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Exchange Rate Fluctuation on Emerging Market and Developing Countries in Europe

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Abstract

This study investigates the determinants of the exchange rate in European Emerging Market and Developing Countries (EMDEs), including Albania, Bulgaria, Hungary, Rep. Moldova, Rep. North Macedonia, Romania, Russia, and Ukraine. This study uses secondary data from 2000-2019 in time series and panel data with a sample of 8 countries sourced from the United Nations Conference on Trade and Development, the International Monetary Fund, and the World Bank. A regression method was used for time series data to analyze each country, and panel data was used for eight countries. Time series regression results show the influence of different relationships in each country. Meanwhile, the panel data regression found that exchange rate fluctuations in EMDE's European countries, GDP growth, and Terms of Trade (ToT) had a significant positive effect on exchange rates. It means that an increase in GDP and ToT growth affects the exchange rate appreciation, and a decrease in GDP and ToT growth affects the exchange rate depreciation in EMDE's European countries. Meanwhile, inflation and loan interest rates have a significant adverse effect on the exchange rate. It means that every decrease in inflation and interest rates on loans affects the appreciation of the exchange rate and vice versa, increases in inflation and interest rates on loans result in exchange rate depreciation in EMDE's European countries.

Keywords: Exchange rate; macroeconomics; Europe

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Introduction

Exchange rate fluctuations are a major concern by the monetary and economic authorities of a country because they are related to international trade and balances (Ramasamy & Abar, 2015). The exchange rate is also one of the benchmarks for competitiveness and shows the economic position of a country (Akhtar & Faruqui, 2015). Exchange rate fluctuations can be seen in the movement up (appreciation) and down (depreciation) in the nominal of a currency. The appreciation of the exchange rate has the opposite effect of depreciation and will have a major impact on the performance of the international balance of payments such as import-export activities and the country's foreign exchange reserves (Krugman & Obstfeld, 2000). Countries that have global market liberalization in carrying out international trade activities are very sensitive to exchange rate fluctuations. In addition, the exchange rate is also an instrument in monetary policy to achieve price stability and stable economic growth. Exchange rate fluctuations are also influenced by the performance of macroeconomic fundamentals and monetary policy so that the determination of interest rates and the performance of economic growth, inflation and international trade performance. So that the management of intermediary variables includes interest rates, Gross Domestic Product and exchange rates (Usman, 2014).

Determination of policies to carry out market liberalization carries a high risk, as happened in the phenomenon of the global financial crisis in 1998 which resulted in market failure resulting in an economic recession that worsened the world economy, higher exchange rate depreciation, rising inflation resulting in increased prices and production activities. decrease. This condition also has a complex impact on other aspects such as domestic and global social and political aspects. In addition, the biggest impact occurred in the real sector, giving rise to a domino effect in the investment sector, financial sector, labor market and so on. The weakness of the financial sector, especially in developing countries, will cause the impact to be even greater and may result in a recovery slowerWeak financial sector as a result of extreme market philosophy, as well as the declining role of government, globalization and the existence of a free trade paradigm (Trihadmini and Atmajaya, 2011).

Several related empirical studies conducted in various developing countries such as the research of Chavez (2020), found that GDP growth had a positive effect on the exchange rate while the term of trade had a negative effect on the real exchange rate in Latin American countries. Almaw's research (2020) found that inflation, economic growth, money supply and government spending positively affect the exchange rate in Ethiopia while the trade ratio has a negative effect on the exchange rate in Ethiopia. Research in Bangladesh by Chowdhury & Hossain (2014) also found that economic growth, inflation

rates, interest rates and balance of payments have a positive effect on the exchange rate in Bangladesh. Meanwhile, research by Caporale et al., (2021) found that international trade ratios have a positive effect on exchange rates in the context of volatility in Latin American and MENA countries. Another study by Habib, et al., (2016) also found contradictory results where economic growth actually had a negative impact on the exchange rate so that a decrease in economic growth could actually appreciate the exchange rate and vice versa. On another point of view from the research of Raksong & Sombatthira (2021) that exchange rates and trade are interconnected and have a fairly strong relationship.

To fill the empirical gap that occurred in the previous empirical studies described above, this study aims to analyze the influence of macroeconomic variables that are thought to be determinants of exchange rates from the internal side of a country (Ramasamy & Abar, 2015). Variables consist of economic growth, inflation rate, trade ratio and monetary instruments, namely the interest rate on loans in influencing exchange rates in EMDE's European countries. The urgency in this study is because the exchange rate is a symbol of the strength of a country which is reflected in the strength of the currency and shows global competitiveness in international trade activities (Islam, 2009) so it needs to be analyzed more deeply, especially for EMDE's countries which majority adhere to the exchange rate regime. floating where the movement is strongly influenced by the internal conditions of the country and the mechanism of the foreign exchange market.

Method

This research is a type of quantitative research. Quantitative research tends to conduct objective analysis in the form of real and definite numbers so that the accuracy of the analysis is more accountable (Creswell, 2012). The study uses secondary data sourced from several related sources, including International Financial Statistics, the World Bank, and the United Nations Conference on Trade and Development. The research object consists of EMDE's European countries including Albania, Bulgaria, Hungary, Rep. Moldova, Rep. North Macedonia, Romania, Russia and Ukraine which have high vulnerability to their internal macroeconomic performance. The research period between 2000-2019 was motivated by the disparity in policy policies between developed countries and European EMDEs, resulting in an increase in capital flows to various developed countries, especially the superpower country, the United States. This condition resulted in a weakening (depreciation) of the exchange rates of EMDEs. In data processing, a multiple regression analysis method was used with panel data, which was then tested for the best model from the panel

data for further estimation. The variables used in the study are listed in the model specifications as follows equation (1).

$$ER_{it} = \beta_0 + \beta_1 INF_{it} + \beta_2 GDP_{it} + \beta_3 LIR_{it} + \beta_4 ToT_{it} + e_{it} \qquad (1)$$

Based on the above modeling, it is known that ER is the exchange rate in US\$; INF is the rate of inflation; LIR is the deposit interest rate; ToT is international trade (exports and imports); it is the symbol of the cross section and the time series shows the panel data; e is the error term and β_0 is a constant and $\beta_1, \beta_2, \beta_3, \beta_4$ is a parameter or regression coefficient for each variable.

To minimize the data and minimize the occurrence of deviations in the classical assumptions, natural logarithms or logs are carried out on data that has large units. In this study, the exchange rate (ER) has units of US\$ while the other variables are in the form of percent so that the exchange rate variable is logged (equation 2).

Table 1. Variable Operational Definitions

Variable	Unit	Description	Source
ER	US\$	Exchange rate in each country	International Financial Statistics
INF	%	Inflation rate in each country	International Financial Statistics
GDP Growth	%	Growth GDP as a reflection of economic growth in each country	OECD National Account
LIR	%	Interest rates on loans in each country	Worldbank
ToT	%	Ratio of export value to import value	United Nations Conference on Trade and Development

Using panel data, there are 3 types of models consisting of the Common Effect Model (CEM), Fix Effect Model (FEM) and Random Effect Model (REM) so that the model specifications are transformed into each model as follows equation (3)-(5).

$$\log ER_{it} = \beta_0 + \beta_1 INF_{it} + \beta_2 GDP_{it} + \beta_3 LIR_{it} + \beta_4 ToT_{it} + \mu_{it} \qquad (2)$$

Common Effect Model (CEM)

$$\log ER_{it} = \beta_0 + \beta_1 INF_{it} + \beta_2 GDP_{it} + \beta_3 LIR_{it} + \beta_4 ToT_{it} + \mu_{it} \qquad (3)$$

Fixed Effect Model (FEM)

$$\log ER_{it} = a_1 + a_2 D_{2i} - a_3 D_3 + a_4 D_4 + a_5 D_5 + a_6 D_6 + \beta_0 + \beta_1 INF_{it} + \beta_2 GDP_{it} + \beta_3 LIR_{it} + \beta_4 ToT_{it} + \beta_5 Dummy_{it} + \mu_{it}$$

(4)

Random Effect Model (REM)

$$\log ER_{it} = \beta_0 + \beta_1 INF_{it} + \beta_2 GDP_{it} + \beta_3 LIR_{it} + \beta_4 ToT_{it} + \beta_5 Dummy_{it} + e_{it} + \mu_{it}$$

(5)

Empirical Result

The best model testing is carried out before making further estimations in the analysis of this study. In selecting the best model, the Chow test was carried out which aims to see the best model between CEM and FEM by looking at the probability numbers of the Chi-square cross section. If the probability number is less than 5% alpha, then the best model is FEM and vice versa if the number is greater than 5% alpha then the best model used is CEM. Furthermore, to see the best model between FEM and REM, the Hausman test was carried out by looking at the random cross-section probability value. If the probability number is greater than 5% alpha then the best model used is REM and vice versa if the probability is less than 5% alpha then the best model used is FEM. Then, to see the best model between REM and CEM, the Lagrange Multiplier test (LM test) is used by looking at the numbers on the Breusch pagan. If the Breusch pagan value is more than 5% then the best model chosen is REM and vice versa if the Breusch pagan value is greater than 5% alpha then the best model chosen is CEM. The results of the best model testing are presented in Table 2.

Table 2. Model Selection Test Results

Testing	Probability	Description
Chow	1.0000	CEM
Hausman	1.0000	REM
Breusch pagan	0.0000	REM

Based on Table 2 shows that the Chow test , the best model chosen is CEM which is confirmed with a probability value of more than 5% alpha, namely 1,000. Furthermore, Hausman test results show that the best model used is REM confirmed with a probability value of 1,000 more than 5% alpha. Then for the LM test it was found that REM is the best model confirmed with a Breusch pagan value of 0.000. The results of testing the model can be concluded that the REM model is the best model because it was selected in 2 tests, namely

the Hausman test and LM. So that REM can be continued as a model that will be estimated further to see the effect of the independent variable on the dependent variable. The results are shown in Table 3.

Table 3. Estimation Results of Panel Model

Variable	Coefficient	Probability	Information
INF	-0.007239	0.0637	Significant Negative
GDP	0.014222	0.0012	Significant Positive
LIR	-0.011224	0.0000	Significant Negative
ToT	0.054960	0.0000	Significant Positive
Prob(F-statistic)	0.000000		Significant
Adjusted R-squared	0.723868		

Table 4 Time Series Model

Country	Independent Variable				
	INF	GDP	LRATE	TOT	R-Squared
Albania	-0.389192	0.014222	-0.011224	0.054960	0.730815
	0.5610*	0.3098*	0.1926*	0.0000***	
Bulgaria	-0.003525	0.008740	-0.018761	-0.009849	0.197945
	0.8163*	0.4633*	0.4633*	0.3436*	
Hungaria	0.017210	0.000281	-0.006737	0.045247	0.752067
	0.2002*	0.9975*	0.54308*	0.0004***	
Rep. Moldova	0.009158	-0.011813	-0.039164	0.012304	0.420937
	0.2777*	0.3489*	0.0103***	0.0920**	
Rep. North Macedonia	0.007860	-0.020198	0.000121	0.025958	0.610577
	0.4884*	0.0698**	0.9988*	0.0064***	
Romania	-0.009352	-0.006476	-0.011303	0.060614	0.470641
	0.5723*	0.4653*	0.3802*	0.1185*	
Russia	0.053163	-0.029956	-0.023317	0.004511	0.591220
	0.0280***	0.0545**	0.4760*	0.0488***	
Ukraina	0.011850	0.020305	-0.031933	0.065970	0.916439
	0.0400***	0.0544**	0.0015***	0.0000***	

*, ** and *** correspond to the 10%, 5% and 1% significance levels respectively

Based on the results of the analysis, the F-Statistic probability value is 0.00000, where the prob value. F-statistic < = 1% which means that the independent variables consist of inflation rate, GDP growth, loan interest rates and the ratio of export and import prices (ToT) together have a significant effect on the real exchange rate in EMDE's European countries. The results of the analysis on the t test also show that the macroeconomic variables used as independent variables have a significant effect on the exchange rate in EMDE's European countries. Table 3 shows that inflation and loan interest rates in EMDE's European countries have a significant negative effect on exchange rates. This result is indicated by a negative coefficient value and a probability less than 5% and 10% alpha, for inflation it has a coefficient value of -0.007239 and a probability of 0.0637 and the deposit interest rate has a coefficient of -0.011224 and a probability of 0. ,0000. This result means that every 1% increase in inflation will decrease the exchange rate by 0.7% and vice versa if there is a 1% decrease in inflation it will increase the exchange rate by 0.7% in EMDE's European countries. In addition, the results also confirm that every 1% increase in the deposit interest rate will decrease or depreciate the exchange rate by 1.1% and vice versa when there is a 1% decrease in the deposit interest rate will increase or appreciate the exchange rate by 1.1 % for EMDE's European countries.

Meanwhile, GDP growth which reflects economic growth and the ratio of international trade has a significant positive impact on the exchange rate in EMDE's Europe. This result is confirmed by the positive coefficient value and the probability is smaller than 5% and 10% alpha. The economic growth variable shows a coefficient of 0.014222 and a probability of 0.0012 which means that when there is an increase in economic growth of 1% it will have an impact on an increase or appreciation of the exchange rate by 1.4% and vice versa when there is a decrease in economic growth of 1% it will decrease or increase. depreciated the exchange rate by 1.4%. The international trade ratio variable has a positive coefficient with a number of 0.054960 and a probability of 0.000, this result means that when there is an increase in the international trade ratio by 1% it will increase or appreciate the exchange rate by 5.4% and vice versa when there is a decrease of 1% then will reduce or depreciate the exchange rate by 5.4% in EMDE's countries in Europe. The coefficient of determination of the adjusted R square value has a value of 0.723868 meaning that the independent variables consisting of inflation, loan interest rates, GDP growth and international trade ratios are able to explain the dependent variable of 72.3% while 17.7% is explained by variables outside the model. .

In addition to panel data analysis, this study also analyzes the effect of macroeconomics on exchange rates for each country using time series data. The results of the analysis are presented in Table 4.

Based on the results of time series analysis, the results of the effect of macroeconomic variables on currency exchange rates in each European EMDEs have different results. The inflation rate has a significant effect on Russia and Ukraine, because the average inflation rate in Russia and Ukraine tends to be high up to 10% so that it has a significant effect on the exchange rate. On the GDP variable that has an effect on a significant level of 5% is in the country of Rep. North Macedonia, Russia and Ukraine. The variable interest rate on loans has a significant effect on the country of Rep. Moldova and Ukraine and the last variable for the Terms of Trade has a significant effect on Albania, Hungary, Rep. North Macedonia, Russia and Ukraine. Terms of trade are the variables that have the most influence on exchange rates in EMDEs countries, this is because the terms of trade as an identification of relative price changes in foreign trade activities (Moosa, 2013) is one of the variables used to identify how much international trade activity is involved. carried out by a country besides that the terms of trade also play a role in measuring the relative prices of commodities produced by a country.

Based on these results, the results of this study are not in line with the empirical study (Chávez, 2020) which states that the inflation rate has a positive effect. The higher the inflation, the exchange rate in a country also increases, which means it depreciates. Another empirical study (Sher & Khan, 2014) also states that the inflation rate has a positive effect on the exchange rate, because inflation results in an increase in the money supply in a country so that the domestic exchange rate of a country depreciates. In some countries that have different exchange rate systems will have different effects between inflation and exchange rates. In addition, the results of the economic growth variable that have a positive impact on the exchange rate are in line with the empirical studies that have been carried out (Mirchandani, 2013) which states that there is a positive relationship between the exchange rate and economic growth. Another empirical study (Nucu, 2010) an increase in GDP causes the exchange rate to increase, which means the exchange rate in a country depreciates, this can happen if economic growth is followed by a high import rate in a country.

The results of the effect of loan interest rates on exchange rates in EMDEs countries are significantly negative in line with proprietary empirical studies (Mirchandani, 2013). If the interest rate on the loan increases, the demand for the country's currency will become an expensive credit receipt for business actors and the public. The high price of the currency will slowly make the value of production more expensive which eventually causes high prices of domestic goods so that the value of the domestic currency depreciates. The positive effect of the trade ratio with the exchange rate is also in line with research by Rault, Ifo and Aper, (2011) and Rao and Tolcha, (2016).

Conclusions

Based on the results of panel data regression analysis in this study, it was found that all independent variables, namely inflation, economic growth, loan interest rates and terms of trade had a significant influence on exchange rate fluctuations in European EMDEs. Inflation and loan interest rates have a significant negative effect, while economic growth and trade have a significant positive effect on exchange rates in EMDE's European countries. In addition, for each country shows different results with time series data analysis. The inflation variable only shows a significant positive effect on the exchange rate in Russia and Ukraine. Meanwhile, loan interest rates have a significant negative effect on exchange rates in two countries, namely Rep. Moldova and Ukraine. This high loan interest rate causes economic actors to be less interested in making loans to banks so that if left unchecked, it can lead to oversupply in finance and cause the exchange rate to depreciate. The ratio of international trade has a significant positive effect on exchange rates in 5 countries, namely Albania, Hungary, Rep. North Macedonia, Russia and Ukraine. Higher export activity in the five countries resulted in increased trade which could appreciate the exchange rate.

Based on the results above, recommendations are made to policy makers in European EMDEs to maintain and pay attention to regulations related to price stability and exchange rate stability so that competitiveness and existence in the global market will be further enhanced. The policy for setting loan interest rates must also be controlled to maintain price stability, demand and exchange rates so that they can have an impact on sustainability and competitiveness in the global market, both in the foreign exchange market and in the global commodity market. Meanwhile, this study has limitations because only some countries in the EMDEs classification in Europe are used as research objects. In addition, the study only looked at the one-way relationship between macroeconomic variables and monetary instruments in influencing the exchange rate. In future research, simultaneous modeling can be used so that the relationship can be investigated more deeply and using the addition of a longer time series and a sample of each country.

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