Analysis Of Exchange Market Pressure In Indonesia

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Abstract
Indonesia, which is included in a small open economy, will be easily affected by the turmoil in a large country such as the United States. Any form of pressure, either appreciation or depreciation of the exchange rate, is necessary because it could lead to a crisis that has a negative impact on the economy. This study analyzes the Exchange Market Pressure (EMP) based on the condition of foreign exchange reserves, the rupiah exchange rate, inflation and the consumer price index using the Vector Autoregressive (VAR) approach. The data used is quarterly secondary data in the first quarter of 2010 to the fourth quarter of 2020. The results show that there is a long-term effect on the variables of foreign exchange reserves, rupiah exchange rate, inflation and the consumer price index on the value of EMP. In the causality analysis, it is known that there is no two-way relationship between all these variables. What happens is only a one-way relationship between foreign exchange reserves and EMP, rupiah exchange rate with EMP, foreign exchange reserves with rupiah exchange rate, and EMP with consumer price index.

Keywords: EMP, causality, VAR

Introduction
The change in the exchange rate system adopted by Indonesia coincided with the Asian financial crisis in 1997/1998 and caused the exchange rate to fluctuate due to various pressures in the foreign exchange market. Before the 1997/1998 Asian financial crisis, Indonesia adopted a fixed exchange rate system, then after the Asian financial crisis it switched to a controlled floating exchange rate system, and became floating. When the 1997/1998 crisis occurred, the rupiah had a fairly high level of volatility. This change in the exchange rate system causes the rupiah to move with the foreign exchange market, so that foreign exchange market pressures in Indonesia often occur. This condition encourages a more in-depth analysis of EMP. The World Bank sees
that there are four main reasons that together make the crisis lead to bankruptcy. The first is the rapid accumulation of external private debt from 1992 to July 1997, so that 95% of the total increase in external debt comes from this private sector, and the average maturity is only 18 months. In fact, during the last four years the government's foreign debt has decreased. The second reason is the weakness in the banking system. The third is the issue of governance, including the government's ability to handle and resolve crises, which later turned into a crisis of trust and reluctance of donors to offer financial assistance quickly. The fourth is the political uncertainty facing the last general election and the question of President Soeharto's health at that time (Lavinda, 2018).

The rupiah exchange rate which was relatively stable and even tended to increase prior to July 1997 has stimulated substantial capital inflows to Indonesia. This phenomenon is a logical thing for a country that adheres to a free foreign exchange system and its economy is open because capital flows will always follow the largest investment return and minimal risk. However, since the currency turnover hit Thailand and spread to other ASEAN countries in mid-July 1997, The pressure on the rupiah exchange rate was exacerbated by the increasingly rampant speculative bubble activity, so that since the crisis the rupiah exchange rate has depreciated to 75 percent (Goeltom & Zulverdi, 1998).

The country's foreign exchange reserves were also affected during this period. Among the 10 years starting from 2010-2020, it can be seen that 2010 was the year in which foreign exchange reserves were the lowest, amounting to 69,562 billion Rupiah. However, in 2011 foreign exchange reserves increased 27 percent to 95,332 billion Rupiah. In 2020, it was recorded that Indonesia had the highest foreign exchange reserves for the last ten years, with a total of 131.7 billion Rupiah at the beginning of the year.

Indonesia's inflation rate in the 2010-2020 period can be seen that in January 2014 the inflation rate had skyrocketed to the highest with a value of 8.22 percent compared to the beginning of the year in the 10-year period. Inflation increased 44 percent from the previous year with a value of 4.57 percent. Meanwhile, the lowest inflation rate based on was at the beginning of 2020, which was 2.68 percent.

Consumer Price Index (CPI) is an index number that describes changes in the prices of goods and services consumed by the general public in a certain period with a predetermined time period. The consumer price index is an index number that measures the average price of goods and services consumed by households. The CPI is often useful as a measure of a country's inflation rate and also as a consideration for adjusting salaries, wages, pensions, and other contracts. CPI and inflation are closely related, where CPI growth can provide an overview of the inflation rate of a region as well as describe the pattern of public consumption. In addition to the above, the CPI is one of the economic indicators that can be used to make a simple analysis of the cycle of economic development in a certain period. There is a fairly close relationship between the CPI and inflation, changes in the CPI reflect changes in prices, when the prices of goods or services in commodities experience an increase, it can be concluded that inflation has occurred in the commodity group (Mankiw, 2007). In addition, the CPI is also an indicator of economic
stability in the sense that the stability of the economy can be seen from the rate of inflation.

When the Asian financial crisis occurred during 1997/1998, economic actors such as company, chooses to maintain its liquidity from various risks that are likely to increase due to the Asian financial crisis which resulted in a decline in the supply of dollars. Decreased supply the dollar will have an impact on high demand from other countries which leads to the value of the currency depreciated local.

This issue of exchange rates will also have a negative impact on product prices in the market country. Currency depreciation causes the price of imported goods to tend to be more expensive, so that the only choice of domestic people is nationally produced goods which result in too much high demand for local goods and ultimately demand is not commensurate with supply. This is further exacerbated by global conditions which also tend to reduce purchasing power public. As a result, there was a boost in the rate of inflation. From countries Almost all countries in Southeast Asia experienced a fairly high spike in inflation. Myanmar is a country with the largest inflation rate, namely 33.9 percent. In 1998, Myanmar's inflation rate has not been successful controlled and reached a high level of 49.14 percent. Besides Myanmar, Laos is also a country second with the highest inflation rate in 1997 which reached 19.54 percent. Even in 1998, Laos' inflation rate jumped to 90.14 percent.

Pressure on the forex market (EMP) is identified as the sum of currency depreciation and international reserve outflow. EMP is assumed to be a more appropriate measure for crises currency because it reflects movements in exchange rates and international reserves. Meanwhile, monetary policy is measured based on domestic credit growth and changes in the exchange rate difference. The foreign exchange market pressure (EMP) on a currency is actually an oversupply in a currency the foreign exchange market of the monetary authority does not try to influence the exchange rate; this oversupply expressed in the relative depreciation required to write it off. Economic pressure in a countries dealing with international economic pressures. International economic pressure on a country's finances can be measured by the Exchange Market Pressure (EMP) index. Under value floating exchange rate, the monetary authority (usually the central bank) is passive with the exchange rate, so EMP is actual depreciation. In any other regime the monetary authorities counteract depreciation by policy measures, such as setting higher official interest rates, or buying currency domestic market in foreign exchange (forex). Then the actual depreciation does not coincide with the EMP, and correct measurement of EMP requires the addition of an antidote to depreciation policy action (Girton & Roper, 1976).

**Research Method**

The main method of collecting data for this research is secondary, that is, researchers seek and retrieve data from a number of parties or related agencies that provide data and will be obtained by researchers in accordance with what will be studied. On the big ridge, this data collection is sourced from trusted agencies such as the Central Statistics Agency (BPS), Bank of Indonesia (BI), International Monetary Fund (IMF), World Bank, and so on.

This research takes place in Indonesia nationally, considering the economic growth in Indonesia often fluctuates so it needs to be analyzed, especially regarding the relationship.
between economy with foreign countries. In this study used quantitative descriptive research methods. Descriptive analysis is an analytical technique used to provide an overview or description of a situation objectively. While what is meant by quantitative is a scientific approach that is produced based on data that is processed and analyzed so that it becomes valuable information in making a decision. In quantitative analysis usually use a computer as a tool help. This study is intended to determine the pressures that occur in the foreign exchange market in Indonesia. Indonesia in the period 2010.Q1 to 2020.Q4. Data analysis techniques used in this study is with Vector Autoregression (VAR) using the help of Eviews 10 and Microsoft Excel 2007 as data processing software. VAR is usually used to analyzing the system variables time series (time series) that are not theoretical. VAR Model models was formed with the consideration to minimize the theoretical approach with the aim of being able to capture economic phenomena well. VAR model also means non-structural model or model not theoretical (Widarjono, 2018).

Results and Discussion

Results of Stationary Test

To determine whether the data is stationary or not is to compare the statistical values DF with its critical value is the statistical distribution. If the absolute value of DF is greater than the value of critically, then H0 is rejected, which means that the data is stationary, and vice versa.

Table 1. Results of Stationary Test (Unit Root Test ADF)

<table>
<thead>
<tr>
<th>Variable</th>
<th>t-Statistic</th>
<th>Prob.</th>
<th>Keterangan</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMP(-1)</td>
<td>7.127930</td>
<td>0.0000</td>
<td>Stasioner</td>
</tr>
<tr>
<td>DEVISA(-1)</td>
<td>7.749023</td>
<td>0.0000</td>
<td>Stasioner</td>
</tr>
<tr>
<td>KURS(-1)</td>
<td>6.897482</td>
<td>0.0000</td>
<td>Stasioner</td>
</tr>
<tr>
<td>INFLASI(-1)</td>
<td>5.917034</td>
<td>0.0000</td>
<td>Stasioner</td>
</tr>
<tr>
<td>IHK(-1)</td>
<td>6.467399</td>
<td>0.0000</td>
<td>Stasioner</td>
</tr>
</tbody>
</table>

Sources: Data processed

The table above is the result of the Unit Root Test stationarity test which was carried out using Augmented Dickey Fuller (ADF). It was concluded that the five variables used in this study is significant at the level. This is known from the probability value which is below 5% alpha (0.05).

Results of Optimum Lag Determination

From the results of the lag length test, it shows that the optimum lag length for the VAR model based on the Akaike Information Criteria (AIC) value is lag 2 with a value of -20.69328.
Estimated results using the VAR model will produce a variance decomposition function and an impulse function responses used to answer research problems.

**Results of Cointegration Test**
Based on the estimation results of the cointegration test, it can be seen that the probability values are none and at most 1 is less than the significance level used, which is $= 5\% (0.05)$, so it means that hypothesis H 0 stating absence of a long-term relationship or cointegration is rejected, and hypothesis H 1 which suggested a long-term relationship or cointegration received. So that, these variables have a stability or balance relationship in the long run long. The data is declared to have passed the causality test so that the estimate used is VAR estimation.

**Results of Causality Test**
From the results of the causality test, it can be seen that those who have a causal relationship are those who has a probability value smaller than alpha 0.05 so that H 0 will be rejected, namely the variable this will affect other variables. From the Granger test above, it can be concluded reciprocal relationship as follows:

a. Foreign exchange variable statistically significantly affects EMP (0.03) and vice versa
EMP statistically does not significantly affect the foreign exchange variable (0.73) so that it is concluded that there is only one-way causality between the variables of FOREIGN EXCHANGE and EMP, namely only FOREIGN EXCHANGE which statistically affects EMP, not the other way around.

b. The EXCHANGE variable (the rupiah exchange rate) does not statistically significantly affect the EMP (0.81) and

c. On the other hand, EMP statistically significantly affects the EXCHANGE variable (0.03) so that we reject the null hypothesis. Thus, it is concluded that there is a unidirectional causality between EXCHANGE and EMP variables are only EXCHANGE which statistically significantly affects EMP and not vice versa.

d. INFLATION variable statistically does not significantly affect EMP (0.15) and EMP significantly statistically did not significantly affect EMP (0.49). Thus it is concluded that no there is any causality between INFLATION and EMP variables.

e. The CPI variable statistically did not significantly affect the EMP (0.83) and vice versa the variable EMP statistically significantly affects the CPI variable (0.005) so it can be concluded that only EMP has a statistically significant effect on the CPI variable, not the other way around.

f. EXCHANGE variable statistically does not significantly affect foreign exchange (0.86) and vice versa the foreign exchange variable statistically significantly affects the EXCHANGE (0.01) variable so that it was concluded that only foreign exchange was statistically significant in influencing the EXCHANGE variable, not the other way around.

**Results of Stability Test**
Stability test shows the description "VAR satisfies the stability condition" which means that
VAR is already in a stable condition. It can also be seen from the value of the modulus that each root is less than 1. Because if the modulus is more than 1 then the VAR can be categorized as unstable.

**Results of Vector Autoregressive (VAR)**

<table>
<thead>
<tr>
<th>Alpha</th>
<th>5%</th>
</tr>
</thead>
<tbody>
<tr>
<td>t-table</td>
<td>1.645</td>
</tr>
</tbody>
</table>

Source: (Gujarati & Porter, 2013)

Where means that the number of research observations is reduced by the number of variables that used. This study has 215 observations, reduced by 5 variables means equal to 210.

That way the t-table can be seen at (df = 210) degree of freedom, $a = 5\%$. In the results of the VAR test output it can be seen that all foreign exchange and exchange rate variables are stationary, while inflation and CPI variables are not stationary. It is shown from the probability value foreign exchange and exchange rate variables that are less than alpha 0.05 (5%), while inflation and CPI has a probability value of more than 0.05 (5%). In addition, to see whether the estimation results significant value can also be seen from the value of R-squared which is quite large, namely 0.900995. To convince that this result is a valid result, it can also be tested using the classical assumption test.

**Results of Impulse Response Function (IRF)**

The Impulse Response Function (IRF) is used to analyze how the variable response is in this VAR system due to the shock of another variable. If the IRF image shows significant movement getting closer to the equilibrium point or returning to the previous equilibrium means that the response a variable due to a shock will disappear over time so that the shock does not leave a permanent influence on these variables. This IRF analysis predicts how condition of the five variables in the future.

![Figure 1. Results of Impulse Response Function (IRF)](http://www.webology.org)

The figure above describes the foreign exchange response due to the shock of the INFLATION variable. The existence of an INFLATION shock caused foreign exchange to increase at the beginning of the period, then decreases in the middle of the period and is getting closer to the
point of equilibrium (convergence) at the end of the period.

Results of Variance Decomposition (VD)

Based on the table above, it can be seen that the VD analysis shows that the variable is expected to have the greatest contribution to the EMP variable over a ten year period what will come is the EMP variable itself. This is evidenced by the results of the average contribution by 79.0122 percent. The contribution of the influence of the EMP on the EMP itself in each period is always decrease. In the first period the effect reaches 100 percent later decreased in the second period with a contribution of 84.27131 percent and the longer the period the effect decreases until in the tenth period the level of influence is 73,83366 percent.

The next effect is shown by the rupiah exchange rate variable (exchange rate), with an average contribution of an average of 8.325597 percent. The contribution of the influence of the rupiah exchange rate on the EMP in each period is always experienced fluctuations even though at the end of the recorded period the level of influence increased to 10,5173 percent. In the first period the contribution given by the rupiah exchange rate variable is by 0 percent.

The third effect is the foreign exchange variable which has an average contribution of 6.868865 percent. View from table VD that the foreign exchange variable has a 0 percent effect in the first period, the same as the previous rupiah exchange rate variable. However, the contribution of its influence tends to increase up to the end of the period reached 8.807011 percent.

The last influence variable is the Consumer Price Index (CPI) variable which has the average influence is 1.585274 percent. The effect in the first period is 0 percent, then followed by 0.055246 percent in the second period, and reached 2.401425 percent in the tenth period.

Discussion

The Effect of Foreign Exchange Reserves on EMP in the Long-Term

Based on the results of long-term estimation through the VAR method, it can be seen that between foreign exchange reserves have an influence on the EMP. This is evidenced by the large value of t-statistic (19.53467) > t-table (1.645). The magnitude of the coefficient value of 1.065522 means that every an increase in foreign exchange reserves per unit (1%) then it will cause an increase in the value of EMP by 1.065522 percent cateris paribus.

From the results above, it can be concluded that the initial hypothesis which states the influence of a significant positive relationship between foreign exchange reserves and EMP in the long term is accepted. This result this is because the increase in foreign exchange reserves will increase the value of the EMP.
These results are in accordance with research conducted by Tanner (2001) who examined EMP in Asian and Latin American countries namely Brazil, Chile, Mexico, Indonesia, Korea and Thailand with using Vector Autoregression (VAR). The purpose of this research is to observe the existence of the effect of monetary policy on EMP in Brazil and Asian countries by using EMP model percentage change in exchange rate and percentage change in foreign exchange reserves. In individual studies, it can be seen that the shock to domestic credit is very important in explain EMP. Domestic credit has a significant effect on the EMP. Judging by the IRF, credit domestic have a negative influence on EMP. Shock on interest rates also affects to EMP but the effect is smaller than that of domestic credit. Pooled Analysis shows the same response where the domestic credit shock has a positive effect on the EMP. Shock interest rates give different results where these variables do not significantly affect EMP (Gusmanita, Effendi, & Kurniawan, 2020).

Likewise with the results of research from (Azhar, Aimon, & Nelonda, 2015) in a study that entitled Exchange Market Pressure Detecting Financial Crisis in Indonesia that foreign exchange reserves have a significant chance of a financial crisis.

The Effect of Exchange Rate on EMP in the Long Run

Based on the table of VAR estimation results, it is known that the rupiah exchange rate against the US dollar significantly positively affects EMP. It can be seen from the t- statistic (7.568830) > t-table (1.645) with a coefficient value of 1.1165620. This means that any increase in the value of the unit rupiah exchange rate will cause an increase in the value of the EMP by 1.1165620 percent.

The conclusion from this is that the hypothesis which states that there is a significant effect significant difference between the rupiah exchange rate and the value of the EMP in Indonesia in the long run is accepted. This result is in accordance with the initial hypothesis which states that the rupiah exchange rate is significant against EMP.

The results of this study are in line with research conducted by (Faliyanty & Andhony, 2012) stated that the exchange rate market (market exchange) is always moving because every market balance switch from time to time in seconds and minutes. However, it's hard to see effectiveness of activities in the foreign exchange market. The EMP index describes how much pressure international market against the domestic foreign exchange market, so that it can be described in the period when critical conditions in the foreign exchange market.

The Effect of Inflation on EMP in the Long Run

Based on the table of VAR estimation results, it is known that the inflation value is not significant affect the EMP. It can be seen from the t- statistic (-0.351007) < t-table (1.645) with a value of coefficient of -0.003102. This means that any decrease in the value of inflation per unit (1%) will caused a decrease in the value of EMP by 0.003102 percent.

This result is not in accordance with the initial hypothesis formulated. Where is the hypothesis stated that inflation significantly affects the EMP. Inflation also reflects activity economy, both domestically and internationally. So that in the end it will affect EMP levels.

However, the results in this study are in accordance with research conducted (Panday,
2015) that Nepal's GDP growth has a negative effect on EMP while India's inflation is not significant effect on EMP.

The Effect of the CPI on the EMP in the Long Run

Based on the table of VAR estimation results, it is known that the value of the consumer price index (CPI) is not significant effect on the value of EMP. It can be seen from the t-statistic (-0.108456) < t-table (1.645) with a coefficient value of -0.002814. This figure means that any decrease in the value of the consumer price index of one unit (1%) will cause a decrease in the value of the EMP by 0.002814 percent.

CPI is basically always closely related to inflation. Because inflation is proven to have no influence on the EMP, as well as the CPI, which is not in accordance with the initial hypothesis that the CPI has an influence on the EMP value.

In some countries, the CPI is used as a target for central bank monetary policy because: The monetary policy taken by the central bank is always in line with other macroeconomic policies. In addition, inflation expectations are always directly related to consumer prices. Directly or indirectly the value of the price index can be influenced by exchange rate movements (Hasyyati, 2013).

Conclusions

Foreign exchange market pressure (EMP) is influenced by several variables, including foreign exchange reserves, rupiah exchange rate, inflation and CPI. These variables have their respective contributions. In the long term, the rupiah exchange rate has the greatest influence on. EMP is compared with other variables such as foreign exchange reserves, inflation and the consumer price index. Thus, in maintaining the stability of the EMP value, it is better to use a policy of which can also control the rupiah exchange rate, because the rupiah exchange rate has a positive influence to the EMP level. However, even so, the money supply must be controlled so as not to cause negative effects on the economy. Foreign exchange reserves have a statistically significant positive effect on EMP and there is a unidirectional causality between these variables. EMP statistically significantly affects the rupiah exchange rate so that null hypothesis is rejected. Foreign exchange reserves also significantly affect the exchange rate variable rupiah and CPI with a one-way relationship, and not vice versa. Inflation to EMP is proven to have no significant and not mutually exclusive relationship influence. EMP is significant in influencing the CPI variable and only applies the relationship one-way, not two-way reciprocity. In addition, the EMP variable itself has the biggest influence on changes in its value, the variable another sample in this study is the variable rate of change in the rupiah exchange rate against the dollar is the variable that has the largest contribution to changes in value that occur on EMP that is 8.325597 percent.

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