Dynamics of Inflation in Indonesia: The Role of CPI, E-Money, Money Supply (M1), and Exchange Rate

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A B S T R A C T

This research aims to compare the influence of the consumer price index (CPI), electronic money transactions (e-money), money supply (M1) and exchange rates on inflation in Indonesia between the periods before the pandemic and after the Covid-19 pandemic. This research is quantitative research with 67 data samples obtained. The data used in this study is published on the official website of the Central Bureau of Statistics and Bank Indonesia. The analysis in this study uses the Chow Test and Error Correction Model with the Engle-Granger method and multiple linear regression with the OLS method assisted by the Eviews 9 data processing software. The results of the Chow test show that the regression model is differentiated according to the period, before and after the pandemic. The results of the OLS test before the pandemic, the variable value of e-money transactions and the money supply affected the inflation rate, while the CPI, exchange rate, and BI rate were not affected. After Covid-19, the analysis results showed that the CPI, exchange rate, and BI Rate had a significant effect on the inflation rate. Meanwhile, the variable value of e-money transactions and the money supply has no effect on inflation rate in Indonesia.

1. INTRODUCTION

Inflation is a dynamic process (Sukendar, 2000). Stability inflation is condition for growing sustainable economy in a country because later will give benefit for enhancement well-being public. Increase inflation No always impact negative for economy, inflation also has impact positive to economy (Salim, Fadilla and Purnamasari, 2021). Study previous state that if level low inflation or is at a level that is not too tall precisely will impact positive for country's economy (Satria, 2012). When rate inflation are in numbers according to the target set, then economy can walk it should be.

Until the arrival of Covid-19 in Indonesia, inflation Keep going experience decline. According to Sukendar (2000), p theory level too much inflation low show exists lethargy economics, p This based on on assumption that the prices are not move to on signify exists weakness on the side request, then no rare, too low level inflation is indicator weak Power buy public so that will push rate growth economy. However, although so inflation also causes income real public become down. His height level inflation so will the more give burden to public especially intermediate to down, so resulting in more rising level poverty (Anggara, 2015).

Inflation is shared by Bank Indonesia to in two category that is core inflation and inflation not core (non-*core inflation*). Core inflation is influenced by fundamental factors, incl environment external, while non- *core inflation* influenced by non-fundamental factors, including inflation material fluctuating food. Inflation in Indonesia is also caused by factors from abroad because Indonesia is a country with economy open in the middle world economy. With circumstances This so the implications is exists turmoil economy overseas will influential to domestic economy. For Indonesia in effort build return the economy, level high inflation must avoided in order to ensure a healthy and enthusiastic development process in economy still maintained (Mahendra, 2016) , for reach target low inflation and keeping it steady stable need Work together and partnership all over holder interest economy, including Bank Indonesia, government, and sectors private. Inflation can own various very effect broad and not can ignored. Very inflationary tall can influence economy, which can cause instability with slowing down growth economy and increase unemployment. Therefore that, manage inflation to be stable become very important. Moreover, exists turmoil The Covid-19 pandemic is being felt all over the world influential to Indonesian economy.

Many influencing factors level inflation can identified by some instrument like Index Price Consumer (CPI), value transaction Money electronic (*e-money*), amount Money circulating in meaning narrow or *narrow*

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money (M1), value exchange rupiah against dollar and BI *Rate* (BI 7- *day* RR *Rate*). The meaning of CPI is is something index For measure average price of goods and services consumed by the home ladder or resident so that can be one indicator For measure level inflation (Sumantri & Latifah, 2019) .

Factor *e-money* or Money electronic in a way simple described by Bank Indonesia as tool payment in form stored electronics in electronic media certain. Progress technology in payments shift role Money cash become tool assessed non - cash payments public more efficient and economical. High increase in transaction volume the supported by facilitating factors use Money electronic in do payment micro and retail in a way more precise and fast than with payment cash (Nursari et al., 2019) . Factor determinant to inflation next that is ethnic group flower Bank Indonesia reference or now called the BI 7- *day* RR *Rate* is signal for banks to set ethnic group the flowers cover savings, deposits and credit. Definition of BI 7- *day* RR, namely explained as reflecting policies attitude or *stance* policy monetary policy determined by BI and announced to public by the Board of Governors of Bank Indonesia each the month. Change in BI 7- *day* RR *Rate* level addressed for slow down rate activity economics that can cause inflation. With the increase in the BI 7- *day* RR *Rate,* as well as ethnic group flower credit and deposits (Komariyah, 2016) . When ethnic group flower deposits go up, people tend to keep money in the bank and amount money in circulation reduce.

According to Bank Indonesia (2015), money circulating can define in meaning narrow (M1) is covers Money cards held society and money giral. Theory quantity explain that Because level inflation indicated by changes percentage in increase price, then will confirm increasing amount Money circulating will cause inflation. According to Priyatama and Apriansah in Zunaitin, W and P (2017) circulation too much money Lots so will result inflation, meanwhile if amount Money circulating too A little so will arise recession. Imbalance between amount Money circulating in society with the amount of output in the market will be bother stability economy.

Definition exchange rate or often called with exchange rate is price relatively One eye Money to other currencies (Silaban et al., 2020) . There is two type exchange rates, that is mark nominal exchange which is price relatively from eye the country 's money. And value swap real, that is is price relatively commodity between both countries, and us can swap commodity from one country with commodity from other countries. Eye value Money foreign currency, including dollars required by the parties related for do transaction various goods from abroad, travel to abroad, or other necessary services obtained from abroad, p This will influence appreciation eye Money foreign. In fact, mark exchange rupiah against dollar tend stable during the Covid-19 pandemic.

Based on the background above, the author is interested in conducting research with a problem formulation that focuses on the comparison of the influence of the determinants of the inflation rate in Indonesia before and after the Covid-19 pandemic with the title "Inflation Dynamics in Indonesia: The Role of CPI, E-Money, Supply Money (MI), and Exchange Rate".

The desired goal achieved in study This that is for now and test is there is influence between variable Index Price Consumers (CPI), Transactions Money Electronics (*E-money),* Total Money Circulation (M1), Exchange Rate Exchange Rates, and Interest rate (BI 7- *Day Reverse Repos Rate)* When before and after happening Covid-19 pandemic in Indonesia against inflation in Indonesia.

2. METHOD

Variables used in study This consists of variable dependent and variable independent with details definition operational variables in Table 1, as following:

Table 1. Table Definition operational variables

Variable Independent	Definition Operational	Indicator	Unit
Index Price Consumer	Index Price Consumer used as reference for observe change price required goods and services paid by the community or consumer.	Monthly *time series* data Index Price Consumer (CPI) period 2016 September (2016m09) until with 2022 months March (2022m03). Processed data originate from the Central Statistics Agency (BPS).	Ratio

Transaction Value Money Electronics (*e-money*)	Amount all over transaction in form electronic where is the money saved in certain media form *chips* or *servers* and users required for *top up* or deposit Money moreover formerly.	Monthly *time series* data TUE (*e-money)* value period 2016 September (2016m09) until with 2022 months March (2022m03). Processed data originate from Bank Indonesia (BI).	Million Rupiah
Amount Money Circulation (M1)	Money Circulation (M1) is obtained from Amount Money Cards and Amounts Money Giral	monthly *time series* data (M1) period 2016 September (2016m09) until with 2022 months March (2022m03). Processed data originate from the Central Statistics Agency (BPS).	Billion Rupiah
Exchange rate	Exchange rate that is mark conversion between rupiah exchange rate against the Exchange Rate dollars.	Monthly *time series* data on exchange rates to dollar period 2016 September (2016m09) until with 2022 March (2022m03). Processed data originate from Bank Indonesia (BI).	Rupiah
Interest Rate (BI-7 *Day Reverse Repos Rate)*	BI-7 *Day Reverse Repos Rate* (term interest) is defined as reflecting policies attitude or *stance* policy monetary set by BI.	Monthly *time series* data Ethnic group Flower period 2016 September (2016m09) until with 2022 months March (2022m03). Processed data originate from the Central Statistics Agency (BPS).	Percent (%)
Rate Inflation	Interpreted with increase goods and or service in a way general and on continuously in period time certain.	Monthly *time series* data (YoY) Inflation Rate period 2016 September (2016m09) until with 2022 months March (2022m03). Processed data originating from Bank Indonesia (BI).	Percent (%)

source: processed data

Sample data used in study This namely Index data Price Consumer (X_1), Transaction Money Electronics (X_2), Quantity Money Circulating in meaning narrow or M1 (X_3), Exchange Rate (X_4), Term Interest (X5) and Inflation Rate (Y) data in Indonesia are taken from data from the Central Statistics Agency (BPS) and Bank Indonesia (BI). page the website during time from 2016 September (2016m09) until with 2022 months March (2022m03) with a total sample of 67 data. The sampling technique used in study This namely saturated sampling. Saturated sampling that is technique determination sample if all over member population used as sample.

Study This is type study descriptive with approach quantitative / statistical. Data processing uses *Software Eviews* 9 *for Windows.* Analysis of data used in research This that is : Analysis Statistics Descriptive, with Stationarity Test, Degree Test Integration, Cointegration Test, Change Test Structural : Chow Test, Correction Test Model Error (*Error Correction Model)*, and with Hypothesis Testing, F Test, t Test, Coefficient Test Determination (*Adjusted R-square)*, and Assumption Test Classic : Normality Test, Linearity Test, Autocorrelation Test, Heteroscedasticity Test, Multicollinearity Test.

3. RESULT AND DISCUSSION

Data Analysis

Table 2. Table Recapitulation of Model Regression Test Results

Variable	Before		After Pandemic	
	Coefficient	Pro	*Coefficient*	Pr
C	-14, 73910	0, 4150	-158, 7188	0, 0001
LOG(CPI)	0, 536944	0, 5286	41, 75775	0, 0000
LOG(TUE)	-0, 376981	0, 0012	-0, 528231	0, 1599
LOG(JUB)	3, 189738	0, 0331	0, 996107	0, 2392

Based on table on can know equation model regression before and after Covid-19 pandemic in study This is as following:

It means If mark CPI, TUE, JUB, EXCHANGE and BIRATE variables in the period before the Covid-19 pandemic is the same with zero, then Inflation will worth – 14, 73910. Likewise, results regression period after

Covid-19 pandemic, if all over variable free is in value zero, then mark inflation will constant as big as - 158, 7188.

t test

In testing This aim for explain how much tall influence One variable independent individually in _ explained variation variable dependent. From the statistical test results in the table on so study This get t count each variable Index Price Consumers (CPI), transactions Money electronic (TUE), amount Money outstanding (JUB), value exchange (Exchange rate), and tribe interest (BIRATE) on the period whole time, before pandemic and after pandemic. From the results multiple linear regression is as following:

Table 3. Table Recapitulation of t Test Results for the Pre-Pandemic Period

Variable	C	Prob.	Results
LOG(CPI)	0, 536944	0, 5286	No Significant
LOG(TUE)	-0, 376981	0, 0012	Significant *
LOG(JUB)	3, 189738	0, 0331	Significant *
LOG(EXCHANGE)	-2, 746052	0, 0983	No Significant
BIRATE	0, 001269	0, 9920	No Significant

Source: Results data calculation Eviews

*Notes: * significant at the 5% level*

From the results above concluded that in the period before Covid-19 pandemic only variable Transaction Money Electronics (*e-money)* and Amount Money Circulating (M1) is influential significant to rate inflation. That matter seen that mark significant variable smaller from 0.05.

Table 4. Table Recapitulation of t Test Results for the Pre-Pandemic Period

Variable	C	Prob.	Results
LOG(CPI)	41, 75775	0, 0000	Significant *
LOG(TUE)	-0, 528231	0, 1599	No Significant
LOG(JUB)	0, 996107	0, 2392	No Significant
LOG(EXCHANGE)	-5, 030644	0, 0250	Significant *
BIRATE	1, 411831	0, 0000	Significant *

Source: Results data calculation Eviews

*Notes: * significant at the 5% level*

From the table above concluded that in the period after variable Covid-19 pandemic Transaction Money Electronics (*e-money)* and Amount Money Circulating (M1) no influential to rate inflation. That matter seen that mark significant variable bigger from 0.05.

Discussion

Influence Index Price Consumers (CPI) against Inflation

Hypothesis first (H ₁) of study i.e. the CPI is influential significant to level inflation in Indonesia in the past Covid-19 pandemic. Regression test results Index Price Consumers (CPI) in the period before Covid-19 pandemic against inflation show no results _ significant. Mark _ probability of CPI of 0, 5286 > 0.05. So in hypothesis testing period before Covid-19 pandemic, **H ₁ rejected.** During period 2016 until _ with 2019, Index Price Consumers in Indonesia are monitored controlled and on target _ inflation. Price goods and services tend stable so that No influence fluctuation inflation.

Hypothesis second (H ₂) of study This is the CPI influential significant to level inflation in Indonesia in the period after Covid-19 pandemic. Analysis results period after Covid-19 pandemic, CPI variable detected influential positive and significant to Inflation. The CPI test results have coefficient positive amounting to 41, 75775 with probability 0, 0000 < 0.05. Therefore _ that, **H ₂ accepted.** Based on results study can interpreted that period after pandemic from 2020 May to 2022 months _ _ March if the CPI increases high (increased) by 1% then will followed with increasing inflation amounting to 41.75775%. The lower CPI value, then inflation will too down (increasing low).

CPI is used for measure development group price goods and services at the same time become reject measuring development condition economy. This matter happen moment the Covid-19 pandemic is underway Where between production and consumption public No happen balance. Price from goods and services in the group expenditure experience increase Because increasing consumption public without supported by existence

production adequate goods and services _ Because its implementation *lock down* and reduction amount employee. This result in accordance with study previously done by Vivy _ Kristinae (Kristinae, 2018) which shows results that the CPI variable has an effect significant to Inflation.

Effect of Transaction Value Money Electronic (e-money) against Inflation

Hypothesis third (H $_3$) from study is Transaction Money Electronics (*e-money)* have an influence significant to level inflation in Indonesia in the past Covid-19 pandemic. Test result show Transaction Value Money Electronics (*e-money)* have an influence significant to inflation with direction negative in the period before Covid-19 pandemic. The TUE variable has mark coefficient -0, 376981 with probability 0, 0012 < 0.05 so hypothesis third **(H $_3$) is accepted.** It means if Transaction Value Money Electronics rose by 1%, then will impact on the decline level inflation of 0, 376981%.

Technology develop the more proceed push society switch use Money electronic (*e-money)* for various transaction. In fact, the data shows mark transaction Money electronics in Indonesia experienced significant improvement _ from year to year. People choose Money electronic Because felt more practical in its use. Increasing mark transaction Money electronic believed potential influence amount Money circulated next _ influential to inflation. This result in line with Ruth Damayanti's research (Damayanti, 2021) in Analysis Influence Transaction Money Electronic regarding the inflation rate in Indonesia which states that Transaction Value Money Electronic influential to Inflation.

Hypothesis fourth (H $_4$) in the study This that is Transaction Money Electronics (*e-money)* have an influence significant to level inflation in Indonesia in the period after Covid-19 pandemic. After the pandemic happen, result testing show that Transaction Value Money Electronic (*e-money)* no influential to Inflation. The TUE variable has coefficient negative of -0, 528231 with mark probability 0, 1599 > 0.05 so hypothesis fourth **(H $_4$) in the period after Covid-19 pandemic denied.** The analysis results obtained in the period This support research conducted by Pisi Bethania Titalessy _ (Titalessy, 2020) as well as Kalam Kalbuadi and Merlyana Dwinda Yanthi (Kalbuadi & Dwinda, 2021) . In study stated that *e-money* against inflation No significant.

Influence Amount Money Circulation (M1) to Inflation

Hypothesis fifth (H $_5$) is present in study This that is Amount Money Circulating (M1) has an effect significant to level inflation in Indonesia in the past Covid-19 pandemic. Test result show that variable Amount Money Outstanding (M1) period before the Covid-19 pandemic shows significant influence _ to inflation with direction positive. The variable JUB has mark coefficient positive of 3, 189738 with probability 0, 0331 < 0.05 so **hypothesis third (H $_5$) in the period before Covid-19 pandemic accepted.** This means that in 2016 September will arrive with 2020 in April, if Amount Money Circulation rises by 1% then level inflation will increase of 3, 189738%. Conversely, if JUB decreases, then will accompany with down level inflation.

This result strengthen results research conducted by Kalam Kalbuadi and Merlyana Dwinda Yanthi (Kalbuadi & Dwinda, 2021) in Analysis Influence Launching System *E-money* and Amount Money Circulating To Inflation in Indonesia shows that Amount Money Circulating in meaning narrow (M1) has an effect significant to Inflation. And appropriate with Theory Request Irving Fisher's money that is inflation only can happen when There is increase in the volume of money in circulation.

Hypothesis sixth (H $_6$) in study This that is Amount Money Circulating (M1) has an effect significant to level inflation in Indonesia in the period after Covid-19 pandemic. However, in period after Covid-19 pandemic, the JUB variable shows no results _ significant to inflation. The coefficient value on the JUB variable is equal to 0, 996107 with mark probability 0, 2392 > 0.05 so **hypothesis the sixth (H $_6$) is rejected.**

Influence Exchange rate to Inflation

Hypothesis seventh (H $_7$) in study This is Exchange rate influential significant to level inflation in Indonesia in the past Covid-19 pandemic. Testing hypothesis in research Exchange Rate variable (KURS) shows no results _ significant to inflation in the period before Covid-19 pandemic. The EXCHANGE variable has coefficient negative of -2, 746052 with probability worth 0, 0983 > 0.05 so hypothesis seventh **(H $_7$) is rejected.**

This result No in accordance with hypothesis where is the Exchange Rate influential significant to Inflation. That matter means the more tall exchange rate so will lower level inflation. In line with results study Heru Symbol (Perlambang, 2017) and Indira Citra Ekaningtyas (Ekaningtyas, 2018) which shows results the influence of the Exchange Rate is not significant to Inflation.

Hypothesis eighth (H $_8$) is present in study This is Exchange rate influential significant to level inflation in Indonesia in the past Covid-19 pandemic. While in period after Covid-19 pandemic hypothesis test results show that exchange rate influential significant to direction negative to inflation. The EXCHANGE variable shows coefficient of -5, 030644 with probability 0, 0250 < 0.05 so in the period after pandemic hypothesis eighth **(H $_8$) is accepted.** It means that when mark exchange rupiah against the dollar rises by 1%, then will lower level inflation as much as *5,030644* %. On the other hand, if exchange rate become down, then will follow by an increase inflation

in Indonesia. The exchange rate during the Covid-19 pandemic is trending experience decline but Still considered stable. This result in accordance with study previously namely by Nichen Rumondor, Robby J. Kumaat, and Steeva YL Tumangkeng (Rumondor et al., 2021) that Exchange Rate influential negative and significant to Inflation in Indonesia. Luthfiah also showed the same results Azizah, Bambang Ismanto, and Destri Cytorus (Azizah et al., 2020) in Influence of Rupiah Exchange Rate and Amount Money Widely Circulated Against Inflation in Indonesia for the 2010 – 2019 Period.

Influence BI Rate to Inflation

Hypothesis ninth **(H $_{9)}$** is present in study This is Ethnic group Interest (BI Rate) has an effect significant to level inflation in Indonesia in the past Covid- 19 pandemic. Interest Rates (BI 7- *Day Reverse Repos Rate)* period before pandemic No show significant results. _ The BIRATE coefficient value is 0.001269 with _ probability equal to 0, 9920 > 0.05 so hypothesis ninth **(H $_{9)}$ is rejected.**

Hypothesis tenth **(H $_{10)}$** in study This is Ethnic group Interest (BI Rate) has an effect significant to level inflation in Indonesia in the past Covid-19 pandemic. Hypothesis test results for period after happen the Covid-19 pandemic shows that The BI Rate variable has an effect significant to inflation and to direction positive. The BI Rate variable has coefficient 1, 411831 with mark probability 0, 0000 < 0.05 so hypothesis tenth **(H $_{10)}$ is accepted.** It means Inflation will increase amounted to 1.411831% when *the* BI Rate level increased by 1%. The lower BI Rate level then will lower level Inflation in Indonesia. This matter show that policy monetary through the BI *Rate* by Bank Indonesia control rate inflation and according to the target will be achieved.

This result in accordance with study previously that is done by Eliya Zunaitin, Regina Niken, and Fajar Wahyu (Zunaitin et al., 2017) who stated that the BI Rate has significant influence _ to Inflation in Indonesia is deep his journal entitled *"The E-money Effect of Inflation in Indonesia". The* same thing is also supported by research by Putri Sari Silaban, Pasca Dwi Putra, Elvira Dilani and Kusniarti Putri Simbolon (Silaban et al., 2020) as well as in Meita Panjaitan and Wardoyo (Panjaitan & Wardoyo, 2016) .

Difference influence between CPI, JUB, Transactions Money Electronics, Exchange Rates, and Tribes Interest (BI Rate) against Inflation in Indonesia at the moment before and after Covid-19 pandemic.

Hypothesis eleventh **(H $_{11)}$** from study This that is there is difference influence between CPI, JUB, Transaction Value Money Electronics, Exchange Rates, and Interest rate to Inflation in Indonesia before and after Covid-19 pandemic. Variable determinant to Inflation based on results testing show exists difference in influence inflation before and after Covid-19 pandemic. This matter shown by the results of the Chow test, namely that there is difference structural model. By simultaneous, results study shows that CPI, JUB, Transaction Value Money Electronics (*e-money)*, Exchange Rates, and Tribes Interest (BI 7- *Day Reverse Repos Rate)* has an effect significant to inflation in the period before pandemic as well as in the period after Covid-19 pandemic. Then t test results also show exists difference from each influence variable independent to inflation.

4. CONCLUSION

The desired goal achieved in study This that is for now and test is there is difference influence determinant to Inflation between variable Index Price Consumers (CPI), Transactions Money Electronics (*E-money)*, Total Money Circulation (M1), Exchange Rate, and Rate Flower (BI 7- *Day Reverse Repos Rate)* When before and after happen Covid-19 pandemic in Indonesia. Based on results data analysis with *Eviews 9* and discussion results study to hypothesis that has been formulated, then can take conclusion as following:

1. Index Price Consumers (CPI) in the period before Covid-19 pandemic against inflation Good in period short nor period long No show results significant. While in period after happening Covid-19 pandemic, CPI variable detected influential to direction positive and significant to Inflation. Which mean that if the CPI experiences increase so will followed with increasing level inflation.
2. Transaction Value Money Electronics (*e-money)* have an influence significant to inflation with direction negative in the period before pandemic period long. Meanwhile, the term ECM test short show no results significant. After the pandemic occurs, the TUE variable does not influential significant to Inflation, fine in period short (ECM) or period long.
3. Amount Money Circulating in the Narrow Meaning (M1) period before the Covid-19 pandemic shows results influence significant to inflation in period long with direction positive. However, No show results significant in the term short. Period after Covid-19 pandemic, JUB variables are the same show no results significant to inflation in period short nor period long.
4. Exchange Rate (KURS) shows no results significant to inflation in period short nor period long period before Covid-19 pandemic. But in one side, period after pandemic test results show that exchange rate influential significant to direction negative to inflation. It means that if mark exchange rupiah against the dollar rises, then

will lower level inflation. On the other hand, if exchange rate become down, then will followed by an increase inflation in Indonesia.

5. Ethnic group Flower (BI 7- *Day Reverse Repos Rate)* period before pandemic No show significant results, good _ in period short (ECM) and long term tests long. Otherwise, period after happen Covvid-19 pandemic results show that The BI Rate variable has an effect significant to inflation and to direction positive. This means that the increase in the BI Rate level is accompanied by with increasing inflation.

6. CPI, JUB, Transaction Value Money Electronics (*e-money),* Exchange Rates, and Tribes Interest (BI 7- *Day Reverse Repos Rate)* as variable determinant to Inflation based on results testing show exists difference in influence inflation before and after Covid-19 pandemic. This matter showed with Chow test results experienced difference structural model and the t test results show difference each influence variable independent to inflation.

Limitations and Novelty Study

Limitations

In study This naturally there is possible limitations and shortcomings made consideration for researcher furthermore. Existing limitations that is among them data *range* or amount observation For period after pandemic Still limited, since from happen the Covid-19 pandemic arrived with study this done.

Novelty

Study This own a number of novelty among others:

a. In data processing uses applications / tools analysis *Eviews 9.*

b. Using econometric models *time series Error Correction Model* (ECM) for term models short.

c. Use method *Chow Test* on estimation models for identify exists change structural research model

Suggestion

Based on results research and conclusions, then some suggestions can be formulated as following :

1. For researcher furthermore

a. Expected for study furthermore can add amount observation time For period after pandemic so that the samples used compared amount of data in the period before pandemic can comparable.

b. Add variable independent of the model, so that the existing regression model can explain other influencing factors inflation in Indonesia.

c. Can using econometric models another *time series.*

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