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THE IMPACT OF COVID-19 ON CHANGES IN THE ADAPTIVE EXPECTATION INFLATION MODEL OF EMERGING MARKET COUNTRIES

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Abstract

This study examines the impact of Covid-19 on changes in the model of adaptive expectation inflation in emerging markets. The data was collected by month from June 2019 to July 2020. The data analysis model uses simultaneous regression of 2TLS. The results prove that there is a change in the behavior of the cagan model, where inflation expectations can be detected from the value of money supply, G.D.P., interest rate, and Balance of Payment. The impact of Covid-19 changes the behavior of inflation expectations from buying behavior to waiting for action; this is based on the decrease in purchasing power and the decrease in foreign trade transactions of emerging market countries.

Keywords: *Covid-19, Cagan Adaptive Expectation Inflation*

1. INTRODUCTION

Economic stability can be seen from the value of people's expectations that are not far away with price growth. Changes in people's rational expectations of purchasing behavior occur due to pandemics. The spread of COVID-19 on a global scale is swift and has a profound impact, no exception for a worldwide economy that continues to show volatility even tends to decline. Uncertainty over the timing of the pandemic has also caused capital market movements across the country to take a deep correction. The encouragement of the central and local governments to start reducing outdoor activities certainly has a significant impact on economic movements reflected in capital market movements in the past month. The Government, through the Ministry of Finance, has even begun to encourage Ministries and Institutions (K/L) and Local Governments to accelerate spending, especially in the second quarter of 2020. Furthermore, the Government also re-focused budgeting and launched the Fiscal Stimulus package volume I and volume II, which is expected to support the movement of the real sector.

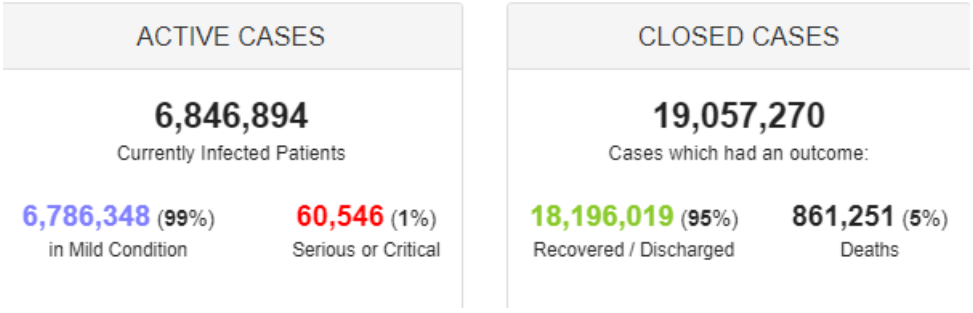

Figure 1: Global COVID-19 confirmed case data from worldometers.com (September 2, 2020)

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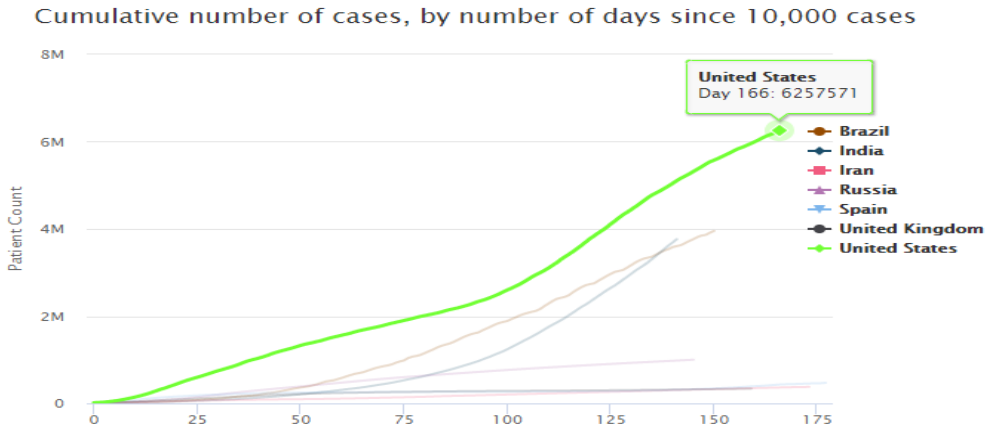

Figure 2: Covid-19 Affected Countries: worldometers.com (September 2, 2020)

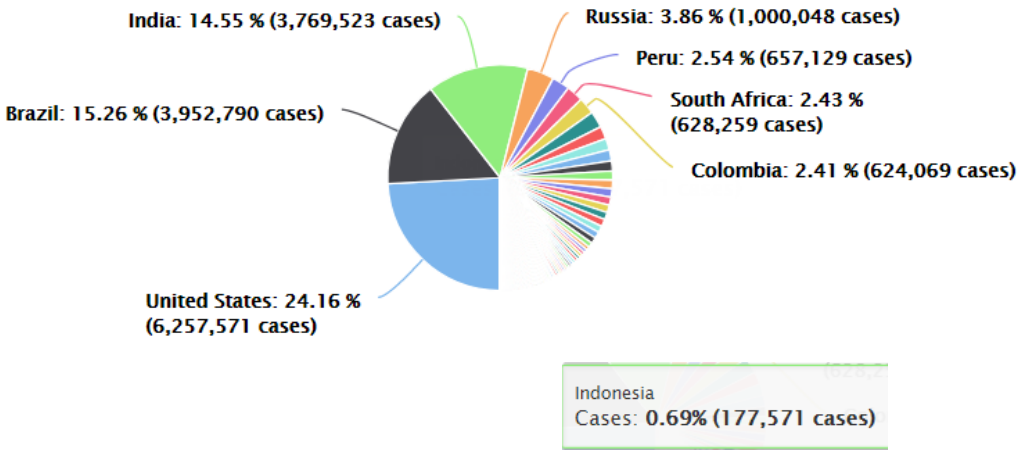

Figure 3: Covid-19 Affected Countries: worldometers.com (September 2, 2020)

The number of corona-infected patients in the world, as of Thursday, April 23, 2020, reached 2,647,349 in the space of fewer than 24 hours, that number increased by more than 74,000 cases. Of the 2.63 million people positively infected with Covid-19, 184,386 died, and 723,874 were declared cured. There are 210 countries and regions around the world that have reported Covid-19, including Indonesia. Before COVID-19 attacked the real sector, the financial industry had already first felt the adverse effects. Global stock markets were battered, the Composite Stock Price Index (J.C.I.) also ambles. During the first quarter of 2020, J.C.I. Recorded a slump of nearly 28%. The worst sell-off occurred in March at 16.76%. Even on March 24, J.C.I. Touched 3,911,716, the lowest level since August 2013. When J.C.I. Ambles, defensive stocks will be more and more in the market. Of all sectors, issuers from the consumer goods sector are most able to withstand the turmoil caused by COVID-19. The Financial Services Authority noted that from the beginning of March 2020 to March 24, 2020, foreign investors were recorded exiting the stock market, and S.B.N. amounted to Rp 6.11 trillion and Rp 98.28 trillion, respectively. The total foreign funds coming out of the Indonesian capital market reached Rp 104.39 trillion. As of July 3, 2020, a total of 60,695 cases occurred in Indonesia. Then, there were 901 patients declared cured, so the total number of patients who recovered was recorded, 27,568 people. While for patients died increased by 49 victims, ing the total to 3,096 cases of death. So if accumulated, there are 30,091 active cases or still undergoing treatment. From

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Worldometers data, as of July 3, 2020, the total number of Covid-19 instances in the world was confirmed as many as 11,179,255 (11.1 million) cases. Of these, 6,266,504 (6.2 million) patients have recovered, and 528,367 have died. Active cases to date accounted for 4,384,386, with 4,325,562 patients with mild conditions and 58,824 in serious condition.

2. LITERATURE REVIEW

Covid-19 (Coronavirus)

According to the WHO, coronavirus is a large family of viruses that can cause disease in animals or humans. In humans, the corona is known to cause respiratory infections ranging from common colds to more severe conditions such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The most recent coronavirus found is the COVID-19 coronavirus. The virus is an infectious disease and was only discovered in Wuhan, China, in December 2019, which later became an outbreak. The infection spreads from one person to another through a droplet of the respiratory tract that is often produced when coughing or sneezing. The time from exposure to the virus to the onset of clinical symptoms ranges from 1–14 days with an average of 5 days. The standard method of diagnosis is a reverse transcription-polymerase chain reaction test (PRC-PCR) from a nasopharyngeal wipe or phlegm sample with results within a few hours to 2 days. Antibody testing from blood serum samples can also be used with results within a few days. Infection can also be diagnosed from a combination of symptoms, risk factors, and a computerized tomography scan of the chest that shows signs of pneumonia.

Model Cagan Adaptive Expectation

The adaptive expectation Cagan model starts with the money demand model in the form of exponential functions, namely:

$$\frac{M_t}{P_t} = e^{\alpha_0+\alpha_2 R_t} y_t^{\alpha_1} \text{ atau } \ln\frac{M_t}{P_t} = \alpha_0 + \alpha_1 \ln(y_t) + \alpha_2 R_t + \mu_t \qquad (1.1)$$

It is known that the value of Rt = rt +,t where rt is the real interest rate, and the substitution of nominal interest rate [R] with r +, will change the money request model to:

$$\ln\frac{M_t}{P_t} = \alpha_0 + \alpha_1 \ln(y_t) + \alpha_2\ r_t + \alpha_2\ \pi_t + \mu_t$$

$$\ln\frac{M_t}{P_t} = \lambda + \alpha\ \pi_t + \mu_t \qquad (1.2)$$

where ,t = inflation expectations, $\lambda = \alpha_0 + \alpha_1 \ln(y_t) + \alpha_2\ r_t$ Suppose ln(Mt) = mt and ln(Pt) = pt so that the equation (1.2) changes to:

$$m_t - p_t = \lambda + \alpha\ \pi_t + \mu_t \qquad (1.3)$$

Cagan's model explains that inflation expectations are expectations of future price rate changes, namely: .

$\Delta p_{t+1} = p_{t+1} - p_t$ Cagan's inflation expectation model was the basis of Milton Friedman's work, and Friedman later referred to it as an adaptive expectation model, namely

$$\pi_t - \pi_{t-1} = \rho(\Delta p_t - \pi_{t-1}) \quad 0 \le \rho \le 1 \qquad (1.4)$$

Δp_t as a measure, the actual inflation rate may be smaller or more significant than the inflation expectation value of the previous period. If $\Delta p_t \prec \pi_{t-1}$ then the value, $\pi_t \prec \pi_{t-1}$ otherwise $\pi_t \succ \pi_{t-1}$. Equations (1.4) can be changed to:

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$$\pi_t = \rho\Delta p_t + (1-\rho)\pi_{t-1}$$
$$\pi_{t-1} = \rho\Delta p_{t-1} + (1-\rho)\pi_{t-2} \quad (1.5)$$
$$\pi_{t-2} = \rho\Delta p_{t-2} + (1-\rho)\pi_{t-3}$$

Equation substitutions (1.8B) to (1.8A) will generate the following money demand models:

$$m_t - p_t = \lambda + \alpha\left(\rho\Delta p_t + (1-\rho)\frac{m_{t-1} - p_{t-1} - \lambda - \mu_{t-1}}{\alpha}\right) + \mu_t$$
$$m_t - p_t = \lambda + \alpha\rho\,\Delta p_t + (1-\rho)m_{t-1} - (1-\rho)\,p_{t-1} - (1-\rho)\lambda - (1-\rho)\mu_{t-1} + \mu_t$$
$$m_t - p_t = \rho\,\lambda + \alpha\rho\,\Delta p_t + (1-\rho)[m_{t-1} - p_{t-1}] + \varepsilon_t \quad (1.9)$$

Where $\varepsilon_t = -(1-\rho)\mu_{t-1} + \mu_t$. Cagan models on equations (1.9) can be estimated by the O.L.S. method. If the estimation results in 0 ≤ρ≤ 1 1 and a α< 0 value of 0, then this fits the theory. Fluctuations in the amount [mt - pt] are indicated by the coefficient of determining the O.L.S. regression equation (1.9). If the coefficient value of determination [R2] is high, then there is an indication of high Inflation or fluctuations in demand for real money; on the contrary, if the coefficient of determination [R2] is low, then there is an indication of low Inflation or fluctuations in demand for real soft money.

3. RESEARCH METHODS

Data analysis uses a qualitative descriptive study. The A.R.D.L. panel model is used in predicting economic fundamentals in the face of the internal and external economic conditions of a country (Rusiadi et al., 2018). Distributed Lag (A.R.D.L.) Autoregressive Panel Pesaran et al. (2001). Data analysis techniques using Two-Stage Least Squares. The estimated results of the system equation with Two-Stage Least Squares are shown in the table below. From the table is known 2 (two) equations.

4. RESULTS AND DISCUSSION

Estimates to determine the effect of variables on two simultaneous equations were made using the Two-Stage Least Squares model. The estimated results of the system equation with Two-Stage Least Squares are shown in the table below. From the table known 2 (two) equations of simultaneous models:

LOG(PDB)=C(10)+C(11)*LOG(GOV)+C(12)*LOG(*TAX*)+C(13)*(INF) + ε_1

LOG(INF)=C(20)+C(21)*LOG(JUB)+C(22)*LOG(SB)+C(23)*LOG(BoP)+C(24)*LOG(PDB) + ε_1

System: NEWSIMULTAN
Estimation Method: Two-Stage Least Squares
Date: 01/25/20 Time: 11:02
Sample: 2000 2018
Included observations: 151
Total system (balanced) observations 302

	Coefficient	Std. Error	t-Statistic	Prob.
C(10)	1.062392	0.092917	11.43382	0.0000

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C(11)	0.997814	0.071313	13.99199	0.0000
C(12)	0.106219	0.069376	1.531051	0.1268
C(13)	0.010534	0.004461	2.361214	0.0189
C(20)	22.53809	4.089829	5.510765	0.0000
C(21)	-1.526865	0.172760	-8.838070	0.0000
C(22)	-0.150474	0.038779	-3.880321	0.0001
C(23)	-0.461712	0.238282	-1.937673	0.0536
C(24)	0.740253	0.138896	5.329554	0.0000
Determinant residual covariance		0.513613		

Equation: PDB=C(10)+C(11)*GOV+C(12)**TAX*+C(13)*INFLASI

Instruments: GOV *TAX* JUB SB BOP C

Observations: 151

R-squared	0.995249	Mean dependent var	9.793685
Adjusted R-squared	0.995152	S.D. dependent var	2.625422
S.E. of regression	0.182793	Sum squared resid	4.911732
Durbin-Watson stat	0.154160		

Equation: INFLASI=C(20)+C(21)*JUB+C(22)*SB+C(23)*BOP+C(24)*PDB

Instruments: GOV *TAX* JUB SB BOP C

Observations: 151

R-squared	0.435914	Mean dependent var	5.501987
Adjusted R-squared	0.420459	S.D. dependent var	5.652745
S.E. of regression	4.303298	Sum squared resid	2703.682
Durbin-Watson stat	0.869241		

Source: Output Eviews 2020

The first equation is an equation used to know simultaneously economic growth and Inflation with the following equations:

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LOG(PDB)=C(10)+C(11)*LOG(GOV)+C(12)*LOG(TAX)+C(13)*(INF) +

Based on the equation, the result of reviews output with two-stage least square model, as follows:

LOG(PDB)=1.062392+0.99*LOG(GOV)+0.10*LOG(TAX)+0.01*(INF)+

Based on the above estimates, it can show that R^2 = 0.995249, which is meaning that variable GOV, TAX, and Inflation can explain Inflation of 99.52% and the remaining 0.48% of G.D.P. is influenced by other variables beyond the estimates in the model.

Based on the estimated results obtained t-count value, there are 2 (two) variables that significantly affect G.D.P. growth, namely GOV and Inflation at alpha= 10 percent, GOV with a prob value of 0.000<0.10, Inflation with a prob value of 0.0189<0.10, so GOV and Inflation have a significant effect on G.D.P. variables. Based on the regression results, it is known that the regression coefficient for GOV positive 0.99 means that any increase in Investment of 1 percent, then G.D.P. will increase by 0.99 percent. Based on the regression results, it is known that the regression coefficient for tax positive 0.106 means that any increase in Investment of 1 percent, then G.D.P. will increase by 0.106 percent. Based on the regression results, it is known that the regression coefficient for positive inflation 0.010 means that any increase to Inflation of 1 percent, then G.D.P. will increase by 0.010 percent. The second equation is the equation used to know simultaneously against economic growth and Inflation with the following equations as follows:

LOG(INF)= 22,53-1,52*LOG(JUB)-0,15*LOG(SB)-0,46*LOG(BoP)+ 0,74*LOG(PDB) + ε_1

Based on the estimated t-count value, there are 4 (four) variables that are stated to significantly affect Inflation, namely J.U.B., S.B., BoP, and G.D.P. with a prob value of 10 percent alpha value. Where the prob value of J.U.B. is 0.0000<0.10 of the alpha value, the prob value of S.B. is 0.0001<0.10 of the alpha value, the BoP prob value is 0.0536<0.10 of the alpha value, and the prob value of G.D.P. is 0,000<0.10 of the alpha value. Covid-19 or Corona Virus is an essential topic in the global era today, especially in terms of the worldwide economy. China's economic growth is predicted to be shocked and decreased by 0.3%-0.6% as a result of COVID-19 spread to various national and international regions. China's economic slowdown, which has the effect of multiple countries, could cut international cooperation in a short period. Because cities in China, especially Wuhan, are the first cities exposed to Covid-19 and are identified as the transport hub of metropolitan business and finance can not conduct economic activity, which usually serves as a container for over 300 factories and 500 best companies in the world. The sectors affected by this pandemic are stocks, exchange rates, G.D.P., Inflation, Investment, exports, imports, tourists, unemployment; here are the related data:

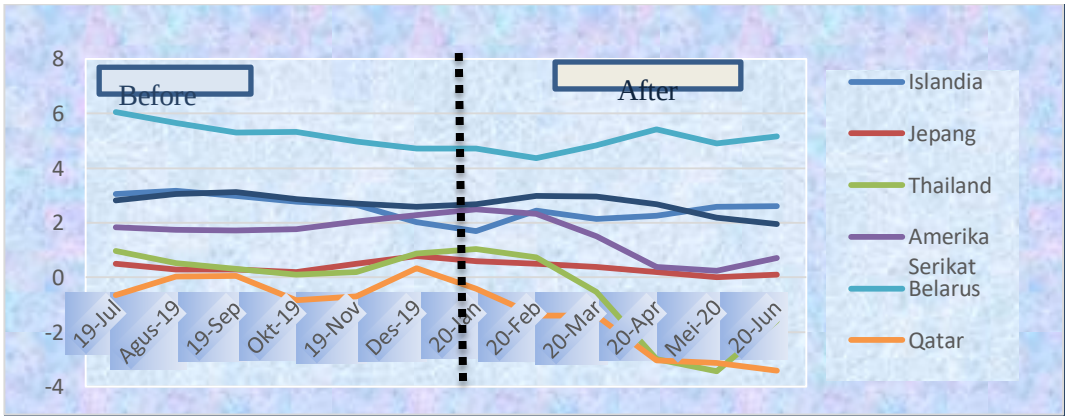

Figure 4. Inflation Of the country with the lowest unemployment rate in the world

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Based on the table and chart above can be seen that in the last 12 months before and after this COVID-19 period, Inflation experienced various fluctuations in each country. Thailand experienced a June 2020 increase of -1,574 from 0.875 in December 2019 before the Covid-19 Pandemic. Norway saw an increase of 1,821 from 1,385 the previous month. Inflation also increased in the United States by 2,483 from 2,292 last month. Indonesia also experienced taxation in January 2020 of 2,677 from 2,586 in December 2019. The increase in the country is due to the impact of COVID-19.

Inflation is a benchmark of the economy, especially in Indonesia. Therefore the Government should be able to control the inflation stability of variables – monetary variables that affect it, such as interest rates, amounts of money, and gross domestic product. And to maintain the inflation stability of economic policy that can be taken by the Government is monetary policy, so in this case, it is the function of Bank Indonesia as the central bank. Given that economic magnitude (M1) has a significant influence on the rate of Inflation, efforts that need to be made to control Inflation should pay attention to changes in monetary magnitude. Namely, with Discount Facility, Open Market Oprasi, and compulsory reserve of minimum, which is expected to depress the rate of Inflation (Adrian, 2005). For developing countries such as Indonesia, Inflation is a very worrying situation because the surge in national Inflation that is not balanced with the nominal income of the population will cause the income people to decrease both real income and per capita income. This will make Indonesia return to the poor, and this will lead to a heavier burden on life, especially the lower economic strata. Name Indonesia(B.I.) said coordination between the institutions is also necessary to anticipate the financial crisis in Indonesia. In the government sector in Indonesia has a significant role in the history of the economy. The role of the Government in the implementation of fiscal policy is to achieve the primary goal of achieving high economic growth, thereby reducing unemployment and controlling Inflation to stabilize both. And the Government optimizes that role by increasing spending (share) to Gross Domestic Income (G.D.P.) (Novi Darmayanti,2014).

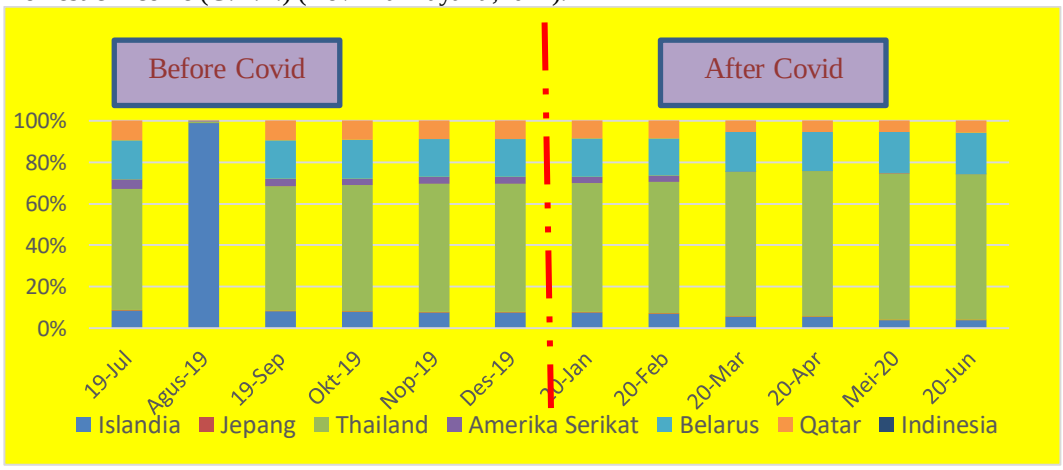

Figure 5: The Unemployment Rate of the country with the lowest unemployment rate in the world

Based on the Table and Chart of Reference Rates above, there are various fluctuations in the 12 months before and after COVID-19 in the country. Iceland saw a decline of 3,500 in February 2020 and continued to decline in June 2020 to 1,750. In 2014, Japan experienced a steady trend towards its benchmark interest rate of 0.100 for the 12 months before and after COVID-19. Thailand fluctuated in January after COVID-19 by 30,470 from 30,196. The United States saw an increase of 1,590 from 1,550 the previous month. Indonesia lowered its benchmark interest rate by 13,732,228 in January 2020 from 14,017,452 the last month before Covid-19. The rate cut in anticipation of the COVID-19 impact of Bank Indonesia Governor Perry Warjiyo said that monetary policy remains accommodative and consistent with controlled inflation forecasts within the target range, safe external stability, and as an are-emptive step to maintain domestic economic growth momentum amid restrained recovery prospects. Bank Indonesia (B.I.) again lowered its benchmark 7-Day Reverse Repo Rate by 25 basis points to 4 percent. This is the fourth time the benchmark interest rate has been reduced throughout

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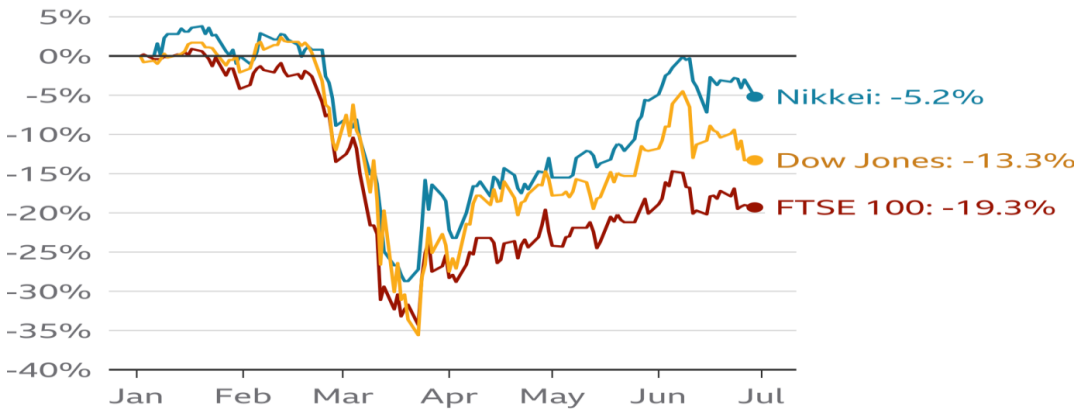
2020. Permata Bank economist Josua Pardede said the decline was in line with predictions. According to him, the decision takes into account the stability of the maintained economy. This is indicated by the stable rupiah exchange rate, the low expectation of the current account deficit, and low demand-side Inflation.

Stock exchanges around the world suffered historic losses in the first three months of 2020 due to the impact of the Covid-19 coronavirus. The Dow Jones Industrial Average stock index on Wall Street, United States, and FTSE exchanges on the London exchange suffered the most significant drop for the first quarter, the worst since 1987, correcting 23 percent and 25 percent, respectively. Similarly, the S&P 500 index (index of 500 large companies) in the U.S. fell 20 percent during the first quarter of 2020, the rushing since 2008. The sharp decline occurred when the exchange authorities temporarily suspended market activity to slow the spread of the Covid-19 virus.



Recent research from investment bank Morgan Stanley predicts Indonesia will experience negative growth for three consecutive quarters this year. In the second quarter, it was estimated at minus 5%. Then, the next quarter began to improve to minus 1.5%. Then in the fourth quarter of 2020, the growth was minus 0.5%. In a research titled Asian Economic Mid-Year Outlook, the overall economic development of the Republic of Indonesia throughout 2020 is minus 1%. His condition will improve or recover the following year, with the figure forecast at 5.8%. The new regular option keeps the USD/IDR symbolized Rupiah currently in the Fibonacci Retracement range of 61.8% in the field of Rp 14,730/US$ While it sees the stochastic indicator on the daily chart still at the level of oversold for a long time, the risk of rupiah correction is considerable if it moves again and is held above fib. Retracement 61.8%. Stochastic is the leading indicator or indicator that initiates price movements. When the Stochastic reaches oversold territory (above under 20), then the price of an instrument has a chance of turning up. In this case, USD/IDR has a chance of rising, which means the U.S. dollar has an opportunity to strengthen after the stochastic reaches oversold. If it returns above Rp 14,730/US$, the Rupiah risks weakening to Rp 14,830/US$.

5. CONCLUSION

The results prove that there is a change in the behavior of the cagan model, where inflation expectations can be detected from the value of money supply, G.D.P., interest rate, and Balance of Payment. The impact of Covid-19 changes the behavior of inflation expectations from buying behavior to waiting for action, this is based on the decrease in purchasing power and the decrease in foreign trade transactions of emerging market countries. Coronavirus or COVID-19 has a significant impact on the global and local sectors. The widespread of the Coronavirus (COVID-19) pandemic has become a negative sentiment affecting global financial markets. This caused foreign investors to exit the domestic financial markets, mainly in stocks and government securities (S.B.N.) due to high uncertainty. The world's Composite Stock Price Index has declined in recent months. Some sectors of

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stocks suffered sharp declines, such as aviation, due to the implementation of the lockdown. However, some stores have increased in the field of technology as well as health. Overall, stock prices on global stock exchanges plummeted. Efforts to prevent investment stability and share prices are carried out in various ways, such as by slashing interest rates and stock buybacks. The I.M.F. also provides series for low countries affected by COVID-19. New customary efforts have different impacts on different sectors in other countries. The aviation, Investment, and stock sectors increased compared to before the new regular option. However, the number of Covid-19 cases in the world continues to grow every day.

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