

Monetary Policy and Innovation During Recession in Indonesia

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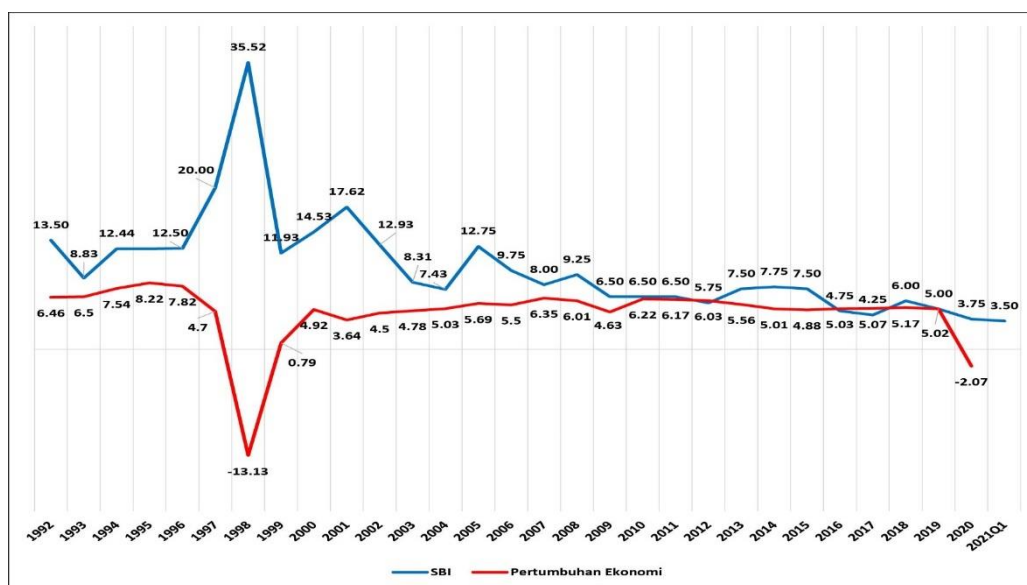
Article Info	Abstract
<p><i>Article history:</i> Received February 01, 2022 Revised March 01, 2022 Accepted April 9, 2022 Available online June 30, 2022</p> <p>Keywords: <i>Schumpeter Growth Model, BI Interest Rate, Innovation, Economic Growth</i></p> <p>JEL Classification: E4; O3.</p>	<p>The COVID-19 pandemic affected global economic growth, including Indonesia's economic recession for four quarters from Q2 2020 to Q1 2021. This study uses Schumpeter's growth theory to analyze the interest rate policies and innovations that encourage economic growth in Indonesia in the long term. This study uses a quantitative approach with the Auto Regressive Distributed Lag (ARDL) model with the variables of GDP, BI interest rates, consumption, innovation, and investment credit. The study results show that Bank Indonesia's accommodative interest rate policy with low-interest rates during the recession due to the Covid-19 pandemic positively influences economic growth. However, in the long-term, interest rates must compete with interest rates from other countries to encourage investment capital flows to Indonesia. The findings show that innovation has not yet affected economic growth in Indonesia, but economic growth fosters innovation to accelerate technology transfer from developed countries through foreign investment. Therefore, the support of the Government and Bank of Indonesia to provide incentives through tax breaks and low-interest rates to business actors developing R&D and innovation will encourage accelerating technology and innovation growth in Indonesia.</p>

INTRODUCTION

The COVID-19 pandemic impacted global economic growth, including Indonesia, which caused Indonesia's economic growth to reach minus 5.52%. This situation caused Indonesia to enter a period of economic recession. According to [Blanchard and Johnson \(2013\)](#), the policy mix between monetary policy and fiscal policy is an option to overcome the decline in economic growth due to decreased demand. Several studies have shown that monetary policy is more effective in overcoming the economic crisis and increasing economic growth ([Jannsen, Potjagailo, & Wolters, 2019](#); [Tanjung, Afifuddin, Daulay, & Ruslan, 2017](#)). Therefore, monetary policy was very influential during the 2008-2009 financial crisis because it could reduce its destructive effects, such as uncertainty, lack of trust, and declining asset values. Therefore, Bank Indonesia responded to the Covid-19 pandemic by lowering the BI interest rate to maintain Indonesia's economic growth. From February to

December 2020, Bank Indonesia decreased interest rates several times to reach 3.50%, the lowest BI interest rate for 28 years.

Figure 1. Economic Growth and BI Interest Rates 1992-2021 (Q1) (Source, BPS)

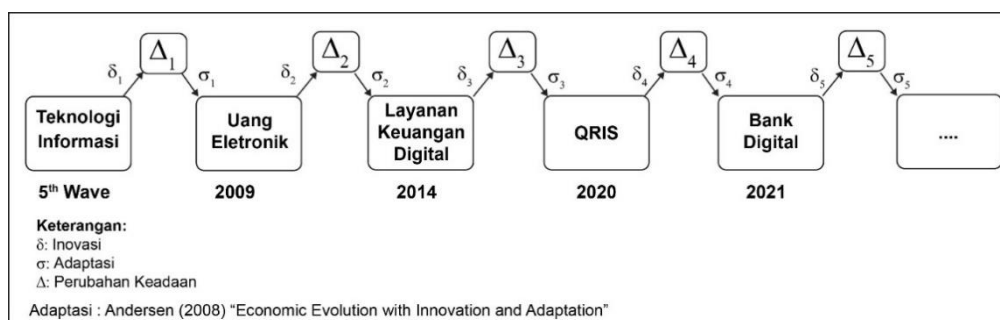


Malata & Pinshi (2020) found that conventional monetary policy is insufficient to overcome the crisis impacted by the COVID-19 pandemic. In the short term, monetary policy can indeed face a situation of uncertainty due to COVID-19. However, monetary authorities need to consider the long-term impact of the COVID-19 pandemic, which can potentially affect the long-term growth economy (Malata & Pinshi, 2020). Thus, the government must draw up a development plan to anticipate the impact of the COVID-19 pandemic on Indonesia's long-term economic growth and develop potential sectors to encourage long-term growth.

The role of monetary policy on long-term economic growth and welfare can be seen by Schumpeter's growth model using budget constraints on research & development activities and household consumption (Chu and Cozzi, 2014; Chu et al., 2015; Chu & Ji, 2016; Huang, Yang & Zheng, 2018; He, 2018; Chu, Ning, & Zhu, 2019). The study results show that nominal interest rates affect technological and economic growth. Schumpeter (1934) stated that the main element of development is innovation, a combination of new products, markets, methods/processes, sources of raw materials, and organizations. Several studies state that invention has an important influence on increasing economic growth (Pece, Simona, & Salisteanu, 2015; Maradana et al., 2017; Haq, 2018; Pala, 2019). However, these findings show that each country has a different relationship between innovation and economic growth. There is a two-way relationship between economic growth and innovation; economic growth affects innovation, and vice versa; innovation also affects economic growth. The invention has a positive and significant impact on economic growth (Pece, Simona, & Salisteanu, 2015).

The COVID-19 pandemic is also driving innovation. One of them is encouraging changes in economic transactions due to the policy of restricting mobility and working from home, which creates the emergence of a contactless or less-touch economy. The development of digital and information technology accelerates changing interactions and transactions to become a contactless economy. The results of advances in information and digital technology provide opportunities for digital innovation to create a financial system and payment system that is fast, easy, cheap, safe, and reliable, which will expand access, provide protection to consumers, and create healthy business practices. Therefore, Bank Indonesia and Otoritas Jasa Keuangan (OJK) made financial services and payments regulations in Indonesia to adapt to information technology and digital innovation development.

Figure 2 Development of the Financial System and Payment System in Indonesia (processed by the author)



For instance. Bank Indonesia makes regulations on *uang elektronik* (PBI No. 11/12/PBI/2009; PBI No. 16/8/PBI/2014; PBI No. 18/17/PBI/2016; PBI No. 20/6/PBI/2018), OJK makes regulations on *Layanan Keuangan Tanpa Kantor* (POJK No.19/POJK.03/2014), Bank Indonesia issues regulations on QRIS (PADG No 21/18/PADG/2019) and OJK issues regulations on digital banks (POJK No .12/POJK.03/2021 and POJK No.13/POJK.03/2021).

Although Bank Indonesia and Otoritas Jasa Keuangan (OJK) are trying to adapt to technological developments that are developing quickly to provide a fast, easy, cheap, safe, and reliable financial and payment system, thereby expanding public access to financial services and providing protection to consumers. However, this change was not immediately followed by business actors. A study conducted by BPS (2020) to determine the effect of the COVID-19 pandemic on business actors showed that 5.76 percent of companies that switched to using the internet and IT for marketing during the COVID-19 pandemic followed the steps of 47.75 percent of companies that had used the internet and IT for marketing via online before the COVID-19 pandemic emerged. In addition, 46.50 percent of business actors have not used the internet and IT for marketing. Therefore, a study is needed to see the effect of innovation on Indonesia's economic growth in the long term.

In addition, the Central Bank, as the monetary authority, will implement an expansionary monetary policy by increasing the money supply and lowering interest rates in conditions of declining economic growth and

recession. This is in line with [Semuel & Nurina \(2015\)](#) and [Harswari & Hamza \(2017\)](#), which state that interest rates significantly negatively affect the gross domestic product. This result is different from the findings of [Araujo \(2017\)](#), which say that interest rates have a positive and insignificant impact on gross domestic product. This finding shows differences in the effects of the monetary authority's interest rate policy on economic growth, so studying its impact on long-term economic growth is fascinating. Based on this description of the problem, this study analyses interest rate policies and innovations that encourage economic development in Indonesia in the long term.

RESEARCH METHODS

This study uses an open economy model policy model with the following equation (Visser, 2004):

$$Y = Z(Y, i, T) + G + Ex(e) - Im(Y, e) \dots\dots\dots(1)$$

Y = National income; Z = private expenditure (consumption and investment); i = interest rate; T = taxes; G = government expenditure; Ex = receipts on the current account of the balance of payments, e = rate of exchange; Im = payments on the current account of the balance of payments

Based on the assumption of a circular flow of Schumpeter's theory of development and focusing on changes in interest rates (monetary policy) so that it is assumed that fiscal (tax) policy is ceteris paribus, equation (1) can be written as:

$$Y = Z(Y, i) \dots\dots\dots(2)$$

Equation (2) can be formulated as

$$GDP = Consumption + Investment + Interest Rate \dots\dots\dots(3)$$

Referring to the Schumpeter Model ([Aghion and Howitt, 2009](#)) with the assumption that (i) economic growth is generated by innovation; (ii) innovation results from entrepreneurial investment, and (iii) innovation replaces old technology, equation (3) can be written as:

$$GDP = Consumption + Innovation + Interest Rate \dots\dots\dots(4)$$

[Aghion and Howitt \(1992\)](#) developed an endogenous growth model by referring to the Schumpeter model in the context of creative destruction. This model is the innovation variable from Research & Development (R & R&D), protected by patent law. Furthermore, in Schumpeter's development theory, it is stated that entrepreneurs innovate through loan capital from banks, so equation (4) can be written as

$$GDP = Consumption + Innovation + Interest Rate + Credit \dots\dots\dots(5)$$

The interest rate, innovation, consumption, and investment credit will affect economic growth based on this equation. This study uses a time series of secondary data from 2010 to 2021 (Quarter 1) with GDP as an endogenous variable and BI interest rates, consumption, innovation, and investment credit as exogenous variables. The data used is quarterly in natural logarithms, except

for interest rates. This study uses a quantitative approach with the Auto Regressive Distributed Lag (ARDL) model with the ARDL model equation used as follows:

$$\begin{aligned} \Delta PDB_t = & \beta_0 + \beta_1 SBI_{t-1} + \beta_2 INOVASI_{t-1} + \beta_3 KONSUMSI_{t-1} + \beta_3 KREDITINVESTASI_{t-1} \\ & + \sum_{i=1}^p \delta_{1i} \Delta PDB_{t-1} + \sum_{i=0}^q \delta_{2i} \Delta SBI_{t-1} + \sum_{j=0}^q \delta_{3j} \Delta INOVASI_{t-1} \\ & + \sum_{j=0}^q \delta_{3j} \Delta KONSUMSI_{t-1} + \sum_{j=0}^q \delta_{4j} \Delta KREDITINVESTASI_{t-1} + Dummy + \mu_t \end{aligned}$$

PDB: Gross Domestic Product (GDP) in a quarter; SBI: Bank Indonesia interest rate in quarter t; Innovation: PMTB intellectual property product in quarter t; Consumption: Household spending in quarter t; Investment Loans: Total investment loans granted by banks in quarter t; Dummy: recession period (1) and non-recession period (0); μ : Disturbance error (white noise)

The analysis begins with a stationary test using the Augmented Dickey-Fuller (ADF) method. Then, determine the optimal lag length based on the Akaike Info Criterion (AIC). Next, do bounds testing for the existence of a long-term relationship between variables by comparing the F-statistic value obtained with the critical message,

Furthermore, stability testing was carried out using CUSUM and CUSUMQ (Pesaran, Shin, & Smith, 2001). Then the normality, autocorrelation, and heteroscedasticity tests were carried out to ensure that the resulting coefficients met the criteria for classical regression assumptions (Gujarati, 2007).

RESULT AND DISCUSSION

Stationary Test

The stationarity test uses the Augmented Dickey-Fuller (ADF) test, whose results indicate that only the investment credit variable is stationary because the prob value is smaller than 0.05, while the other variables (GDP, SBI, innovation, and consumption) are not stationary at the Level. Furthermore, testing on the 1st difference shows that all data are stationary because the prob value is less than 0.05. These results indicate that the data meet the requirements for estimation using the ARDL method.

Table 1 Stationary Test

Variables	Level		1st difference	
	ADF Test	Prob	ADF Test	Prob
LOG_PDB	-1,448	0,550	-9,367	0,000*
SBI	-1,135	0,693	-4,443	0,001*
LOG_INOVASI	-1,898	0,330	-7,469	0,000*
LOG_KONSUMSI	-1,319	0,613	-6,691	0,000*
LOG_KREDITINVESTASI	-5,439	0,000*		

ADF Critical Value (5%): -2,933

*) stationary

Lag Length and Optimal Lag Length

The lag length test for the ARDL model shows that the optimal lag length for lag three is based on the AIC and SIC criteria:

Table 2. Lag Length Optimal Test Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-69,32	NA	2,37e-05	3,54	3,75	3,61
1	371,91	756,41	5,90e-14	-16,28	-15,04	-15,83
2	420,48	71,71	2,02e-14	-17,40	-15,13	-16,57
3	467,74	58,51*	8,07e-15*	-18,46*	-15,15*	-17,25*

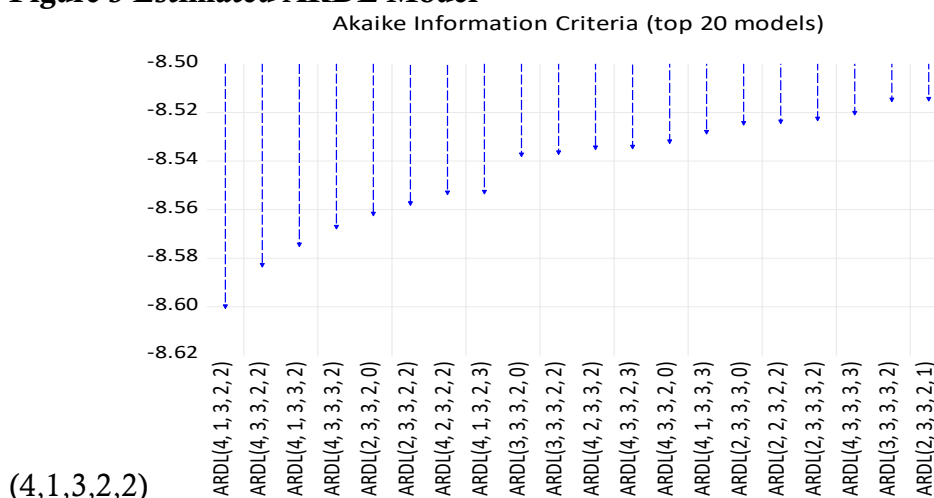
Note:

LR: Likelihood Ratio; FPE: Final prediction error; AIC: Akaike Information Criterion; SC: Schwarz Information Criterion; HQ: Hannan-Quinn Information Criterion

*) Optimal Lag Length

However, after the ARDL model was estimated using lag three and tested for stability, the model was unstable, so the model estimation used lag 4. Then, the determination and selection of the best ARDL model used the optimal combination of lag four based on the Akaike Criteria Info (AIC). The results obtained for the best ARDL model are ARDL.

Figure 3 Estimated ARDL Model



Furthermore, the determination and selection of the best ARDL model use the optimal lag combination (lag 4) based on the Akaike Info Criterion (AIC). Figure 3 shows twenty estimation models according to the Akaike Info Criterion (AIC) criteria, maximum lag length. Thus, the model (4,1,3,2,2) is the maximum based on the smallest Akaike Info Criterion (AIC) value, which is -8.60.

Bounds testing

Bounds testing aims to determine a long-run association in the ARDL model (4,1,3,2,2) by comparing the F-statistic value obtained with the Pesaran critical. Accordingly, the test results show an F-statistic of 39.02, more significant than all available critical values (1%, 5%, and 10%). As a result, the

null hypothesis states that no long-run association is rejected. Thus, the finding shows that GDP, SBI, innovation, consumption, and investment credit move together in the long term.

Table 3. Cointegration/Bound Testing

Variabel	F-Statistik	Information
PDB		
SBI		
INOVASI	39,02	There is a long-term relationship
KONSUMSI		
KREDITINVESTASI		
Critical Value Bounds (Significance)	I(0)	I(1)
10%	2,45	3,52
5%	2,86	4,01
2,50%	3,25	4,49
1%	3,74	5,06

Long Run Equation

Estimating the long-term equation for the ARDL(4,1,3,2,2) model shows that SBI, innovation, consumption, and investment credit statistically affect economic growth.

Table 4 Estimation of the Long-Term Equation

Dependent Variabel: : D(LOG_PDB)					
Variable	Coefficient	Std. Error	t-Statistic	Prob.	
SBI	0,001	0,000	2,303	0,031	
LOG_INOVASI	-0,026	0,007	-3,554	0,002	
LOG_KONSUMSI	0,998	0,011	87,512	0,000	
LOG_KREDITINVESTASI	0,015	0,005	2,816	0,010	
EC = LOG_PDB - (0,001*SBI -0,026*LOG_INOVASI + 0,998 *LOG_KONSUMSI + 0,015*LOG_KREDITINVESTASI)					

Consumption has the most significant coefficient value of 0.998. These results indicate that consumption is the dominant factor influencing economic growth. Consequently, the increase in consumption by 1 percent increased economic growth by 0.99 percent. Meanwhile, SBI has a positive effect with a coefficient of 0.001, which means an increase in SBI by 1 percent will increase economic growth by 0.001 percent. Furthermore, innovation has a negative effect with a coefficient of 0.026, which means an increase in the invention of 1 percent will reduce economic growth by 0.026 percent. Meanwhile, investment credit has a positive effect with a coefficient of 0.015, implying an increase in investment credit by 1 percent will increase economic growth by 0.015 percent.

Short Run Equation

Estimating the short-term equation for the ARDL model (4,1,3,2,2) shows a relationship between variables in the short term by looking at the value of ECT or CointEq, which is harmful and significant at the 5% level. The CointEq (-1) value is -1.793, and the prob is less than 0.05, which means a short-term cointegration in this model. Furthermore, the negative coefficient sign explains a correction mechanism for long-term balance deviations at a rate of 179.3 percent per period (quarterly).

Table 5 Estimation of the Short-Term Equation

Dependent Variabel: D(LOG_PDB)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1,218	0,080	15,254	0,000
D(LOG_PDB(-1))	0,658	0,079	8,323	0,000
D(LOG_PDB(-2))	-0,088	0,030	-2,893	0,008
D(LOG_PDB(-3))	-0,090	0,032	-2,795	0,010
D(SBI)	0,006	0,001	4,929	0,000
D(LOG_INOVASI)	-0,006	0,005	-1,242	0,227
D(LOG_INOVASI(-1))	0,030	0,004	7,219	0,000
D(LOG_INOVASI(-2))	0,019	0,004	4,383	0,000
D(LOG_KONSUMSI)	0,998	0,029	34,516	0,000
D(LOG_KONSUMSI(-1))	-0,609	0,071	-8,526	0,000
D(LOG_KREDITINVESTASI)	-0,022	0,017	-1,277	0,214
D(LOG_KREDITINVESTASI(-1))	-0,067	0,016	-4,136	0,000
DUMMY	0,002	0,002	0,987	0,334
CointEq(-1)*	-1,793	0,118	-15,134	0,000

The results show that changes in consumption have the most significant coefficient value, meaning that consumption considerably influences changes in economic growth. Changes in consumption significantly positively affect the same period with 0.998. On the other hand, changes in consumption in the first lag with a value of 0.609 have a significant negative impact on changes in economic growth. These results indicate that an increase in changes in consumption by 1 percent will increase economic growth by 0.998 percent in the same period and reduce differences in economic growth by 0.609 percent in the following quarter. Meanwhile, changes in BI interest rates had a positive impact in the same period with a coefficient of 0.006. These results indicate that shifting BI's interest rate by 1 percent will increase the current 0.006 percent economic growth.

Furthermore, the change in innovation has no significant adverse effect in the same period, with a coefficient value of 0.006. On the other hand, changes in creation in the first lag and second lag have a significant positive effect on changes in economic growth with coefficient values of 0.03 and 0.01, respectively. These results indicate that an increase in the innovation shift by 1 percent will reduce economic growth by 0.006 percent in the same period and

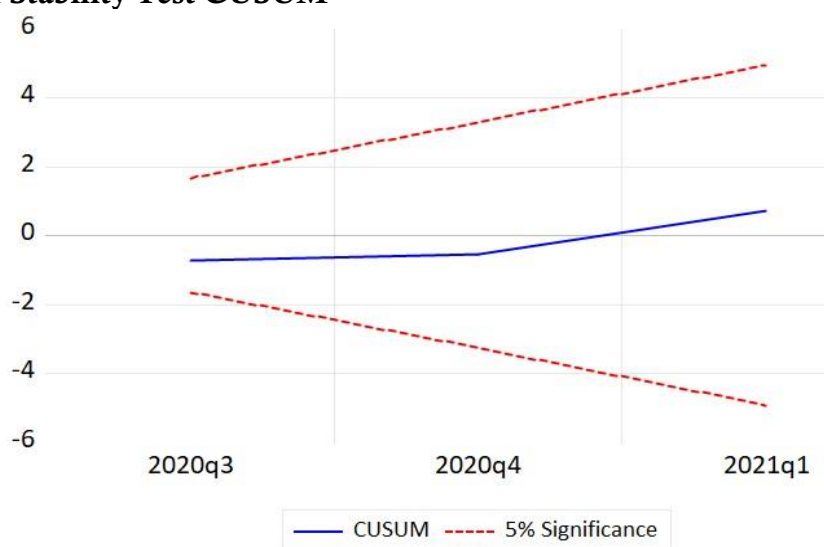
increase economic growth by 0.03 percent in the next quarter and 0.01 percent in the following six months. (two quarterly periods).

Meanwhile, changes in investment credit have no significant adverse effect in the same period with a coefficient value of 0.022. On the other hand, the shift in investment credit in the first lag has a coefficient of 0.067. These results indicate that an increase in investment credit shift by 1 percent will reduce economic growth by 0.022 percent in the same period and increase economic growth by 0.067 percent in the following quarter. The result of the Dummy with a positive coefficient of 0.002 is not significant, indicating that the recession period has a positive effect on changes in economic growth. These results suggest that the recession in this period will encourage economic growth.

Robustness check

Robustness checks on the ARDL model (4,1,3,2,2) using the CUSUM and CUSUMQ stability tests (Pesaran, Shin, & Smith, 2001) and the classical regression assumption test (Gujarati, 2007). CUSUM (cumulative sum of recursive residuals) with a 95% confidence level by looking at the estimation model line at a critical value of 5 percent or not outside the upper and lower limit lines. The estimate is stable if the cable is between the lower and upper limit lines. The forecast is unstable if the CUSUM line goes out of the upper and lower limits.

Figure 4 Stability Test CUSUM

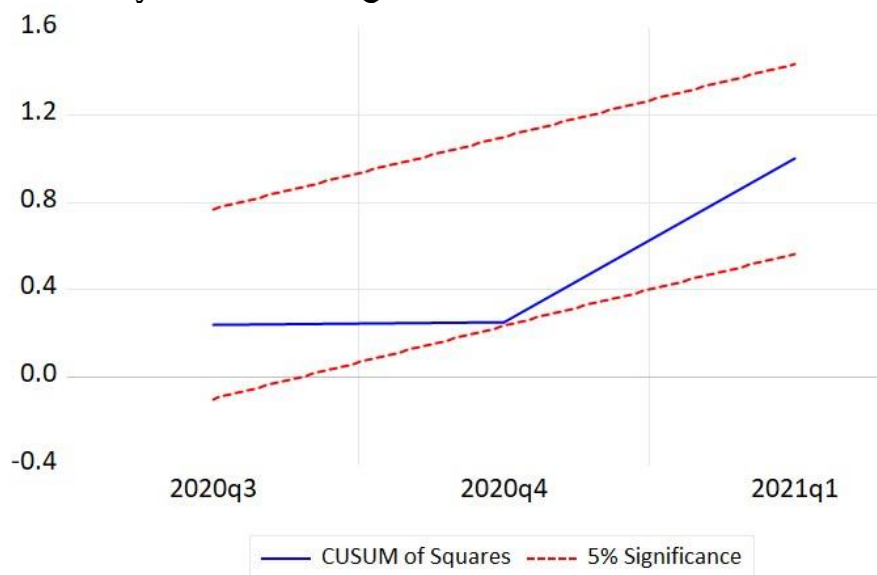


The ARDL model test results (4,1,3,2,2) show that the CUSUM line is between the upper and lower limits of the critical value of 5 percent (figure 4.6), so the model estimate is considered stable.

The next step is to perform the CUSUMQ (cumulative sum of squares of recursive residuals) test with a 95% confidence level to ensure that the model is genuinely stable. The CUSUMQ test criteria, namely: (1) if the CUSUMQ line is at a critical value of 5 percent or does not fall outside the upper and lower limits, then the estimate is considered stable, and (2) if the CUSUMQ line is outside the upper and lower limits, then the estimate is considered unstable.

The ARDL model test results (4,1,3,2,2) show that the CUSUMQ line is between the upper and lower limits of the critical value of 5 percent, so the estimated model is considered stable.

Figure 5 Stability Test CUSUMQ



The results of the CUSUM and CUSUMQ tests show that the ARDL model estimation model (4,1,3,2,2) is stable. The estimation results can be used to interpret the relationship between SBI, innovation, consumption, investment credit, and economic growth. Furthermore, the classical assumption test was carried out to ensure that the resulting coefficients met the BLUE (best linear unbiased estimator) characteristics by testing for normality, autocorrelation, and heteroscedasticity.

Table 6 Summary of Classical Assumption Test

Test	Value Prob	Note
Normality Test	0,504	Support
Autocorrelation Test	0,062	Support
Heteroscedasticity Test	0,453	Support

The test results show that the ARDL model (4,1,3,2,2) meets the classical assumption criteria. The coefficients explain the relationship between SBI, innovation, consumption, investment credit, and economic growth.

CONCLUSION

This finding shows that Bank Indonesia's accommodative interest rate policy with low-interest rates during the recession due to the Covid-19 pandemic positively influences economic growth. This is in line with the findings of Juoro (2014), which states that a decrease in the BI rate causes a reduction in loan interest rates and increases economic growth. However, Bank Indonesia should raise interest rates to attract investment capital flows to Indonesia long-term. These findings show that BI's interest rate policy follows the Solow economic growth model, which states that savings and investment

are the main components of economic growth. An increase in savings and investment will increase the capital stock, which will increase national income. This finding is in line with the results of Araujo (2017), which concludes that interest rates positively affect Gross Domestic Product following the Solow-Swan model, which states that interest rates positively correlate with economic growth interest rates affect savings and investment.

Furthermore, these results indicate that innovation can increase economic growth in the short term during a recession. However, it can negatively affect economic growth for a long time. This finding follows Schumpeter's theory of economic development, which reveals that development results from innovation and creative destruction. Schumpeter's economic development theory emphasizes that invention has a dual nature: innovation can make business actors gain monopoly profits through new products, processes, and methods (temporary). At the same time, the invention has a disruptive effect (disruption) on the old business actor (incumbent) so that they experience losses because the product is outdated and replaced by the latest product (unable to make product changes). Moreover, these results align with Bialbao-Osorio & Rodriguez-Pose (2004) and Petrariu et al. (2013), which state that innovation harms economic growth. Innovation negatively affects economic growth due to the catch-up process from developed countries to developing countries' neoclassical theory (Bialbao-Osorio & Rodriguez-Pose, 2004; Petrariu et al. (2013).

This finding shows that innovation has not yet affected economic growth in Indonesia as in developed countries. However, economic growth encourages innovation to accelerate technology transfer from developed countries through foreign investment. In addition, the support from the Government and Bank of Indonesia to provide incentives through tax breaks and low-interest rates to business actors developing R&D and innovation will encourage accelerating technology and innovation growth in Indonesia.

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