inflows can have a positive effect on the economy. The existence of capital inflows can lead to an appreciation of the domestic currency and will trigger an explosion in asset prices which in turn will encourage domestic credit expansion. The domestic currency will strengthen, or in other words, the EMP will decline, as a result of the rise in capital flows combined with the rise in domestic credit growth that is being directed by the monetary authority to increase liquidity.

Exchange Market Pressure Response to GDP Growth Shock

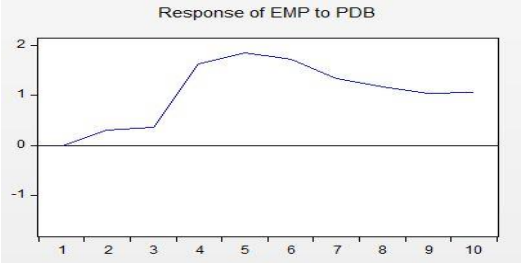

Figure 3. IRF EMP Test Results on GDP growth shock

Source : Results of data processing on Eviews 10, (2022)

The EMP responded positively to GDP growth shocks in periods 2 to 10 at one standard deviation. When the EMP responds positively to a GDP growth shock, it means that the EMP has fallen below zero in the second to tenth period. The EMP's response to GDP growth was 0.3049 percent in the second period, 1.6358 percent in the fourth period, and increased from the fifth to the tenth quarter. The results of the EMP responded positively to the GDP growth shock in line with Lestano's (2010) research, entitled "A Structural VAR Model of Exchange Rate Market Pressure: The Case of Indonesia" Thus when there is a shock to GDP growth, the EMP reacts favorably. When the GDP growth rate declines, as it did from 2020:Q2 to 2021:Q1, there is a positive EMP response to the GDP growth shocks. In response to the number of foreign exchange pressures that have reduced in value below zero, which indicates that there is a decrease in pressure on the forex market, GDP growth demonstrates that there are significant societal limitations that have an impact on the economy.

Exchange Market Pressure Response to Shock Current Account

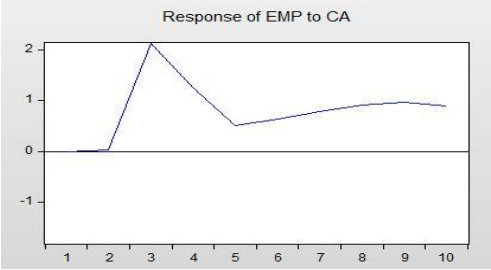

Figure 4. IRF EMP Test Results against CA. shock

Source : Results of data processing on Eviews 10, (2022)

In periods 2 to 10, by one standard deviation, EMP responded favorably to shocks to the current account (CA). This indicates that when there is a shock to the current account balance or a current account deficit, it will lessen the pressure on the currency market or EMP has a value below zero. Up to the tenth period, when the fluctuating numbers tended to grow by 1.0615, the EMP response to the EMP shock had outcomes of 0.3049 in the second period, 1.6358 in the fourth period, and so on. These findings are consistent with the study by Ozcelebi (2019) "Assessment of Asymmetric Effects on Exchange Market Pressure: Empirical Evidence From Emerging Countries" which found that changes in the current account balance have a positive impact on the exchange market pressure (EMP), as they can lessen forex market pressures. A country's economic power is measured by its ability to trade goods and services, generate income from its own production assets, and receive grants and remittances from its citizens (Bank Indonesia, 2018). Therefore, the local economy will develop better, including international trade, an increase in revenue from investment, and an increase in income from foreign employees, the higher the ratio of the current account balance to the economy.

Exchange Market Pressure Response to Shock BI Rate

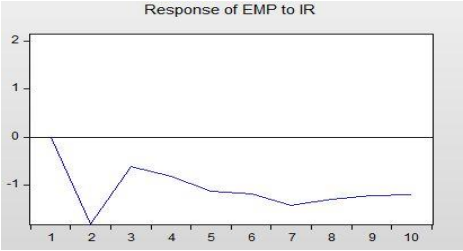

Figure 5. IRF EMP Test Results against IR shock
Source : Results of data processing on Eviews 10, (2022)

According to Ozcelebi (2019), "Assessment of Asymmetric Effects on Exchange Market Pressure: Empirical Evidence From Emerging Countries," these findings support the theory that the EMP reacts favorably to shocks in the current account balance because the current account balance can IR shocks cause the EMP to react negatively in periods 2 to 10 at one standard deviation. This indicates that the EMP will react negatively by increasing FX market pressure in response to a shock to the BI rate. When the EMP reacts negatively, it indicates that the currency market is under more pressure or that the EMP's value has increased above zero. The response value was -1.7963 percent in the second period and -1.1268 percent in the fifth period. According to a Abdul Aziz & Widodo (2017) titled "Exchange Market Pressure: Evidences from ASEAN Inflation Targeting Countries" if interest rates rise, the domestic currency would weaken and/or foreign exchange reserves will be lost, which will result in an increase in EMP. The BI rate manages market liquidity to help monetary policy accomplish its operational goals. The BI rate's other goals are to maintain economic stability and rein down inflation. In most cases, BI will raise the BI rate if inflation is anticipated to be higher than the objective, and vice versa if inflation is anticipated to be lower than the target.

Results of Variance Decomposition (VD)

To determine the relative impact of research factors on other variables, variance decomposition is used to assemble the forecast error variance of a variable, that is, how much the variance before and after the shock differs from other variables. The

decomposition variable on the EMP variable during a 10-quarter period is summarized in the table below.

Table 9. Results of Variance Decomposition

Period	EMP	DC	PDB	CA	IR
1	100.0000	0.000000	0.000000	0.000000	0.000000
2	89.50455	1.506470	0.251667	0.002844	8.734466
3	81.70478	1.219534	0.464059	9.301636	7.309988
4	77.39753	1.171181	4.661979	9.922394	6.846918
5	73.39804	1.992837	8.545047	8.640695	7.423379
6	71.76639	2.112468	10.55973	7.726640	7.834771
7	70.49938	2.418728	10.96618	7.343135	8.772570
8	69.87739	2.502671	11.01304	7.296282	9.310617
9	69.55475	2.595622	10.85429	7.363969	9.631372
10	69.40355	2.630361	10.77334	7.329168	9.863582

Source: Results of data processing on Eviews 10, (2022)

Variance decomposition seeks to quantify the relative importance of the DC, PDB, CA, and IR factors in influencing the EMP variable. From Table 9, it can be inferred that the EMP variability period began as a result of the EMP shock itself, which was 100%, and was caused by the variance decomposition results in the equation model where the contribution of the independent variables to the forex market pressure or the EMP from period 1 to period 10 fluctuated. Other factors started to have an impact on the fluctuation of currency market pressures or EMP in the second period. EMP continues to play a significant role in the second session with an 89.50% dominance. Then, with a period 8 contribution of 11.01%, GDP growth is the independent variable with the highest contribution to EMP, demonstrating the importance of GDP growth in the pressures on the foreign exchange market. In addition, the fourth period's 9.92% contribution from the current account balance variable was the second highest. The BI rate variable's third contribution in the tenth period was 9.86%, and the domestic credit growth variable's (DC) tenth period contribution was the smallest at 2.63%.

Conclusion

Based on the results of the long-term VECM estimation, domestic credit growth has a significant positive relationship to Exchange Market Pressure (EMP), GDP growth has a significant negative relationship to EMP, the current account balance is not significant to Exchange Market Pressure (EMP), and BI rate has a significant positive relationship to EMP. According to the findings of the short-term VECM estimation, domestic credit growth has a significant positive relationship to EMP, GDP growth has a significant negative relationship to EMP, the current account balance has a significant negative relationship to EMP, and the BI rate has a significant negative relationship to EMP. Exchange Market Pressure (EMP) responded effectively to shocks to domestic credit growth, GDP growth, and the current account balance, according to the results of the Impulse Response Function (IRF). EMP meantime reacted negatively to BI rate shocks. The positive response indicated a decrease in the value of the EMP below zero or a decrease in pressure on the foreign exchange market, while the negative response noted an increase in the Exchange Market Pressure (EMP) above zero or a pressure increase on the foreign exchange market.

Based on the conclusions above, the role of the government to control EMP is very necessary. Governments and stakeholders can advance international trade by increasing exports and controlling imports, through international economic cooperation. The closer the cooperation with many countries, the more opportunities the country has to conduct international trade. In addition, the government should also improve the quality of human resources and technology so that the quality of export products is getting better. The government through Bank Indonesia can also maintain economic growth through infrastructure development to realize price stability and inclusive and quality economic growth. And the government must reduce domestic credit growth by limiting new loans, increasing taxes, and synergy between State-Owned Enterprises (SOEs). The limitation of this study is that it has not compared crisis conditions and non-crisis conditions. As happened in 2008 and 2021, wherein 2008 there was a monetary crisis and in 2021

with the covid-19 pandemic. Subsequent research uses a combination of independent variables that affect EMP and compares how the independent variables affect EMP in crisis and non-crisis conditions.

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