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Long-term stability of money demand and monetary policy in Indonesia

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ABSTRACT

The purpose of this study is to determine the long-term and short-term relationship between inflation, interest rates, exchange rates, and economic growth to the demand for money in Indonesia. The method used in this study is Autoregressive Distributed Lag (ARDL). The Data used are money demand, inflation, interest rates, exchange rates, GDP in Indonesia for the period 2015-2021. The results of this study are inflation has a positive relationship and significantly affects the demand for money, interest rates have a negative relationship and does not affect significantly, the exchange rate has a positive relationship, while GDP has a positive relationship in the short term, but in the long term has a negative relationship and does not affect significantly. Policymakers should develop and implement comprehensive long-term economic plans that prioritize sustainable growth. This may include initiatives to diversify the economy, enhance productivity, improve infrastructure, and promote investments to foster a stable economic environment that minimizes adverse effects on the demand for money in the long run. This research can help monetary authorities determine appropriate policies to maintain economic stability, such as collaborating with the government in overcoming market failures with the aim of achieving price stability.

1. Introduction

This study analyze the relationship between money demand and monetary policy in Indonesia. The hypothesis shows that monetary policy has a long-term and short-term relationship to the demand for money in Indonesia. Conduct this study because the importance of the monetary sector in maintaining the stability of a country's economic activity. Boucekkine et al (2021) stated that the demand for money that remains stable is very important in determining the objective of aggregate monetary and credit growth to establish optimal monetary performance. This study conduct five variables namely; inflation, interest rates, exchange rates, and economic growth. Second, we estimate the stability of the money demand for monetary variables using the Autoregressive Distributed Lag (ARDL) model. This ARDL model estimates long-term and short-term relationships and provide optimum lag and stability tests (Kurniawan et al., 2023). The monetary sector is the heart of the economy, where economic and financial development cannot be separated. The more liquid the circulation of money will have an impact on the economic transactions that occur. Money acts as a medium of exchange, therefore it can be said that the demand for money determines the amount of money that must be provided by the monetary authority (Mukhlis et al., 2016).

Implementation of the operational process of monetary control begins with the preparation of a monetary program by setting base money targets in accordance with the liquidity needs of the economy which are predicted based on projections of inflation, economic growth and other variables.

The control carried out by the monetary authority has the main objective of achieving price stability. In managing economic development so that it can proceed well and stable, the monetary authority carries out macroeconomic stabilization policy steps. This policy is basically managing the demand side and supply side of an economy so that it leads to sustainable economic growth conditions. In managing economic development so that it can proceed properly and stably, the monetary authority carries out macroeconomic stabilization policy measures. This policy is implemented in line with the cycle of economic activity (business cycle) (Melati & Kurniawan, 2023). A country certainly experiences ups and downs in line with the business cycle. In this regard, the monetary policy that is applied needs to be adjusted to the movement of the economy. Considering that there is a deadline for the influence of monetary policy or economic problems that cannot be predicted, this requires the central bank to be able to evaluate and accurately estimate the development of various financial variables and their influence on achieving targets in the formulation of the monetary policy adopted (Simorangkir, 2014).

Study from Tule et al (2018) who discussed the demand for money in Nigeria stated that there is a stable relationship between M2 and its determinants and included stock prices in the long run, in contrast to Hensch (2019) concluded in Denmark one of the implications of negative interest rates is to reduce the percentage price change in monetary policy to deposit rates, which automatically increases deposits compared to alternative placements of funds. Meanwhile Nyumuah (2018) investigate the effect of interest rate variability and exchange rate variability on the money demand function in developing countries. This study concludes that overall volatility of interest rates and exchange rates has no significant effect on the demand for money in all countries except Gambia and Uganda. Many studies have discussed the stability of money demand and monetary policy, but there are still many differences in results, the countries studied and the period studied are long. Thus, our goal in conducting research is to review the stability of money demand and monetary policy in Indonesia. Given the importance of stability in money demand and monetary policy in maintaining economic stability. The money supply must be controlled according to the state of a country's economy (Amanah et al., 2020). Controlling the money supply in monetary policy is the task of the monetary authority (Bank Indonesia) as an integral part of macroeconomic policy (Mentari & Pangidoan, 2020).

Boucekkine et al (2021) argued that stable money demand is very important in determining aggregate monetary and credit growth objectives to shape optimal monetary performance. Many perspectives discuss the demand for money in various developed and developing countries because of the importance of stability in the demand for money. Monetary policy can determine economic stability with broad observations from developing countries to maintain monetary stability and economic stability in general (Widodo, 2015). Dou (2018) analyzed the determinants of money demand in China, found that interest rates, expected inflation and income affect money demand in China. Meanwhile, according to Folarin & Asongu (2017) income in the long run has an effect on the demand for M2 money and the real exchange rate has an effect on both the long term and the short term. Many previous studies have also developed research related to the stability of money demand in Indonesia. James (2005) estimate the function of money demand by utilizing the time-trend as a proxy for technological change, the result showed the demand for money in Indonesia is stable with the CUSUM and CUSUMQ test approaches its means that monetary aggregate can be implement by central bank, contrast to Narayan (2007) utilized the cointegration test with the Johansen approach on the data from 1970 to 2005. The findings from the research also showed that the money demand model in Indonesia is unstable with the Hansen test approach.

Based on the explanation above, this research will examine the stability of the demand for money and monetary policy in Indonesia, given the importance of stability in the demand for money and monetary policy in maintaining economic stability. Furthermore, this research aims to shed light on the dynamics of money demand and its relationship with monetary policy in the Indonesian context over an extended period. By analyzing long-term data and employing advanced econometric techniques, this study seeks to offer insights into the factors influencing the stability of money demand and the effectiveness of monetary policy tools in Indonesia's unique economic landscape. The findings of this research are expected to not only enrich academic discourse but also provide practical implications for policymakers, financial institutions, and market participants, aiding in the formulation of more robust and targeted monetary strategies to foster sustainable economic development and resilience against external shocks. Ultimately, the culmination of this study is anticipated to contribute significantly to the ongoing discourse on monetary economics and policy effectiveness, thereby

fostering a deeper understanding of Indonesia's monetary dynamics and informing future policy decisions.

2. Method

This study discusses the long-term stability of money demand and monetary policy in Indonesia. This study uses a quantitative approach during the period 2015 to 2021. In order to see whether or not there is a relationship between the variables of this research. So the ARDL (Autoregressive Distributed Lag) method was used using eviews software. ARDL is a model that includes one or more past values (lags) of the dependent variable among the explanatory variables. A regression model that includes variable values that explain the present or past value (lag) of the dependent variable as one of the explanatory variables is called Autoregressive Distributed Lag (ARDL). This model can differentiate short-term and long-term responses of the dependent variable to a one-unit change in the value of the explanatory variable. This study uses the formula from the quantity theory of income approach pioneered by Marshall from Cambridge University, as follows:

$$M = k.PY \tag{1}$$

where: M is the amount of money, k is the part of GNP that is in the form of cash, so basically it is equal to 1/V, P is price and Y is real national income. The data used in this research is time series secondary data, in the form of monthly data taken from 2015 to 2021.

Table 1. Definition of Variables

No	Variables	Definition
1	Money Demand (Md)	The demand for money theory approaches the quantity of income
2	Inflation (INF)	Consumer price index
3	Interest Rate (IR)	BI Rate and BI-7 Day Reverse Repo Rate (BI7DRR)
4	Exchange rate (ER)	Rupiah against Dollar US
5	Gross Domestic Product (GDP)	Constant price economic growth rate 2010

Source: Indonesian Central Bureau of Statistics

Table 1 shows the definition of variables used in this study. The object of this research is the demand for money in Indonesia and the economic variables that influence it. The variables that influence the demand for money are inflation, interest rates, exchange rates and Gross Domestic Product. Following are the dynamics of movement of each of these variables from 2015 to 2021. Data was obtained from various sources, including publications by Bank Indonesia and the Indonesian Central Bureau of Statistics. Data was obtained from various sources, including publications by Bank Indonesia and the Indonesian Central Bureau of Statistics. The equation for the ARDL model as follows:

$$LMD_t = \beta_0 + \sum_{i=1}^{n} \beta_1 LMd_{t-i} + \sum_{i=0}^{n} \beta_2 LINF_{t-i} + \sum_{i=0}^{n} \beta_3 IR_{t-i} + \sum_{i=0}^{n} \beta_4 LER_{t-i} + \sum_{i=0}^{n} \beta_5 PDB_{t-i} + e_t \tag{2}$$

Based on equation (2) the error correction of the ARDL model is compiled as follows:

$$\Delta LMD_t = \alpha_0 + \sum_{i=1}^{n} a_1 LMd_{t-i} + \sum_{i=0}^{n} a_2 LINF_{t-i} + \sum_{i=0}^{n} a_3 IR_{t-i} + \sum_{i=0}^{n} a_4 LER_{t-i} + \sum_{i=0}^{n} a_5 PDB_{t-i} + yECT_{t-1} + e_t \tag{3}$$

Where the above equation Md is the demand for money, INF is Inflation, IR is the interest rate, ER is used to explain the exchange rate, GDP is the Gross Domestic Product, while α is the short-

term coefficient and β is the long-term coefficient. In this research, several testing stages were carried out, namely; unit root test, cointegration test, optimal lag length test, ARDL model estimation, and model stability test. In this research, several testing stages were meticulously executed to uphold the robustness and dependability of the analysis. These pivotal stages encompassed the following procedures. Initially, the Unit Root Test, utilizing methodologies like the Augmented Dickey-Fuller (ADF) or Phillips-Perron (PP) test, was conducted to discern the stationarity of the variables under scrutiny. Stationarity, a fundamental assumption in time series analysis, ensures the constancy of statistical properties over time, and the unit root tests enable researchers to identify trends or non-stationarity within the variables. Subsequently, the Cointegration Test was deployed to explore the enduring equilibrium relationship among variables, particularly when individual variables exhibit non-stationarity. The Johansen cointegration test or Engle-Granger test served as common tools for this assessment.

Determining the Optimal Lag Length was then undertaken to prevent misspecification and enhance model accuracy, with techniques such as Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), or Hannan-Quinn Information Criterion (HQIC) being employed. Following this, the ARDL Model Estimation was employed to scrutinize the long-run relationships while accommodating short-term dynamics, utilizing the Autoregressive Distributed Lag (ARDL) model, which is adept at handling both stationary and non-stationary variables. Lastly, the Model Stability Test was executed to gauge the resilience of the estimated model over time, involving assessments of the stability of relationships and coefficients across various sub-periods or samples, with techniques such as Chow test, CUSUM (Cumulative Sum) test, or recursive estimation being employed to detect any structural breaks or parameter instability. Through this systematic approach to testing, researchers ensured the integrity and credibility of their findings, furnishing a substantial empirical foundation for the scrutiny of money demand stability and the efficacy of monetary policy in Indonesia.

3. Results and Discussion

The unit root test or Unit Root Test is a test used to see whether the data in a study is stationary or not. Stationary data is stated if the data used does not experience drastic changes or data fluctuations are around an average value (Zaretta & Yovita, 2019). Table 2 the GDP variable is stated to be stationary at the level level. The ADF value is greater than the critical value at the level of 1%, 5% or 10%. Likewise with the probability (<0.05), whereas at the first different level all variables are stationary except for the PDB variable, this is evidenced by a probability of 0.3897 (>0.05). The unit root test is used to determine data stationarity. In this study, non-stationary variables were produced at the level level and stationary at the first differences level. This means that all data is integrated at order I(1) and estimation of the model can be done using cointegration techniques

Table 2. ADF Stationery Test Result

Variables	Level	First Difference
Md	-1.452	-9.742***
INF	-1.204	-9.075***
IR	-1.277	-6.572***
ER	-2.116*	-9.384***
GDP	-3.284**	-1.776

Source: Data processed

The cointegration test is a test used to determine whether there is a long-term balance between variables. The cointegration test in this study uses the Bound Test approach. Table 3 shows the F-statistic value of 17.12358 is above the upper bound at α=5%, which is 3.49. This means all variables used in the study are cointegrated, it means that all variables has long-term balance in the estimation.

Table 3. Result of Bound Test Cointegration

F-Statistics	Lower Bound I(0)	Upper Bound I(1)
17.124***	2.56	3.49

Source: Data processed

The optimum lag used in this study by the Akaike Information Criterion (AIC) approach. The lowest value of final prediction error (FPE) is found in lag 4 as shown in Table 4. The lowest likelihood

ratio (LR) and Hannan-Quinn (HQ) is found in lag 4. Therefore, the optimum length lag is 4. Based on AIC, the model is suitable for ARDL model are 4,1,2,0,1.

Table 4. Result of Stability Test

lag	LogL	LR	FPE	AIC	SC	HQ
0	11.07417	NA	5.90e-07	-0.153776	-0.003811	-0.093696
1	448.2580	807.9600	1.74e-11	-10.58881	-9.689020*	-10.22833
2	483.2626	60.26117	1.36e-11	-10.84209	-9.192477	-10.18121
3	514.8131	50.32102	1.17e-11	-11.00793	-8.608486	-10.04664
4	566.8965	76.47688*	6.13e-12*	-11.69358*	-8.544316	-10.43189*
5	588.4166	28.87504	7.12e-12	-11.60548	-7.706392	-10.04339

Source: Data processed

Table 5 and 6 shows the short and long term inflation has a positive relationship and has a significant effect on the demand for money (Md). In the short term, the resulting total influence is 3.42 percent. Meanwhile, in the long run, the total effect is 2.17 percent. This is in accordance with the theory of Irving Fisher and Marshall which assumes that rising prices or inflation will increase the demand for money. In line with the previous research Zaretta & Yovita (2019), Awang (2016) and Amanah et al (2020) states that inflation has a positive relationship to the demand for money. Contrast from Boucekkine et al (2021) states that inflation has a negative relationship in Algeria. Because of the importance of real assets as an alternative to holding cash balances, since the demand for them falls by more than 6 percent when the price level rises by 1 percent. The very high inflation elasticity rate supports alternative asset holdings, especially real assets, and reduces hoarding.

Table 5. Result of Long-term Estimation

Variable	coefficient	Average Variable	Magnitude of Effect		The Effect Value of Money Demand
			Partial	Total	
D(MD(-1))*	-1.576	1716137	-2704400.23	27355.36405	256.2650504
D(INF(-1))	1.473	122.44	180.392811	3.425	0.032086637
D(IR(-1))	-0.008	5.22619	-0.03953613	0.076	0.000709586
D(ER)**	0.359	13907.65	4993.81989	222.061	2.080266686
GDP(-1)	-0.0002	3.8373	-0.00063699	0.061	0.000571489
D(MD(-1), 2)	0.280	1716137	480523.508	27357.220	256.2824362
D(MD(-2), 2)	0.097	1716137	165905.828	27357.037	256.2807188
D(MD(-3), 2)	0.154	1716137	264896.043	27357.094	256.2812591
D(INF, 2)	1.150	122.44	140.788736	3.102	0.029056492
D(INF, 2)	0.021	5.22619	0.11144328	0.105	0.000980218
D(IR(-1), 2)	0.037	5.22619	0.19434633	0.120	0.001128822
D(GDP)	0.005	3.8373	0.01970454	0.066	0.000621149
C	0.016	**Total**	-1787759.57	109655.7307	1027,254886
Mean Dependents	0.009				

Source: Data processed

Interest rates in the short term and long term have a negative relationship and do not have a significant effect. The short-term regression coefficient obtained is -0.007565 with a probability value of 0.7150. The partial influence obtained is -0.0395 percent with a total effect of 0.076 percent. The coefficient obtained in the long run is -0.0048 with a probability value of 0.7178. The partial effect of interest rates on money demand is -0.025 percent with a total effect of 0.0480 percent. This means that when interest rates increase by 1 percent, the demand for money will decrease by 0.0048 percent. This is in accordance with Keynesian theory, where when interest rates increase, bond prices will fall which causes people to prefer to save and reduce the cash they hold. This insignificant effect is due to the expectation factor. Cambridge theory on the expectation factor: if in the future interest rates rise, then someone will tend to reduce the amount of securities they hold and increase the amount of cash they hold. Ridha et al (2021) and Nyumuah (2018) argued that overall interest rate volatility has no

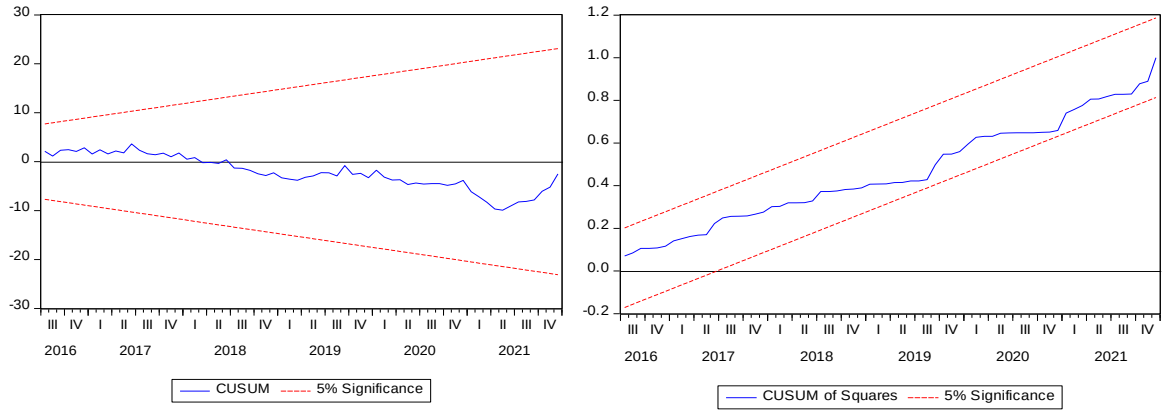
significant effect on the demand for money in two African countries, namely; Equatorial Guinea and Nigeria. This is because there is a factor of expectation in the future (expectation) which causes an increase in volatility or uncertainty in interest rates will increase the risk to maintain fixed income securities. Therefore, businesses and households would prefer to keep more cash balances to reduce risk. Second, interest rate uncertainty increases transaction demand and asset demand for money. Therefore, it can be concluded that the demand for money has a positive relationship to interest rate volatility. Meanwhile, the findings of Marlina et al (2019) that effect of United States policies on Indonesia, argued that higher domestic interest rates would result in higher domestic capital inflows which would result in higher domestic demand for money.

Table 6. Result of Long-term Estimation

Variable	Coefficient	Average Variable	Magnitude of Effect		The Effect Value of Money Demand
			Partial	Total	
INF	0.934925	122.44	114.472217	2.1734056	0.020360464
D(IR)	-0.004800	5.22619	-0.025086	0.048062912	0.000450253
D(ER)	0.227856	13907.65	3168.941	140.9037358	1.319986197
GDP	-0.000105	3.837	-0.000403	0.03870929	0.000362629
C	0.010115	**Total**	3283.388227	143.1639136	1.341159542
Mean Dependents	0.009368				

Source: Data processed

The exchange rate relationship in the short term has a positive sign and has a significant effect on the demand for money. This is because the coefficient value obtained is 0.3590 and the probability value is 0.0401. The partial effect obtained is 4993. This means that when the value of the rupiah in dollars increases by 1 percent, the rupiah/USD will depreciate by 4993.8 rupiah. Meanwhile, in the long term, the exchange rate has a positive relationship and does not significantly influence the demand for money. The results of this study are in accordance with the research hypothesis, where when the rupiah exchange rate in dollars increases, the demand for money will increase. Abilawa & Siddiq (2016) found a positive relationship between the exchange rate and the demand for money. this study found that long-term results of economic growth had a negative relationship and did not have a significant effect. Meanwhile, in the short term, economic growth has a positive relationship and does not significantly influence the demand for money. The partial effect obtained is 0.0197 percent with a total effect of 0.066 percent. This finding is consistent with Keynesian theory of transaction motives, which assumes that the demand for money depends on income. The higher the income, the higher the transaction volume. This causes the demand for money to increase. This argument supports with the previous studies by Boucekkine et al (2021), Hossain & Arwatchanakarn (2020) and Tule et al (2018).



CUSUM test CUSUMQ test

Figure 1. The Stability Test

The stability test is used to analyze the stability in the model. Using CUSUM and CUSUM of Square tests approach. Figure 1 shows that the model is stable. The stability of the variable data in this study can be seen from the blue line lies the red area with a significant value of 0.05 or 5%.

4. Conclusion

This study analyze the effect of inflation, interest rates, exchange rates and economic growth on the demand for money. From these findings concluded that rising prices or inflation will increase the demand for money, when interest rates increase, bond prices will fall which causes people to prefer to save and reduce the cash they hold. An increase in the dollar exchange rate will increase the demand for money, as well as income. Enhancement income will make the higher the volume of transactions. This causes the demand for money to increase. The implication of the study to manage the various factors affect the demand for money, fostering economic stability and sustainable growth. Recognizing the long-term negative relationship between GDP and the demand for money, policymakers should focus on implementing sustainable economic growth strategies. Such strategies should aim to boost productivity, diversify the economy, and encourage investment to counteract any potential adverse effects on the demand for money in the long run. With this research, the monetary authority can use it to analyze appropriate policies to maintain economic stability. One thing that can be done is to collaborate with the government, such as overcoming market failures with the aim of achieving price stability. It is important in making policies to pay attention to the country's economic conditions so that the economy can meet the predetermined targets. In conclusion, this research offers valuable insights into the dynamics of money demand and provides policymakers with evidence-based recommendations to navigate the complexities of monetary policy formulation. By heeding these recommendations and adopting a proactive stance towards policy implementation, monetary authorities can bolster their capacity to maintain economic stability and foster sustainable growth in Indonesia.

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