ICEBSS
international conference on
economic business and
social science

MONEY SUPPLY IN INDONESIA 1990-2020: PARTIAL ADJUSTMENT MODEL APPLICATION

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ABSTRACT :

The money supply is one of the important factors to maintain the stability of a country's economy. Factors that can affect the money supply include GDP, investment, and interest rates. The purpose of this research was to estimate the effect of GDP, investment, and interest rates on money supply growth in Indonesia from 1990-2020 both in the short and long-term using the Partial Adjustment Model (PAM) regression analysis. The regression results showed that GDP and investment had no effect on the money supply growth in Indonesia from 1990-2020, while interest rates had a negative effect. The government is expected to increase GDP and investment to boost consumption, so that people are prosperous and Indonesia's economic growth increases. This will lead to the increase in the money supply growth. In addition to the government, Bank Indonesia as the central bank is expected to be able to control interest rates so that they are not too high or too low, with the hope of maintaining the stability of the money supply so that the possibility of inflation causing economic downturn tends to be low.

Keywords: money supply growth, GDP, investment, interest rates, Partial Adjustment Model.

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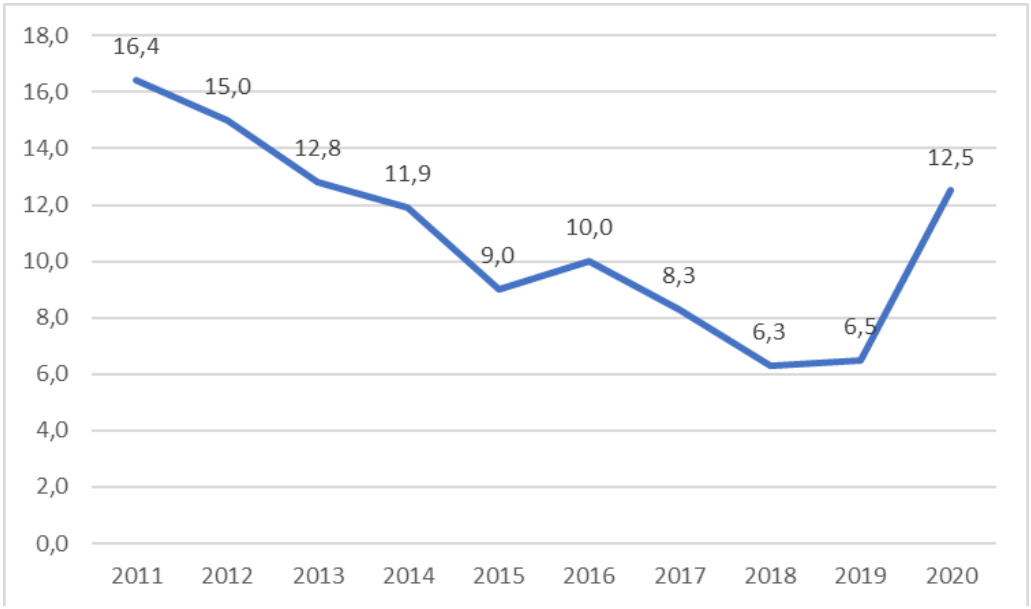
INTRODUCTION

Inflation is a macroeconomic variable that should always be watched out for by every country, including Indonesia. The importance of controlling inflation is based on the consideration that high and unstable inflation will have a negative impact on people's socioeconomic conditions because it causes people's real incomes to decline, so that the standard of living of the people decreases. In addition, inflation causes uncertainty for economic actors to make decisions in economic activities that will ultimately reduce economic growth

(Utami & Suryaningsih, 2011). Inflation can occur if the money supply in society is too much so that it will push up the price of goods. Conversely, if the money supply is very low, then an economic downturn will occur. Thus, the management of the money supply must always be carried out carefully taking into account the factors and risks that will occur (Langi, 2014).

Graph 1
Growth of Money Supply in Indonesia in 2011-2020 (%)



Source: *World Bank*

Based on Chart 1, the growth of the money supply in 2011-2016 has continued to decline. A considerable decline occurred in 2015 to 9.0% due to weakening economic growth and non-entry of funds into the financial system (Kuncoro, 2015). In 2016, the growth in the money supply again increased to 10.0% due to the increasing growth of quasi-money, especially in the form of savings and deposits (Loka Data, 2016). The growth of the money supply declined again in 2017-2019 due to a decrease in the growth of money supply in the narrow sense and securities other than stocks, as well as due to a decrease in domestic and foreign assets (Bank Indonesia, 2019). In 2020, the growth of the money supply increased by 12.5%. This increase was caused by an increase in rupiah demand deposits and the money supply (Laoli, 2021).

One of the factors closely related to the money supply is investment. Investment is defined as goods purchased by individuals or companies to increase their capital inventory. In terms of macroeconomics, investment is the addition of capital goods and production goods to increase the ability to produce goods and services in the economy. The amount of investment determines the amount of capital or money that will be spent or spent on the investment. The higher the investment, the demand for public money for

investment becomes greater, so that the money supply increases (Permatasari & Rosyetti, 2017).

Table 1
***Foreign Direct Investment* in Indonesia**
2011-2020 (Milion US$)

Tahun	FDI
2011	19241
2012	19138
2013	18817
2014	21811
2015	16641
2016	3921
2017	20579
2018	20569
2019	23883
2020	18591

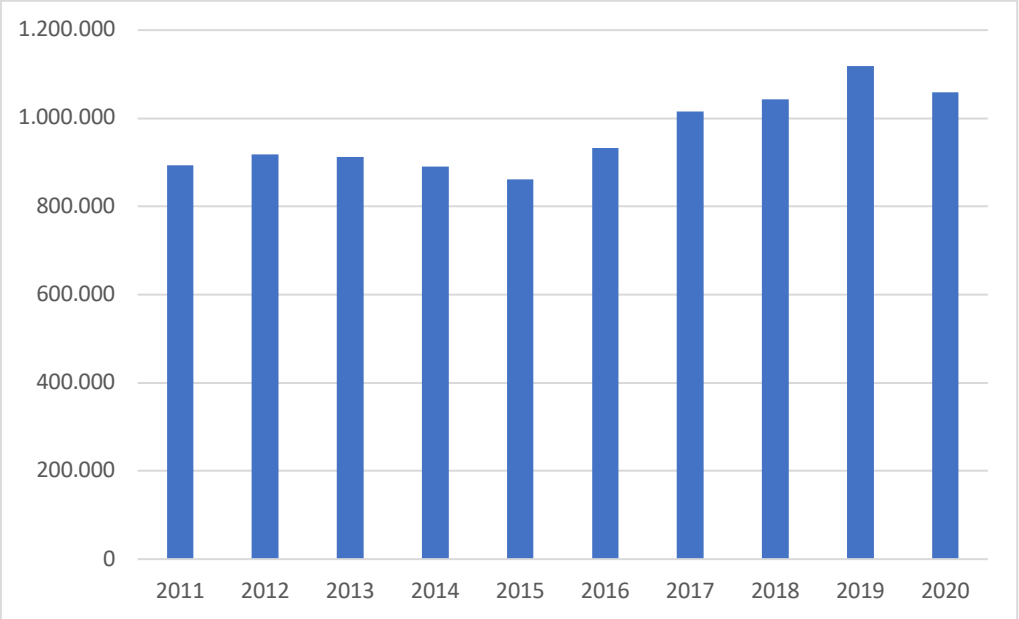
Source : UNCTADstat

Based on Table 1, it can be seen that FDI in 2011-2014 continued to increase. However, FDI decreased dramatically in 2015 and 2016 from 16641 million US$ to 3921 million US$. This is the impact of the interest rate adjustment policy by America, the British Brexit referendum from the European Union, and other geopolitical conditions (Jamil & Hayati, 2020). Then, in 2019, FDI experienced a considerable increase to 23883 US$, one of which was due to increased investment in the gas, water, and transportation sectors which increased from the previous year. Meanwhile, in 2020, FDI decreased to 18591 US$ due to increasing global economic challenges due to global economic uncertainty and the impact of the Covid-19 pandemic in the world, including in Indonesia, which caused exports to decline and disruption of the availability of materials obtained from other countries (Sundusiyah et al., 2021).

In addition to investment, another factor influencing the money supply is the Gross Domestic Product (GDP). The economic development of a country can be measured through economic growth, which indicates the growth of the production of goods and services in an economic region over a certain period of time. The production is measured in the concept of value added created by economic sectors in the region in question which in total is known as GDP (Warkawani et al., 2020). An increase in GDP will increase the money supply because a high GDP indicates high production, so people's purchasing power will also increase. Thus, the money supply will also increase following the high level of production and purchasing power of the community (Mentari & Pangidoan, 2020).

Based on Chart 2, GDP in Indonesia in 2011-2020 tends to increase, although there was a decline in 2015 caused by plummeting home consumption due to expensive food prices, which made people limit their spending (Hartati, 2016). The decline in GDP also occurred in 2020 due to the Covid-19 pandemic which caused sluggish economic activities. The government implemented various policies to reduce the spread of the virus pandemic, but these policies led to a reduction in household consumption (RT) and consumption of non-profit institutions serving households (LNPRT) (Pratiwi, 2022).

Graph 2
Indonesia's GDP on a Prevailing Price Basis for 2011-2020 (Million US$)

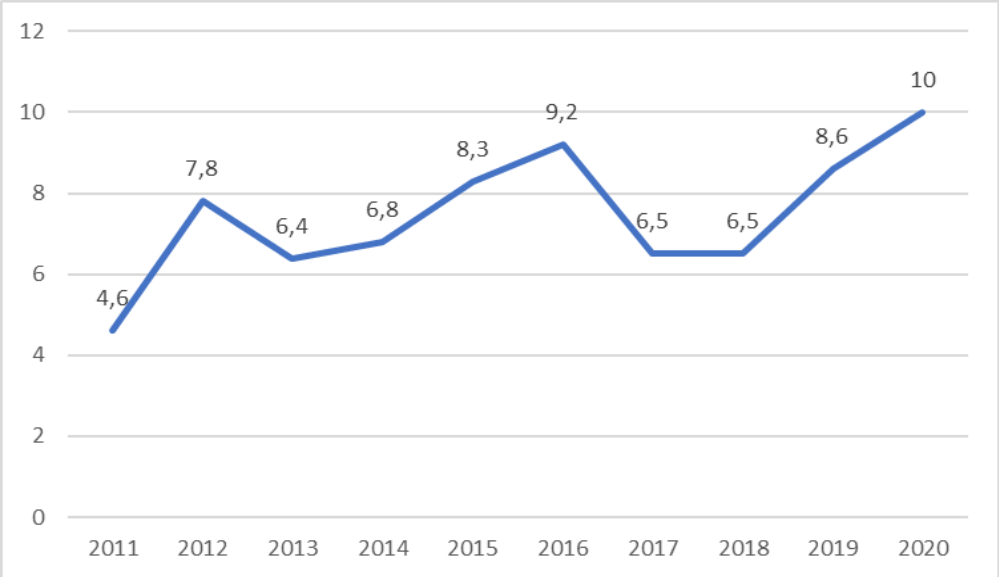


Source: *World Bank*

The next factor influencing the money supply is the interest rate. Interest rates are one of the variables in the economy that are always observed carefully because of their far-reaching impact. Like prices, interest rates are central to the market, namely the money market and the capital market (Indriyani, 2016). If interest rates rise, people's desire to consume will decrease and people will prefer to save or invest instead of spending their money in the hope of getting interest gains. As a result, people's interest in consumption will decrease and will have an impact on the country's financial system because the demand for goods also decreases. The decline in people's consumption will lead to a decrease in the amount of money in circulation. On the contrary, a decrease in interest rates will encourage people to borrow money in banks to meet their needs so that it will increase people's consumption, which leads to an increase in the amount of money in circulation (Maria et al., 2017).

Chart 3 shows that interest rates in Indonesia in 2011-2020 fluctuated. In 2011, interest rates fell and then rose in 2012. The fall in interest rates in 2011 occurred due to the unstable global economy due to the crisis in the US and Europe (Kompas, 2011). The highest interest rate was in 2020. This happened because of the pandemic coupled with the continued increase in energy prices and the scarcity of food supply, as well as the large amount of capital outflows from capital inflows, which caused inflation. This is a result of the tightening of monetary policy by central banks around the world as a step to deal with the Covid-19 pandemic which is expected to be able to restore the Indonesian economy (Riefky, 2022). If interest rates continue to rise, a country's financial system becomes inefficient. People's consumption will decrease because people prefer to save or invest their money to make a profit. This can cause economic instability because community consumption is one of the largest contributors to national income (Financial Services Authority, 2017).

Graph 3
Indonesia Interest Rate for 2011-2020 (%)



Source: *World Bank*

The money supply is an important factor in a country's economy. Factors that can affect the money supply include GDP, investment, and interest rates. Therefore, the stability of the factors affecting the money supply must be considered. This study aims to estimate the effect of GDP, investment, and interest rates on the growth of the money supply in Indonesia in the 1990-2020 in the short and long term.

A. Literartur review

Hariani (2014) examined the effect of Gross Domestic Product (GDP), Bank Indonesia Certificate (SBI) interest rate, and Gross Fixed Capital Formation (PMTB) on the money supply in Indonesia in 1990-2010 using ordinary least

squares (OLS) analysis. The results of the study found that GDP and PMTB had a positive effect on the money supply, while SBI had a negative effect on the money supply.

With the same analysis model, Anwar & Andria (2016) conducted a study on the effect of GDP, interest rates, and inflation on demand for money (M2) in Indonesia in 1985-2014. The results of his research found that GDP and interest rates have a positive and significant effect on the demand for money in Indonesia, while inflation has a negative and significant effect on the demand for money in Indonesia.

Harahap & Hafizh (2020) examined the effect of Islamic bank financing, GDP, and interest rates on the money supply in Indonesia from January 2016 to December 2019. The study found that Islamic bank financing and GDP have a positive and significant effect on the money supply, while interest rates have a negative and significant effect on the money supply.

The effect of interest rates, inflation rates, and US dollar rates on the money supply in Indonesia using a sample from 1996-2016 was studied by Sancaya & Wenagama (2020) using the OLS method. The results of the study found that interest rates have a negative and significant effect on the money supply in Indonesia, while the inflation rate and the US dollar rate have a positive and significant effect on the money supply in Indonesia.

Anggraini & Rahayu (2022) examined the effect of GDP, interest rates, and rupiah exchange rate on the US dollar on the money supply in Indonesia from 2011 quarter 1 to 2019 quarter 4. It was found that GDP and the rupiah exchange rate against the US had a positive effect on the money supply in Indonesia, while interest rates negatively affected the money supply in Indonesia.

A different approach, the Error Correction Model (ECM), was used by Setiadi (2013) to estimate the effect of inflation, interest rates, and GDP on money demand in Indonesia from 1999 quarter 1 to 2010 quarter 4. The regression results show that in the short term, inflation and GDP have a positive effect on the demand for money in Indonesia, while interest rates have a negative effect. In the long run, inflation and GDP have a positive effect on the demand for money in Indonesia, while interest rates have a negative effect. The ECM approach was also used by Polontalo et al. (2018) who found that in both the short and long term, GDP, inflation, and interest rates had a positive effect on money demand in Indonesia in 2010 quarter 1 to 2017 quarter 4.

ECM analysis is also used by Syifa et al. (2019) to examine the effect of RTGS value, clearing, electronic money, inflation, and interest rates on the money supply in Indonesia from 2009 quarter 1 to 2017 quarter 3. The study found that in both the short and long term, the value of RTGS, clearing, electronic money, and inflation has a positive effect on the money supply, while interest rates negatively affect the money supply.

Helmy & Pratama (2022) using the same approach examines the effect of GDP, FDI, interest rates, inflation, and exchange rates on the money supply in Indonesia from 2011 quarter 1 to 2020 quarter 4. The results of the study found that only FDI has a significant effect on the money supply in the short term, where the effect is positive. In the long run, GDP and FDI have a positive effect on the money supply, while interest rates negatively affect the money supply. Meanwhile, exchange rates and inflation have no effect on the money supply in both the short and long term.

Alhaj et al. (2016) using the Autoregressive Distributed Lag (ARDL) approach examined the effect of GDP, domestic investment, inflation, exports, interest rates, foreign direct investment, government spending, imports, and financial costs on the money supply in Sudan in 1980-2016. From the results of his research, it was found that in the short term, GDP, government spending, exchange rates, domestic investment, inflation, foreign direct investment, and exports have a positive effect on the money supply in Sudan, while imports and financial costs negatively affect the money supply in Sudan. Then, in the long run, GDP, government spending, exchange rates, domestic investment, inflation, and foreign direct investment have a positive effect on the money supply in Sudan, while exports, imports, and financial costs negatively affect the money supply in Sudan.

The difference between this study from previous studies lies in the analysis model used, where this study uses a Partial Adjustment Model (PAM). This research is expected to provide accurate estimation of how much GDP, investment, and interest rates affect the money supply in Indonesia in the short and long term. By using PAM, it can also be known the time of adjustment of the money supply to the expected level.

B. Materials and Methods

This study used the multiple linear regression method with the Partial Adjustment Model (PAM) regression analysis tool, which assumes the existence of a long-term equilibrium relationship of two or more variables. In the short term, nevertheless, what happens is an imbalance (Gujarati & Porter, 2003). The general model form of PAM that formulates long-term relationships is as follows:

$$Y_t^* = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon_t$$

The long-term regression equation in this study is:

$$JUB_t = \beta_0 + \beta_1 GDP_t + \beta_2 INV_t + \beta_3 IR_t + \varepsilon_t$$

The partial adjustment behaviour is formulated with the following equation:

$$JUB_t - JUB_{t-1} = \delta(JUB_t^* - JUB_{t-1})$$

Thus, a short-term equation is obtained as follows:

$$JUB_t = \delta\beta_0 + \delta\beta_1 GDP_t + \delta\beta_2 INV_t + \delta\beta_3 IR_t + (1-\delta)JUB_{t-1} + v_t$$

Note :

JUB	:	Growth in the money supply (%)
GDP	:	*Gross Domestic Product* (Million US$)
INV	:	Foreign direct investment (Million US$)
IR	:	Interest rate (%)
δ	:	Coefficient of adjustment
β_0	;	Constant
$\beta_1, \beta_2, \beta_3$	:	Coefficient of independent variables
$1 - \delta$	:	JUB coefficient of the previous period
t	:	Era
v	:	Residual

For PAM to be valid, coefficient must be between zero and one and must be significant or statistically proven.

This research includes quantitative research that uses secondary data in the form of an annual time series. The data used includes the money supply, GDP, investment, and interest rates in Indonesia in 1990-2020, and obtained from the World Bank and the United Nations Conference on Trade and Development (UNCTAD).

The study will also test whether the regression model meets the Gauss-Markov assumptions, which include residual normality (Jarque-Fallow Test), homoskedastic residuals (White Test), and no autocorrelation (Breusch-Godfrey Test). In addition, it will also look at the Variance Inflation Factors (VIFs) of each independent variable to find out whether multicollinearity occurs.

In addition to the above tests, it is also necessary to conduct an F test to find out whether there is an influence of independent variables together on the dependent variables. H0 in the F test is GDP, investment, and interest rates together have no effect on the money supply. H 0 will be rejected if the probability of F-statistics < α, if H 0 is rejected then the hypothesis chosen is HA.

Then, a t-test also needs to be performed to find out whether individual independent variables have a real effect on the dependent variables. H0 t test states that each independent variable has no effect on the money supply = 0, where i = 1-3). As for HA states that, > 0, where j = 1 & 2), which means GDP and investment each positively affect the amount of money flowing, while < 0, which means that the interest rate negatively affects the money supply,

C. Result and Discussion

To estimate the effect of GDP, investment, and interest rates on the money supply in Indonesia in 1990-2020, this study used the Partial Adjustment Model (PAM) technique. The results of the PAM estimates along with the Gauss-Markov assumption test are summarized in Table 2.

Table 2
PAM Estimation Results

$JUB_t = 22{,}13561 - 0{,}0000203GDP_t + 0{,}000547INV_t - 0{,}861804IR_t + 0{,}316693JUB_{t-1}$
(0,0750) (0,2095) (0,0003)* (0,0378)*
R^2 = 0,577677; DW-Stat = 1,643852; F-Stat = 8,891080; Sig. F-Stat = 0,000116
Test Diagnosis
(1) Multicollinearity (VIF)
GDP = 6,916188; *INV* = 6,153528*; IR* = 1,057355; *JUB*(-1) = 1,418060
(2) Normality (Test Jarque-Bera)
χ^2(2) = 3,751265 Sig. χ^2(2) = 0,153258
(3) Autocorrelation (Test Breusch-Godfrey)
χ^2(2) = 2,439603 Sig. χ^2(2) = 0,2953
(4) Heteroskedasticity (Test White)
χ^2(14) = 16,88297 Sig. χ^2(14) = 0,2625

Source: *World Bank* & *UNCTADstat*, managed
Note: * Significant at *α* 0,05

Based on Table 2, it can be seen that the value of the regression coefficient of the previous year's money supply (1 - δ) is 0.3167; so that δ = 1 – 0.3167 and obtained a result of 0.6833 or 68.33%. Then, 1 - δ proved to be noticeable because the t-statistical probability was less than 0.05. Thus, the conditions for the validity of PAM are met. The adjustment of the growth of the money supply in one period was 68.33%, so that the adjustment of the money supply to the desired level of the money supply was relatively fast. The validity of PAM on this regression can represent the existence of short-term and long-term theoretical relationships between dependent variables and independent variables selected to compile the econometric model in this study.

$1 - \delta = 0{,}3167$
$\delta = 1 - 0{,}3167 = 0{,}6833$
1) $22{,}13561 = 0{,}6833\beta_0$

$\beta_0 = \frac{\delta\beta_0}{\delta} = \frac{22{,}13561}{0{,}6833} = 32{,}3951559$

2) $-0{,}0000203 = 0{,}6833\beta_1$

$\beta_1 = \frac{\delta\beta_1}{\delta} = \frac{-0{,}0000203}{0{,}6833} = -0{,}00002971$

3) $0{,}000547 = 0{,}6833\beta_2$

$\beta_2 = \frac{\delta\beta_2}{\delta} = \frac{0{,}000547}{0{,}6833} = 0{,}00080053$

4) $-0{,}861804 = 0{,}6833\beta_3$

$\beta_3 = \frac{\delta\beta_3}{\delta} = \frac{-0{,}861804}{0{,}6833} = -1{,}26123811$

From the results of calculating constants and long-term coefficients, the long-term estimator model is obtained as follows:

$JUB_t = 32{,}3951559 - 0{,}00002971GDP_t + 0{,}00080053INV_t - 1{,}26123811IR_t$

The results of the Jarque-Fallow Test (JB) show a statistical probability of JB of 0.153 which means more than α 0.1; so that the residual is normally distributed. Then, statistical probability on the Breusch-Godfrey Test (BG) of 0.295; So there is no autocorrelation problem in the model. White Test results show probability is 0.263 which means there is no heteroskedasticity in the model. It can be seen that all independent variables have Variance Inflation Factors (VIFs) that are less than 10, so it can be said that there are no serious symptoms of multicollinearity.

The F test yields an F-statistical probability of 0.000116 which means less than α 0.05; so that together, GDP, investment, and interest rates affect the growth of the money supply. Then, the coefficient of determination (R2) of 0.5777 means that 57.77% of the variation in growth in the money supply is due to variations in GDP, investment, and interest rates, while the other 42.23% is due to variables outside the model.

Table 3
***t* Result Test**

Variable	Coefficient	Sig. *t*	Note	Conclusion
GDP	$\delta\beta_1$ = -0,0000203	0,0750	α = 0,05	$\delta\beta_1$ Insignificant
INV	$\delta\beta_2$ = 0,000547	0,2095	α = 0,10	$\delta\beta_2$ Insignificant
IR	$\delta\beta_3$ = -0,861804	0,0003	α = 0,05	$\delta\beta_3$ significant

Source: Tabel 2

Based on Table 2, it is known that the variables that have a real effect on the growth of the money supply are interest rates, while GDP and investment have no effect.

Based on Tables 2 and 3, it is known that interest rates have proven to have a negative effect on the growth of the money supply, while GDP and investment have no effect. Thus, the coefficient of interest rates (δβ 3) can be interpreted, while the coefficients of (GDP (δβ 1) and investment ()δβ 2) It does not need to be interpreted because it is insignificant. The short-term and long-term interest rate coefficients are 0.8618 and 1.2612. This means that if the interest rate rises by 1%, then the growth in the money supply will decrease by 0.8618% in the short term and by 1.2612% in the long term.

Based on the regression results, it is known that GDP has no effect on the growth of the money supply in Indonesia in the short and long term, so it does not fit the hypothesis. In Table 4, it appears that consumption growth is not as large as savings growth. Bakan consumption had decreased in 2020 due to the Covid-19 pandemic. This is an indication that people prefer to save or save their money instead of consuming, so the growth of the money supply tends to be slow even though GDP is increasing.

Table 4

Growth of Savings and Consumption in Indonesia 2012-2020 (%)

Year	Savings	Consumption
2012	16,59	5,10
2013	11,12	5,35
2014	6,15	4,50
2015	7,99	4,68
2016	10,04	4,16
2017	8,78	4,41
2018	6,80	4,85
2019	6,17	4,70
2020	10,50	-2,12
2021	3,98	2,24

Source: Statistics Indonesia (BPS)

The results of a different study were found by Polontalo et al. (2018), in which GDP had a positive effect on the money supply. The high GDP will increase the production of goods and services, so that the income earned by enterprises and workers and consumption increases, which can increase the money supply.

Furthermore, the hypothesis of this study also states that investment has a positive effect on the growth of the money supply. Helmy & Pratama (2022) found results according to the hypothesis. If investors invest their capital or money in the form of direct investment, such as building factories or buying companies, the companies purchased or built will produce goods or services to obtain income. The income will be used to pay employees' salaries, purchase

raw materials, and carry out various other transactions, so that consumption increases. Increased consumption will increase the money supply.

Table 5
Contribution of the Five Largest Sectors to Indonesia's GDP in 2017-2021 (%)

Sector	2017	2018	2019	2020	2021
1	21,22	21,04	20,79	20,61	20,55
2	13,23	13,21	13,15	12,92	13,04
3	12,69	12,54	12,37	12,85	12,63
4	9,97	10,05	10,12	10,00	9,91
5	7,87	7,64	7,36	7,37	7,39

Source: BPS
Note:
1. Processing Industry
2. Trade
3. Agriculture
4. Construction
5. Mining

Table 6
Proportion of FDI in the Five Largest Contributing Sectors to Indonesia's GDP in 2017-2021 (%)

Sector	2017	2018	2019	2020	2021
1	40,82	35,31	33,86	46,06	50,83
2	4,01	2,08	1,49	1,51	1,49
3	5,27	6,10	3,68	4,45	3,25
4	0,70	0,85	0,57	0,66	0,30
5	13,57	10,37	8,00	6,99	12,28

Source: BPS
Note:
1. Processing Industry
2. Trade
3. Agriculture
4. Construction
5. Mining

Table 5 shows that the five largest contributing sectors to Indonesia's GDP in 2017-2021 are the processing, trade, agriculture, construction, and mining industries. However, in Table 6, it appears that almost all the proportion of foreign investment in the five sectors is relatively low. Only the manufacturing industry sector has gained a large share of investment. Low investment makes

it difficult for companies to develop due to the lack of capital obtained, so that the increase in production of goods or services is uncertain, as well as their income. This causes the increase in consumption to be erratic, thus making the growth of the money supply not necessarily increase..

A negative influence on the growth of the money supply is found on interest rates, so it corresponds to the hypothesis. It can be seen in Chart 3 that interest rates in 2011-2020 fluctuated, and in the last three years have continued to rise to maintain financial stability. The increase in interest rates makes people's desire to consume will be reduced because they prefer to save rather than spend their money, in the hope of benefiting from the interest. As a result, people's interest in consumption decreased which caused a decrease in the amount of money in circulation. Similar results were also found by Anwar & Andria (2016), where interest rates negatively affect the money supply in Indonesia.

D. Conclusion

The money supply is one of the important factors to maintain the stability of a country's economy. Factors that can affect the money supply include investment, GDP, and interest rates. Therefore, the stability of the factors affecting the money supply must always be considered. The purpose of this study is to estimate the effect of GDP, investment, and interest rates on the growth of the money supply in Indonesia in the 1990-2020 in the short and long term. To achieve the research objectives, multiple linear regression was carried out with the Partial Adjustment Model (PAM) regression analysis tool. Based on the regression results, it is known that in the short and long term, GDP and investment have no effect on the growth of the money supply in Indonesia in 1990-2020, while interest rates have a negative effect.

The government as the policy holder is expected to be able to control the growth of the money supply in accordance with economic factors that have an impact on the growth of the money supply. With respect to GDP, the government should make policies that can encourage an increase in GDP because a high GDP indicates high state income, so it can attract investors. This will increase economic activity, household consumption and increase people's welfare. This will have an impact on increasing the growth of the money supply. In addition to the government, Bank Indonesia as the central bank is expected to be able to control interest rates so that they are not too high or too low, with the hope of maintaining the stability of the money supply so that the possibility of inflation causing economic downturn tends to be low.

The limitation of this study lies in the research sample which is only until 2020, not until the latest year 2021 and 2022. This is because the variable data for 2021 and 2022 has not been fully published. In addition, this study only used three independent variables, namely GDP, investment, and interest rates. Further research is expected to be able to crave other more complex variables

in explaining the factors that affect the growth of the money supply in Indonesia.

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