

The Impact of Monetary Policy on the Industry Sector in Indonesia

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Abstract

Several studies show that there is a relationship between monetary policy and industrial sector output. The main objective of this research is to analyze the impact of monetary policy on the industrial sector. The appropriate model for time series data that is not stationary is the Vector Error Correction Model (VECM). This study involved quarterly data during 2010 to 2019 from Central Bank of Indonesia (BI) and Statistics Indonesia (BPS). The empirical results indicate that the industrial sector has a positive response to the shock of the BI interest rate variable. On the other hand, the industrial sector gave a negative response to shocks from the consumer price index variable and the BI interest rate. The results of the variance decomposition show that the largest percentage contribution is shown by the inflation variable as measured by the Consumer Price Index (CPI) and Foreign Direct Investment (FDI).

Keywords: BI rate, Monetary policy, Industry sector, VECM
JEL Classification E52, E58

INTRODUCTION

Historically, in every economic crisis, the central bank has become an institution that plays a crucial role in stabilizing crisis handling and economic rescue through monetary policy instruments. Since two decades before the 2008/2009 global crisis, the credibility of monetary policy in various countries has contributed to reducing inflation and stimulating economic growth (Taylor, 2014). Many issues concerning the interactions between banking and monetary policy forced policymakers to redefine economic policies and motivated macroeconomists to focus on the implications of financial intermediation constraints for asset price fluctuations, the behavior of non-financial firms, households, governments, and in turn for real macroeconomic performance (Beck et al., 2014). Based on Law No. 23 of 1999 implicitly, Bank Indonesia in 2000 implemented an inflation-targeting framework (ITF). Following this law, the objective of Bank Indonesia is to achieve rupiah stability in terms of price stability (inflation) and stability of the rupiah exchange rate.

Tkalec and Vizek (2009) analyzed the impact of macroeconomics policies on manufacturing production in Croatia. The results suggest that changes in fiscal conditions, the real effective exchange rate, and personal consumption primarily affect low technological intensity industries. Production in high technological

intensity industries is, in general, elastic to changes in investments, foreign demand, and fiscal policy. Then, how is research in monetary policy to the industrial sector? Several previous studies discussing the impact of monetary policy on output, both in Indonesia and other countries, including Maryatmo (2004), showed that budget deficit through the government revenue mechanism affects the interest rate in the short and long run. In the short run, a budget deficit would affect the exchange rate and price level through the government expenditure mechanism. In the long run, however, causality tests show that the exchange rate and price level would, in turn, affect the budget deficit.

Leitemo (2004) investigated the nexus between interest-rate and exchange-rate dynamics. These two variables are studied in a game between the monetary and fiscal policymakers where the monetary policymaker targets inflation. In the Nash game, a conflict over the appropriate size of the output gap leads to excessive interest rate and exchange-rate volatility. For this reason, there are benefits to restricting fiscal policymaking. Suppose the fiscal policymaker is considered to have a first-mover advantage. In that case, the fiscal policymaker will internalize its effect on monetary policy, and the conflict is resolved, and interest-rate and exchange-rate volatility are reduced. Al Arif and Tohari (2006) stated that the global variables do have impacts on the domestic variables fluctuation, implying the fragility of the domestic economy due to the external shock, and the monetary policy is effective in supporting the economic growth and stabilizing the price level. However, the Bank Indonesia policy to stabilize the international shock via the exchange rate channel contributes to a higher impact of the international shock on the domestic interest rate. Moreno (2008) showed that in many emerging market economies (EMEs), the effect of monetary policy interest rates is generally more robust and has a longer impact on deposit and credit rates when compared to bond yields. Another research related to monetary policy is the research of Setiawan (2009), which examined the impact of monetary policy on inflation and economic growth in Indonesia. The result of that research states that the interest rate, the money supply, and the rupiah exchange rate against the USD are proven to influence economic growth significantly.

Karim (2012) found that the monetary policy transmission mechanism works through interest rate and broad credit channels in influencing firms' investment spending in the Malaysian economy. Monetary policy has heterogeneous effects in respect of sub-sectors of the economy. In the long term, the firm's investment in the consumer products and services sectors is significantly affected by the interest rate and broad credit channels. However, the firm's investment in industrial products and property sectors has only been significantly affected by interest rates and broad credit channels. Research on the impact of monetary policy is sometimes combined with an analysis of the impact of fiscal policy. When analyzing the formation of ROA performance through variable performance between Loan to Deposit Ratio (LDR) and Net Interest Margin (NIM), it appears that both provide positive support so that if the indirect relationship of SBI monetary policy plays a more decisive role in the future, the performance impact will be negative. SBI can be reduced through the mediating role of LDR and NIM. Bank Indonesia's policy to increase the SBI as an instrument is not in line with the interests of growing and strengthening regional banking businesses. These things may be different from the national private banks, which have business

networks throughout Indonesia with a much larger capital position and resources support. Yunanto and Medyawati (2014) stated that Indonesia's monetary policy is more effective than fiscal policy.

According to Yunanto (2013), fiscal, monetary, trade, and industrial policies cannot stand alone in achieving the final goal. Policies without paying attention to policies in other sectors will not be optimal and may have a negative impact on the economy as a whole. A fiscal policy that is too expansive can lead to inflation, as well as a fiscal policy that is too tight, such as an increase in high tax rates in society, can reduce consumption or reduce the allocation of productive funds to suppress economic growth. Yang et al. (2015) found that in China, looser monetary policy results in more remarkable strategic change than the tighter one for the high adjustment cost. External capital dependence and industrial competition intensity strengthen the positive correlation between monetary policy conditions and strategic change. Private firms are more susceptible to money supply changes than state-owned enterprises. Companies tend to expand investment on a fixed asset but to shrink investment on research and development, and trademark in looser money supply conditions. Ichwani et al. (2018) remarked that fluctuating prices generally caused an increase in inflation during 2012 - 2016 in almost all industrial sectors and fuel prices. Bank Indonesia implemented a monetary policy in 2012-2016 to control inflation. This can be seen from the inflation rate movement, which tends to decrease from year to year. The value of the Rupiah exchange rate began to improve at the end of 2016. The monetary policy adopted by Bank Indonesia was sufficient to provide positive sentiment so that the value of the Rupiah continued to strengthen and be stable.

Aji (2020) revealed that the SBI interest rate and money supply significantly affect manufacturing GDP. While Bhat et al. (2020) provided two policy simulations scenario from the estimated model, they highlight the differential impact of monetary policy. The first one hikes the policy rate by 5%, and the second reduces bank credit to the commercial sector by 10%. The first policy simulation experiment results reveal that interest hike has a significant negative impact on aggregate demand, aggregate supply, and general price level. However, the maximum impact is borne by investment demand and imports, followed by private consumption. While among the components of aggregate supply, maximum impact is born by infrastructure output followed by the manufacturing and services sector, with the agriculture sector being insensitive. The second policy simulation experiment results revealed that pure monetary shocks have a significant negative impact on aggregate demand, aggregate supply, and general price level. However, the maximum impact is born by private consumption and imports, followed by investment demand. While as among components of aggregate supply, maximum impact is borne by infrastructure followed by the manufacturing and services sector, with the agriculture sector found to be insensitive.

From both policy simulation experiments, the study highlighted the relative importance of the income absorption approach instead of the expenditure switching effect. Ahmad and Rangaraju (2020) indicated that industries exhibit differential responses to an unanticipated monetary policy tightening. In general, manufacturing industries appear to be more sensitive than mining, and utility industries and durable manufacturing industries are more sensitive than those within nondurable and other manufacturing industries to a monetary policy shock.

While all industries respond to the policy shock, most of the responses are reversed between 12 and 22 months. Hudiyanto (2020) noted that the BI interest rate impacts the Indonesian economy. The central bank's interbank money market interest rates as operational targets have played a good role in transmitting monetary policy instruments to interest and credit rates.

This study enhances the previous study by Novitalia (2015) by providing a more extended research period that makes the analysis can be more in-depth. Additionally, revisiting this issue is reasonable since the vast study and the findings are different. Therefore, the purpose of this research is to analyze the impact of monetary policy on the industrial sector. The variables studied were the Bank Indonesia interest rate, foreign direct investment, the rupiah exchange rate against the US dollar, the consumer price index (CPI), and the GDP of the industrial sector. The contribution of this research is empirical findings in the development of a model to analyze the impact of monetary policy on the industrial sector, as well as the contribution of economic policy recommendations to the economy.

METHOD

This study involved time series data for the period 2010: 1 to 2019: 4, quarterly data based on constant values with the base year 2005, except for data in the form of index values. Data sources are Economic and Financial Statistics (SEKI) published by Bank Indonesia (BI), and data from Statistics Indonesia (BPS). The variables adopted from Novitalia (2015) for foreign direct investment, the Consumer Price Index (CPI), the rupiah exchange rate against the US dollar (exchange rate), the SBI interest and the GDP industrial sector. The complete operationalization of the variables can be seen in Table 1.

Table 1. Research Variables

No.	Variables	Description
1.	Exchange rate	The exchange rate rupiah against US Dollar
2.	PDBINDUS	Industrial sector Gross Domestic Product
3.	Foreign Direct Investment (FDI)	Foreign investment
4.	IHK	Consumer price index
5.	BIRATE	BI interest rate

The stages of data testing include data stationarity test, Johansen cointegration test, Granger causality test, VECM estimation, Impulse Response Function analysis and Variance Decomposition. The results of data testing are described in the results section and the following discussion.

RESULTS AND DISCUSSION

The initial step of data processing is to test the stationarity of the data, namely, testing all research variables. When the data being tested are not entirely stationary, then the next test that can be done is the cointegration test to see whether there is a long-term relationship (Widarjono, 2007). The stationarity test was carried out using the unit root test through the Augmented Dickey-Fuller (ADF) test. The data that has been tested show the results that the data is not stationary at the level, so the following process is that data differentiation is carried out so that all data is stationary at the same stage. The following are the results of the data

stationarity test as shown in Table 2 and the results of the Johansen cointegration test as shown in Table 3.

Table 2. Data Stationarity Test Result

Variable/Unit Root Test		Critical value			ADF-Test Statistic
		1%	5%	10%	
FDI	Level	-3.51553	-2.89862	-2.58660	1.163182
D(FDI)	First Difference				-8.74294
EXCHANGE	Level	-3.51553	-2.89862	-2.58660	-0.69959
D(EXCHANGE)	First Difference				-8.36279
BIRATE	Level	-3.51667	-2.89911	-2.58686	-2.39834
D(BIRATE)	First Difference				-4.04403
IHK	Level	-3.51553	-2.89187	-2.58660	-1.88005
D(IHK)	First Difference				-8.72075
PDBINDUS	Level	-3.51553	-2.89288	-2.58660	0.50324
D(PDBINDUS)	First Difference				-8.82100

Table 2 presents the results of the data stationarity test showing that all data have been stationary after being differentiated in the first order I (1). This indicates that the analysis can be done with a Vector Error Correction Model (VECM). The next step is to test whether there is cointegration between variables in the study.

Table 3. Johansen Cointegration Test Result

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized	Trace		0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.470729	131.8578	69.81889	0.0000
At most 1 *	0.281730	83.50240	47.85613	0.0000
At most 2	0.257552	58.35322	29.79707	0.0000
At most 3	0.239825	35.72026	15.49471	0.0000
At most 4	0.177821	14.88055	3.841466	0.0001

Table 3 informs the results of the Johansen cointegration test (Trace Test). The Johansen cointegration test was carried out using lag = 8, according to the results of the LR value on the lag order selection criteria. The maximum lag obtained from this study is 11, or it can be interpreted as 11 quarters, while the optimum lag obtained is based on the most considerable LR value, namely 39.490, which occurs in the eighth quarter or is equal to 24 months (one year). The use of this residual lag length in each VAR equation is free from normality and autocorrelation problems. The Trace Test and Maximum Eigen Value results show that there are five cointegrating equations.

Causality Test

The behavior of economic variables does not only have a one-way relationship but shows a two-way relationship, known as the concept of causality (Widarjono, 2007). The following is the F-statistic value and probability from the causality test, which is presented in Table 4.

Table 4. Causality Test Result

No.	Causality	Obs	F-Stat	Prob
1.	DFDI does not Granger Cause DBIRATE	71	0.80387	0.6019
	DBIRATE does not Granger Cause DFDI		0.18717	0.9917
2.	DEXCH does not Granger Cause DBIRATE	71	0.82478	0.5845
	DBIRATE does not Granger Cause DEXCH		3.40422	0.0124
3.	DEXCH does not Granger Cause DBIRATE	71	0.82478	0.5845
	DBIRATE does not Granger Cause DEXCH		1.17195	0.3329
4.	DPDBINDUSTRI does not Granger Cause DBIRATE	71	0.36997	0.9319
	DBIRATE does not Granger Cause DPDBINDUSTRI		0.31822	0.9557
	DEXCH does not Granger Cause DFDI		0.88844	0.5324
5.	DFDI does not Granger Cause DEXCH	71	1.07044	0.3974
	DIHK does not Granger Cause DFDI		2.54974	0.0196
6.	DFDI does not Granger Cause DIHK	71	0.26290	0.9751
	DPDBINDUSTRI does not Granger Cause DFDI		1.24665	0.2908
7.	DFDI does not Granger Cause DPDBINDUSTRI	71	0.98980	0.4544
	DIHK does not Granger Cause DEXCH		1.13035	0.3584
8.	DEXCH does not Granger Cause DIHK	71	1.52370	0.1708
	DPDBINDUSTRI does not Granger Cause DEXCH		1.05738	0.4063
	DEXCH does not Granger Cause DPDBINDUSTRI		1.18774	0.3237
9.	DPDBINDUSTRI does not Granger Cause DIHK	71	2.77238	0.0121
	DIHK does not Granger Cause DPDBINDUSTRI		0.17517	0.9934

The causality test results in Table 4 show that the variables have one-way causality, namely the BI interest rate variable and the exchange rate. The next stage is model estimation using VECM. The following analysis uses two properties of VAR, namely impulse response function (IRF) and variance decomposition. The IRF of the estimated model confirms the dynamic response of all variables to the shock of one standard deviation on the variables in the system. The following is the response of the industrial sector to the shock of the foreign direct investment variable, the rupiah exchange rate against the US dollar, the CPI and BI interest rates.

Shock in FDI, as seen in Figure 1, caused a negative response from the industrial sector, namely that the graph saw a sharp decline until the second quarter. In the third quarter, the industrial sector was able to rise as indicated by an increasing line, however, in the fourth quarter, there was a slight decline again. A different response is shown when the shock occurs due to inflation (CPI). The industrial sector responded negatively to the point where it fell below zero. The shock to the BI interest rate variable resulted in a slight increase in the second quarter of the industrial sector. However, in the middle of the third quarter towards the fourth quarter, the industrial sector experienced a decline to almost zero. In the fourth and fifth quarters, a positive response was shown by the industrial sector, and subsequently, there were no sharp fluctuations in the industrial sector. A sharp decline occurred in the ninth quarter, which exceeded the point below zero or negative.

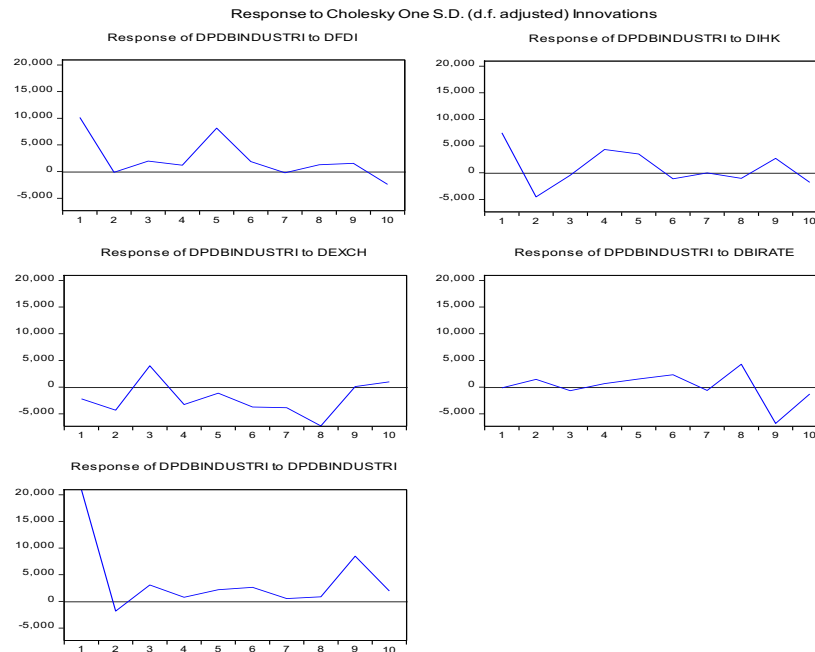


Figure 1. The industrial sector's response to the BI interest rate, Exchange Rate, Foreign Direct Investment

These conditions can be explained as follows. Based on the Indonesian Economic Report (2019), Bank Indonesia established a monetary policy, namely a policy to lower interest rates consistent with forecasts of low inflation within the target range, controlled external stability, and attractive returns on domestic financial investment. This policy is a pre-emptive step to stimulate the momentum of domestic economic growth amid the global economic slowdown. Domestic economic growth is mainly the focus of the industrial sector. The industrial sector showed a positive response to the shock from the rupiah exchange rate against the US dollar in the third quarter. Conditions that were below zero (minus) in the third quarter showed good progress, namely achieving positive values. The turning point of this condition is that in the fourth quarter, the growth of the industrial sector has again fallen below zero or minus. This continued until the eighth quarter.

With regard to the exchange rate, the monetary policy set by Bank Indonesia is the policy on Foreign Debt. Bank Indonesia establishes policies that are fully outlined in the Bank Indonesia Regulation (PBI) concerning External Debt and Other Foreign Currency Liabilities from Banks (No.21/1/ PBI / 2019) released on January 7, 2019, came into effect March 1, 2019. Bank Indonesia in 2019 conveyed the synergy of the 2019 policy mix, one of which was accommodative monetary policy. This policy includes (1) BI 7Day Reverse Rate (BID7RR) 100 bps; (2) Minimum Statutory Reserves (GWM) of 100 bps; (3) Strengthening OM; (4) Fundamental and appreciative exchange rates; (5) Inflation Control Team / Regional Inflation Control Team (TPI / TPID). Bank Indonesia implemented an accommodative monetary policy by lowering the reserve requirement and policy interest rates. Accommodative monetary policy aims to stimulate the economy and is generally carried out when economic growth is too slow compared to the expectations of policymakers. The central bank will usually take various

instruments to increase the amount of money circulating in the economy. The most common way is reducing the interest rate.

Table 5. Industrial Sector Variance Decomposition

Period	DPDBINDUS	DBIRATE	DEXCH	DIHK	DFDI
1	48.89935	4.872642	1.516673	21.49830	23.21303
2	42.50009	9.213808	1.272280	27.19910	19.81473
3	40.87581	8.886783	5.158940	25.54617	19.53230
4	38.93442	9.148041	5.696643	27.38827	18.83263
5	35.21174	10.04394	6.788556	25.39476	22.56101
6	34.35759	9.705477	8.176427	26.16189	21.59862
7	33.84139	9.658014	8.470148	26.09693	21.93352
8	31.67953	10.82333	11.67009	25.30628	20.52077
9	30.21114	15.07603	11.09820	22.41903	21.19560
10	28.00054	14.58038	16.05549	20.82922	20.53438
11	28.10827	14.44433	15.93207	21.22769	20.28764

In addition to the impulse response, the VAR model also provides Forecast Error Decomposition analysis of variance or often referred to as variance decomposition. Analysis of variance decomposition, describing the relative importance of each variable in the VAR system due to shock. This analysis is useful for predicting the percentage contribution to the variance of each variable due to changes in certain variables in the VAR system (Widarjono, 2007). Based on Table 4, it can be seen that the highest percentage contribution is shown by the CPI, and the next largest contribution is FDI. The percentage of CPI contribution experienced increased fluctuation from the first period to the second period, namely 21.493% to 21.199%. In the third and fourth periods, it increased to 25,546% and 27,388%. The CPI is an index that measures the average price of goods and services consumed by households. The CPI measures the average price change over time when consumers pay for goods and services, which is commonly known as inflation. Inflation in 2019 remains low and under control, thus supporting macroeconomic stability. Consumer Price Index (CPI) inflation in 2019 was recorded at 2.72%, down from the 2018 achievement of 3.13%. This development brought CPI inflation back to within the target range of $3.5 \pm 1\%$, continuing the achievement of the last four years, which was also consistently within the target range. Low inflation in 2019 was influenced by cyclical factors of maintained domestic demand and an appreciated exchange rate (Bank Indonesia, 2019).

FDI, as the second percentage contributor, made a real contribution to the realization of investment, namely in the smelter growth and development program. As of 2019, there are 46 companies that have invested in the amount of USD 50.4 billion (USD 12.27 billion are already operating and USD 38.13 billion in the planning and construction stages), directly absorbing more than 64,000 people. (Ministry of Industry, 2019). In general, in Indonesia, economic growth in 2019 is not as strong as the previous year, although it remains resilient, supported by good domestic demand, and maintained stability. This development is the result of stronger policy synergy between the Government, Bank Indonesia, and related authorities. The processing industry is still one of the main engines of Indonesia's

economic growth during the 2014-2019 period. The growth of the non-oil and gas industry for five years has always been above 4% on average, and at the end of 2019, it reached 5% (Ministry of Industry, 2019). Indonesia's balance of payments improved in 2019, and this supported the strengthening of the rupiah exchange rate with decreased volatility. On average, the Rupiah exchange rate strengthened 0.76% to the level of Rp14,139 per US dollar, from Rp14,246 per US dollar in 2018 (Bank Indonesia, 2019).

CONCLUSION

Based on empirical facts, it can be concluded that monetary policy has an impact on the industrial sector. This is based on the results of the IRF analysis, which shows a positive response from industrial sector variables to variable shocks to the BI interest rate. The results of the variance decomposition analysis showed that the largest percentage contribution came from the CPI and FDI. Limitations in this study do not include control variables such as the global crisis so that the analysis of the impact of monetary policy can be more comprehensive and in-depth. Further research is needed for each period by including dummy variables in order to determine changes in the effectiveness of monetary policy from time to time.

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