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DUAL MONETARY POLICY AND INCOME INEQUALITY IN INDONESIA

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ABSTRACT

This paper examines the effect of Indonesia's dual monetary policy on income inequality. This issue of inequality in Indonesia remains significant, and failure to address it could lead to a major economic and social conflict. The studies of monetary policy on income inequality are still inconclusive. In Indonesia, there are limited literatures that show the effect of monetary policy on income inequality. This study shows that both monetary policies significantly affect income inequality in Indonesia where in the long run, Islamic monetary policy seems to not affecting the inequality. Hence, it can be concluded that the Islamic monetary system should be encourage to improve the inequality in Indonesia.

Keywords: Conventional monetary policy; Islamic monetary policy; Income inequality; Indonesia; SDGs no. 10.
JEL Classifications: E52; E58; I31.

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I. INTRODUCTION

We examine the nexus between Indonesia's dual monetary policy and income inequality. This issue of inequality is important since Indonesia is the fourth most populous country in the world, with a population of over 270 million (World Bank, 2022), and the economic development is still concentrated on one of the five largest islands, Java (Badan Pusat Statistik, 2022). In addition, recent statistics indicate that inequality in Indonesia is growing faster than in other Asian nations. In the last 20 years, the top 10% have increased their income share to 48%, while the bottom 50% have decreased their income share to 12.4% in 2019 (World Bank, 2016). As stated by Dabla-Norris *et al*. (2015), the failure to address the problem of income inequality will exacerbate the crisis and conflict

In Indonesia, research on the relationship between monetary policy and inequality is extremely rare. To the best of the author's knowledge, this relationship has only been conducted by Putri and Wasiaturrahma (2019), but it focuses solely on conventional monetary policy. As a result, our contribution is that we investigate not only conventional monetary policy but also a dual monetary system which also examine the role of Islamic monetary policy in terms of inequality. Dual monetary policy is the policy which allows conventional and Islamic banking to be operated side by side (Ascarya, 2012).

Accommodating this Islamic banking system presents an intriguing issue because this system must have the underlying asset of any transactions. As a result of its connection to the real sector, this system is resistant to financial turbulence. Furthermore, early Islamic scholars wrote that Islamic financial and economic policies should be in accordance with Islamic values, which positively contribute to reducing income inequality (Chapra, 1985). Prior studies suggest that Islamic financing system found to be having a positive impact to Indonesian household welfare compared to conventional financing system especially in the change of income (Fianto *et al.*, 2018), while also giving more positive impact on the SDGs development in Indonesia (Ghoniyah *et al*., 2020).

In the context of empirical data on Islamic banking, the growth rate is remarkable, accounting for more than 15.77% of the market (Otoritas Jasa Keuangan, 2022). In addition, the government's establishment of the Islamic Economics and Finance National Committee, which aims, among other things, to accelerate the development of the halal industry as part of the overall economy, necessitates a robust backing from the Islamic banking sector. These are the reasons why research on this topic has recently gained popularity.

The purpose of our research is to provide the central bank with empirical evidence regarding the relationship between monetary policy and inequality. Essentially, we wish to determine whether both policies (conventional and Islamic monetary policies) have the same effect on inequality in the short and long term, as both of the monetary policy should be working in linear. Specifically, it is to determine whether the selection of an expansionary both conventional and Islamic monetary policy could increases or decreases the inequality. Does it play the same role in addressing inequality as traditional monetary policy? This study is anticipated to provide comprehensive data that will result in a more effective monetary policy. Numerous studies on monetary policy and inequality have been

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conducted in this context, with mixed results. First, monetary policy expansion reduces income inequality. This result has been observed in the United States (Galli and Hoeven, 2001; Coibion *et al*., 2017), the United Kingdom (Mumtaz and Theophilopoulou, 2017), the Euro Area (Samarina and Nguyen, 2019), Germany (Kulp, 2020), Indonesia (Putri and Wasiaturrahma, 2019), and the study on advanced and emerging countries (Galli and Hoeven, 2001; Coibion *et al*., 2017; Furceri *et al*., 2018). The second finding is that contractionary (expansionary) monetary policy reduces (increases) income inequality. This finding has been documented in the United States (Davtyan, 2017), Japan (Inui *et al*., 2017), and Mexico (Villarreal, 2014). Thirdly, Albert *et al*. (2020)'s research in the United States demonstrates that monetary policy has no significant effect on income inequality.

Koedijk *et al*. (2018) explained that the difference between the structure of the economy and the structure of household income accounts for the contradictory findings of the literatures. Davtyan (2017) also explained that the income inequality data utilized in the study could account for divergent findings in the literature. In addition, the level of financial development and financial access in the countries is viewed as a factor in the divergent findings of the literatures (Villarreal, 2014). Some scholarly works also classify the link between monetary policy and income inequality. Coibion *et al*. (2017) identifies five connections between monetary policy and inequality. Nevertheless, some channels had a different impact on income inequality than others. The composition of income, the financial segmentation, and the portfolio channel demonstrated that expansionary monetary policy could increase inequality. In the meantime, saving redistribution and the earning heterogeneity channel demonstrated that an expansionary monetary policy can reduce inequality. The ability of monetary policy to affect income inequality through the movement of interest rates to the real sectors is described. As a result of the fact that many households rely on wages for their income, income composition is one of the channels. Therefore, if the monetary policy rate expands (low interest rate), business loans will increase, leading to a rise in production and profits. However, due to its rigidity, wages cannot increase as rapidly as profits. Therefore, expansionary monetary policy could increase income inequality via this channel (Davtyan, 2017).

Samarina and Nguyen (2019), utilizing the indirect effect of monetary policy on income inequality, mention additional channels, namely the macroeconomic and financial channels, which could link monetary policy to income inequality. Through the macroeconomic channel, expansive monetary policy will reduce income inequality. Therefore, it will stimulate durables consumption, demand, and productive investment. This effect is that an increase in production and employment raises wages, which benefits the lower class while having a lesser impact on the upper class. In the meantime, financial channels may dampen the Gini coefficient's response to expansionary monetary policy.

The structure of this paper is as follows: The data and methodology of this study were discussed in Section II. Section III analyzes the empirical findings of the study, while Section IV presents the conclusion and recommendations of the study.

II. DATA AND METHODOLOGY

A. Data

This study utilizes quarterly time series data from 2004Q1 to 2019Q4 for Indonesia. The period is selected based on the beginning Islamic monetary policy rate utilized until before the COVID-19 pandemic impacts the socioeconomic sector. As a proxy for income inequality in Indonesia, we use the Gini index for post-tax post-transfer from the Standardized World Income Inequality Database (SWIID) 9.0. As the Gini index is only available annually, we interpolate the data to obtain a higher frequency (Davtyan, 2017). We utilize EViews' cubic frequency conversion based on cubic spline interpolation.

Our primary variable in this study is monetary policy and inequality, consistent with previous research (Galli and Hoeven, 2001; Davtyan, 2017; Samarina and Nguyen, 2019; Kulp, 2020). For our study, we have 5 independent variables and Gini index as dependent variable. Policy rate for conventional and Islamic monetary policy data is obtained from Indonesia statistics of economy and finance (SEKI) Bank Indonesia. To analyze the effect of Islamic monetary policy, we use Islamic interbank monetary market rate.

Other independent variables obtained from the Badan Pusat Statistik are real gross domestic product, consumer price index, employment, and average wages. While other variables are already available on a quarterly basis, the semi-annual series for the employment variable has been interpolated to a quarterly basis. Except for conventional monetary policy and Islamic monetary policy, these variables will be transformed into log form.

Table 1.
Data Description

This table provides detail data description of all variables considered in this study.

Variables	Description	Data Source
GINI	Gini Coefficient of Income Inequality post-tax post-transfers (Gini Indices of Disposable-Income Inequality).	Standardized World Inequality Index Database (SWIID) 9.0
TOP1	Pre-tax national income share held by the p99p100 group. Pre-tax national income is the sum of all pre-tax personal income flows accruing to the owners of the production factors, labor and capital, before taking into account the operation of the tax/transfer system, but after taking into account the operation of pension system. The population is comprised of individuals over age 20. The base unit is the tax unit defined by national fiscal administrations to measure personal income taxes.	World Inequality Database (WID)
CMP	Conventional monetary policy interest rates.	Indonesian Economic Statistics Bank Indonesia (SEKI BI) (I.25)
IMP	The rate of return used as the level of Islamic monetary policy in Indonesia. Using the Islamic Interbank Money Market (PUAS) rate of return	Indonesian Economic Statistics Bank Indonesia (SEKI BI) (I.25)
GDP	Total added value generated by all business units in a certain country (2010=100)	Badan Pusat Statistik (Statistics Indonesia)
CPI	The average price change of goods and services consumed by households in a certain period of time (2018=100)	Badan Pusat Statistik (Statistics Indonesia)
EMPL	Population aged 15 years and over (of working age) who had a job in the past week	Badan Pusat Statistik (Statistics Indonesia)

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B. Methodology

As explained in Section I, the effect of monetary policy on income inequality occurs through a variety of distributional transmission channels. These channels then empirically investigated whether the change in monetary policy affects income inequality, albeit with inconclusive results (Galli and Hoeven, 2001; Davtyan, 2017; Samarina and Nguyen, 2019; Kulp, 2020). Vector AutoRegression (VAR) is frequently used in these studies to determine the relationship between monetary policy and income inequality. As the objective of this study is to examine the short-run and long-run dynamics, AutoRegressive Distributed Lag (ARDL) is deemed the alternative method for examining the relationship between income inequality and monetary policy (Shrestha and Batta, 2018). The ARDL model used in this study was derived from Kulp (2020), as shown below:

$$\log(y_t) = \beta_0 + \beta_1 \log(y_{t-p}) + \beta \log X_{i,t-p} + \gamma_t + u_t \quad (1)$$

Moreover, in accordance with the research of Kulp (2020), the use of ARDL as the methodology is intended to capture variables other than monetary policy that may influence income inequality. We also attempt to capture both the conventional and Islamic monetary policy effects. Consequently, the modified model is presented below:

$$\begin{aligned} \Delta GINI_t = \propto_0 + & \sum_{t=i}^{p} a_1 \Delta GINI_{t-i} + \sum_{t=i}^{p} a_2 \Delta CMP_{t-i} + \\ & \sum_{t=i}^{p} a_3 \Delta LGDP_{t-i} + \sum_{t=i}^{p} a_4 \Delta LCPI_{t-i} + \sum_{t=i}^{p} a_5 \Delta LEMPL_{t-i} + \lambda_1 GINI_{t-1} + \\ & \lambda_2 CMP_{t-1} + \lambda_3 LGDP_{t-1} + \lambda_4 LCPI_{t-1} + \lambda_5 LEMPL_{t-1} + u_t \end{aligned} \quad (2)$$

$$\begin{aligned} \Delta GINI_t = \propto_0 + & \sum_{t=i}^{p} a_1 \Delta GINI_{t-i} + \sum_{t=i}^{p} a_2 \Delta IMP_{t-i} + \\ & \sum_{t=i}^{p} a_3 \Delta LGDP_{t-i} + \sum_{t=i}^{p} a_4 \Delta LCPI_{t-i} + \sum_{t=i}^{p} a_5 \Delta LEMPL_{t-i} + \lambda_1 GINI_{t-1} + \lambda_2 IMP_{t-1} + \\ & \lambda_3 LGDP_{t-1} + \lambda_4 LCPI_{t-1} + \lambda_5 LEMPL_{t-1} + u_t \end{aligned} \quad (3)$$

Equation (2) represents the conventional model, whereas equation (3) represents the Islamic model. *GINI* represents the Gini index, *CMP* represents the conventional monetary policy, *GDP* represents the gross domestic product, *CPI* represents the consumer price index, *IMP* represents the Islamic monetary policy, and *EMPL* represents the number of people of working age who are employed.

ARDL is also used in this study due to the small number of observations used, 64, where this method produces a robust result and performs well with a small number of observations (between 30-80 observations) (Duasa, 2007; Al-Malkawi *et al*., 2012; Hasan *et al*., 2020). When compared to other methods, ARDL has advantages. According to Shrestha and Bhatta (2018), ARDL is an estimation model based on Ordinary Least Squares (OLS) that can be applied to non-stationary time series or in a mixed order of integration. One benefit of using the ARDL model is that it can be applied to variables that are stationary on I(0), I(1), or even in different order of integration (Pesaran *et al*., 2001). Kassim (2016) also discussed the benefits of using the ARDL model, stating that it addresses the problem of

bias variables and autocorrelation, and that it provides non-biased and efficient estimation as well as valid t-statistics even when there is an endogenous regressor.

Furthermore, by using an error correction model derived from the ARDL method, it was possible to integrate short-run dynamics and long-run equilibrium without losing information and avoid spurious regression (Shrestha and Bhatta, 2018). We only run the robustness test for the Islamic model because it is unique to this study. We use a dummy variable in the Islamic monetary policy model and the ARDL method as the robustness test method.

III. MAIN FINDINGS

This section discusses the econometric results, which are then analyzed and discussed. The stationarity test is performed first, followed by the bound cointegration test, long-run estimation, and short-run estimation. The analysis of the results is then provided at the end of the section, along with the robustness test results.

A. Descriptive Statistics

Table 2 provides a statistical description of the variables used in this study, including the Gini index, monetary rates, and macroeconomic variables. This study has 64 quarterly observations spanning 16 years.

Table 2.
Descriptive Statistics

This table reports the descriptive statistics for the variables used in the study. *GINI* denotes Gini index; *CMP* denotes conventional monetary policy; *IMP* denotes Islamic monetary policy; *GDP* denotes gross domestic product; *CPI* denotes consumption price index; *EMPL* denotes amount of employment; and Std. Dev. denotes standard deviation.

	GINI	*CMP*	*IMP*	*GDP*	*CPI*	*EMPL*
Mean	45.1413	0.0719	0.0552	1.85E+12	73.5075	1.10E+08
Median	45.6377	0.0712	0.0562	1.85E+12	72.3158	1.11E+08
Maximum	47.2413	0.1275	0.1049	2.82E+12	103.4000	1.32E+08
Minimum	42.1000	0.0425	0.0000	1.07E+12	41.8699	92810791
Std. Dev.	1.7046	0.0187	0.1574	5.08E+11	18.6863	11391199
Skewness	-0.4201	1.1048	-0.2753	0.0919	-0.0169	0.0769
Kurtosis	1.6255	4.6038	5.6274	1.8164	1.7995	1.9068
Jarque-Bera	6.9207	19.8810	19.2180	3.8257	3.8461	3.2495
Probability	0.0314	0.0000	0.0000	0.1476	0.1461	0.1969
Observations	64	64	64	64	64	64

All variables, with the exception of *CMP*, have normal skewness, according to the statistics. Furthermore, the *CMP* and *IMP* variables have a leptokurtic form, whereas the *GINI, GDP, CPI,* and *EMPL* variables have a platykurtic form. The Jarque-Bera probability value above 5% indicates that the *CPI, EMPL*, and *GDP* are normally distributed. Meanwhile, the *GINI*, *CMP*, and *IMP* variables have

probabilities less than 5%, indicating that H_0 is rejected and the third variable is not normally distributed.

B. Preliminary Test Results

B.I. Stationarity Test

Table 3 shows the results of the stationarity test. According to the KPSS test, *CMP*, *IMP*, *CPI*, and *EMPL* are stationary at the level, whereas *GINI* and *GDP* are stationary on the first difference.

Table 3.
Unit Root Test

This table summarizes the results of the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root test. The KPSS test determines whether or not the null hypothesis is stationary. * and ** denote significance at 1% and 5% level respectively. The variables are consist of *LGINI* denotes log of gini index; *CMP* denotes conventional monetary policy; *IMP* denotes Islamic monetary policy; *LGDP* denotes log of gross domestic product; *LCPI* denotes log of consumption price index; and *LEMPL* denotes log of amount of employment. While Det.Term denotes deterministic terms; c denotes intercept; t denotes trend.

Variable	Det.Term	KPSS	
		Level	First Difference
LGINI	c,t		0.172810*
CMP	c	0.6095*	0.0441**
IMP	c	0.1504**	0.2206**
LGDP	c,t	0.2530	0.1222**
LCPI	c,t	0.2056*	0.0455**
LEMPL	c,t	0.1344*	0.0788*

B.II. Bound Cointegration Test

The bound test is used to determine whether or not the model has a long-run relationship. Table 4 displays the results of the bound cointegration test. The result of the bound test on the conventional monetary policy model indicates a strong cointegration with F-statistics is greater than two sets of critical values on a 5% significant level (22.30 > 2.86 > 4.01). Based on the test, the result for Islamic monetary policy also indicates a long-run relationship with strong cointegration. F-statistics has a higher value in the Islamic monetary policy model than two sets of critical values on a 5% significant level, where 10.51 > 2.86 > 4.01.

Table 4.
Bound Cointegration Test

This table summarizes the results of the bound cointegration test, which was used to investigate cointegration in the model. For the test, we present both the conventional and Islamic models.

Level of Significance	I(0)	I(1)
10%	2.45	3.52
5%	2.86	4.01
1%	3.74	5.06

C. Main Results

C.I. Long-Run Estimation

Following that, we perform long-run estimation for both models. Table 5 shows that in the conventional model, all variables have a significant effect on *GINI*, with *CMP* and *GDP* positively significant and *EMPL* and *CPI* negatively significant on a 5% significant level. While for the Islamic model, *EMPL* has a negative significant effect on *GINI*.

Table 5.
Long-Run Estimation

This table summarizes the long-run estimates of the Conventional and Islamic models in ARDL estimation. The * symbol denotes a statistically significant result at the 5% level. The variables are consist of *LGINI* denotes log of Gini index; *CMP* denotes conventional monetary policy; *IMP* denotes Islamic monetary policy; *LGDP* denotes log of gross domestic product; *LCPI* denotes log of consumption price index; and *LEMPL* denotes log of amount of employment.

Regressors	Conventional Model		Islamic Model	
	Coefficient	*P*-value	Coefficient	*P*-value
CMP	0.4909*	0.0000		
IMP			0.0401	0.8260
LGDP	0.4477*	0.0000	-0.1041	0.5449
LCPI	-0.2422*	0.0000	0.0541	0.7168
LEMPL	-0.1953*	0.0274	0.5767*	0.0437

C.II. Short Run Estimation

Table 6 shows the results of short run estimation for conventional monetary policy. The error correction term has a significant negative value, -0.0361, in the short run estimation. This indicates that the model's 0.03% deviation will be corrected to equilibrium in one quarter. All variables in this model are statistically significant in terms of the Gini Index. *CMP* has a significant positive impact on *GINI* (0.0063). *GDP* and *EMPL* have a significant positive effect as well. While *CPI* has a significant negative effect.

Table 6.
Conventional Short-run Estimation

This table shows the significant results of ECM regression of conventional model at 5% level. The variables are consist of *LGINI* denotes log of Gini index; *CMP* denotes conventional monetary policy; *IMP* denotes Islamic monetary policy; *LGDP* denotes log of gross domestic product; *LCPI* denotes log of consumption price index; and *LEMPL* denotes log of amount of employment. While CointEq denotes Cointegration Equation.

Variables	Coefficient	*P*-value
C	-0.1520	0.0000
Δ(*LGINI*(-1))	2.1260	0.0000
Δ(*LGINI*(-2))	-1.8980	0.0000
Δ(*LGINI*(-3))	0.8639	0.0008
Δ(*LGINI*(-4))	-1.1032	0.0001
Δ(*LGINI*(-5))	2.4433	0.0000
Δ(*LGINI*(-6))	-2.3897	0.0000
Δ(*LGINI*(-7))	1.0518	0.0000
Δ(*CMP*)	0.0063	0.0000
Δ(*CMP*(-1))	-0.0116	0.0000
Δ(*CMP*(-2))	-0.0116	0.0000
Δ(*CMP*(-3))	-0.0061	0.0001
Δ(*CMP*(-4))	-0.0090	0.0000
Δ(*LEMPL* (-1))	0.0064	0.0003
Δ(*LEMPL* (-3))	0.0089	0.0002
Δ(*LEMPL* (-4))	-0.0051	0.0120
Δ(*LEMPL* (-5))	0.0057	0.0005
Δ(*LGDP*)	0.0036	0.0000
Δ(*LGDP* (-1))	-0.0109	0.0000
Δ(*LGDP* (-2))	-0.0090	0.0000
Δ(*LGDP* (-3))	-0.0056	0.0000
Δ(*LGDP* (-4))	-0.0034	0.0000
Δ(*LGDP* (-6))	0.0010	0.0059
Δ(*LGDP* (-7))	0.0021	0.0000
Δ(*LCPI*)	-0.0015	0.0023
Δ(*LCPI* (-1))	0.0052	0.0000
Δ(*LCPI* (-2))	0.0036	0.0001
Δ(*LCPI* (-3))	0.0025	0.0005
Δ(*LCPI* (-4))	0.0016	0.0020
Δ(*LCPI* (-5))	-0.0018	0.0004
Δ(*LCPI* (-6))	-0.0016	0.0044
Δ(*LCPI* (-7))	-0.0014	0.0016
CointEq(-1)	-0.0361	0.0000

Table 7.
Islamic Short Run Estimation

This table shows the significant results of ECM regression of Islamic Model at 5% level. The variables are consist of *LGINI* denotes log of Gini index; *CMP* denotes conventional monetary policy; *IMP* denotes Islamic monetary policy; *LGDP* denotes log of gross domestic product; *LCPI* denotes log of consumption price index; and *LEMPL* denotes log of amount of employment. While CointEq denotes Cointegration Equation.

Variables	Coefficient	*P*-value
C	-0.0437	0.0000
Δ(*LGINI*(-1))	2.3326	0.0000
Δ(*LGINI*(-2))	-1.9749	0.0000
Δ(*LGINI*(-3))	0.8581	0.0054
Δ(*LGINI*(-4))	-1.5897	0.0001
Δ(*LGINI*(-5))	3.2247	0.0000
Δ(*LGINI*(-6))	-2.4926	0.0000
Δ(*LGINI*(-7))	0.6824	0.0002
Δ(*IMP* (-4))	0.0033	0.0023
Δ(*IMP* (-5))	0.0039	0.0001
Δ(*IMP* (-6))	0.0041	0.0000
Δ(*IMP* (-7))	0.0015	0.0041
Δ(*LEMPL* (-2))	-0.0127	0.0001
Δ(*LEMPL* (-4))	-0.0121	0.0000
Δ(*LEMPL* (-6))	-0.0052	0.0042
Δ(*LEMPL* (-7))	-0.0027	0.0096
Δ(*LGDP*)	0.0015	0.0018
Δ(*LGDP* (-1))	0.0039	0.0000
Δ(*LGDP* (-2))	0.0051	0.0000
Δ(*LGDP* (-3))	0.0051	0.0000
Δ(*LGDP* (-4))	0.0031	0.0016
Δ(*LGDP* (-5))	0.0021	0.0135
Δ(*LCPI* (-2))	-0.0029	0.0000
Δ(*LCPI* (-3))	-0.0018	0.0019
Δ(*LCPI* (-4))	-0.0025	0.0002
Δ(*LCPI* (-5))	-0.0028	0.0000
CointEq(-1)	-0.0105	0.0000

Table 7 shows the outcome of the Islamic monetary policy model. The error correction model performs significantly worse in the short-term test of the Islamic model. This means that the 0.0105% model deviation will be corrected back to equilibrium within a quarter. The *IMP* and *GDP* have a significant positive effect. While *EMPL* and *CPI* show a significant negative effect. We also ran diagnostic and stability tests on both models. Table 8 and Figures 1 and 2 show the outcome. Both models passed the diagnostic and stability tests.

Table 8.
Diagnostic Test

The diagnostic tests for the conventional and Islamic models are shown in the table below. The serial correlation test investigates the null hypothesis of no serial correlation up to two lags. The normality test determines whether the residual is normally distributed. The heteroskedasticity test investigates whether the null hypothesis is homoskedasticity. The values shown below are F-statistics/Jarque-Bera values. The P-values are presented in parenthesis.

Diagnostic Test Statistics	Conventional Model	Islamic Model
Serial Correlation	5.9369 (0.0178)	1.0225 (0.4163)
Normality	15.647 (0.000400)	0.7013 (0.7042)
Heteroskedasticity	0.3819 (0.9923)	1.0406 (0.4498)

Figure 1.
Conventional Stability Test

The figures depict the stability test in the conventional model baseline, which was performed using the CUSUM and CUSUM of Squares tests. The CUSUM line remains between the 5% significance line, indicating stability.

A. CUSUM

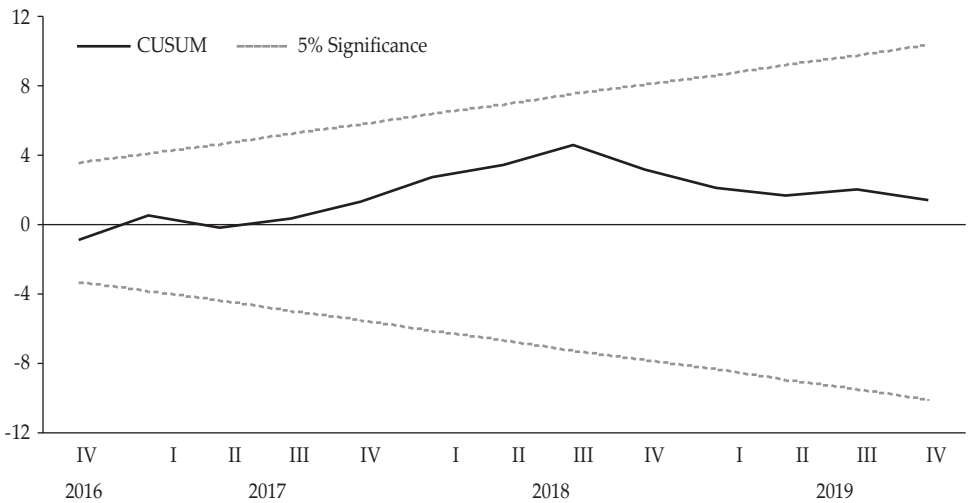

Figure 1.
Conventional Stability Test (Continued)

B. CUSUM of Squares

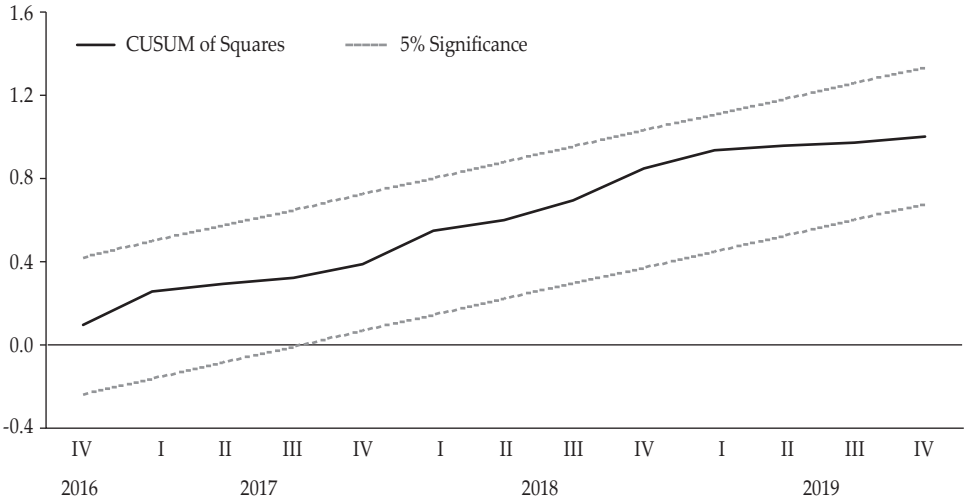

Figure 2.
Islamic Stability Test

The figures depict the stability test for the Islamic model baseline, which was performed using the CUSUM and CUSUM of Squares tests. The CUSUM line remains between the 5% significance line, indicating stability.

A. CUSUM

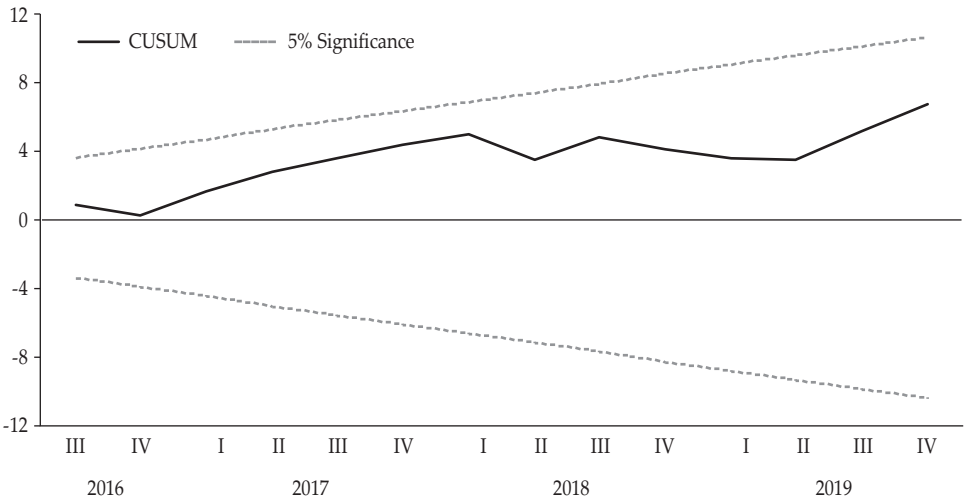

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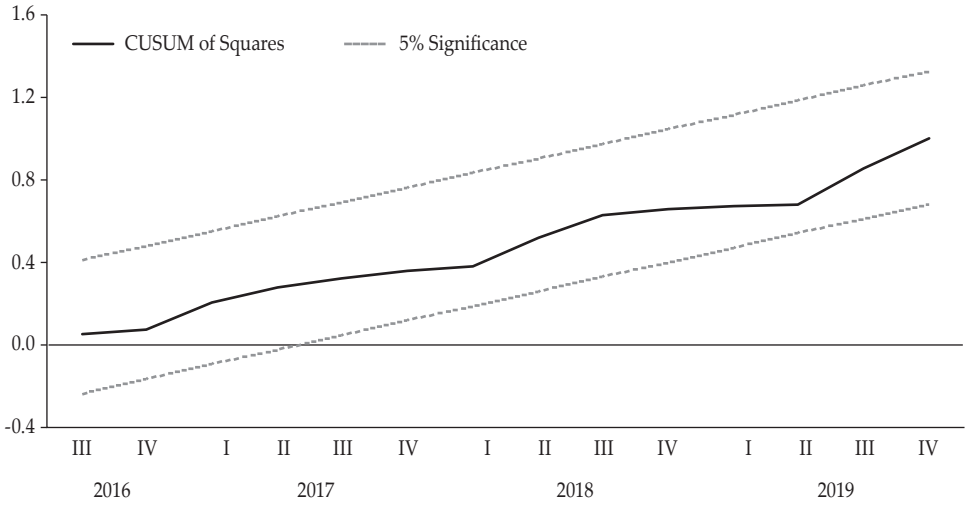
Figure 2.
Islamic Stability Test (Continued)

B. CUSUM of Squares



D. Discussion

In the short and long term, conventional monetary policy has a positive effect on income inequality, whereas Islamic monetary policy has only a short-term effect. This indicates that a rise in policy rates, also known as a contractionary monetary policy, will increase income inequality (Galli and Hoeven, 2001; Coibion *et al*., 2017; Mumtaz and Theophilopoulou, 2017; Furceri *et al*., 2018; Samarina and Nguyen, 2019). This synchronized effect on income inequality is likely a result of the implementation of dual monetary policy, which should be consistent and equivalent between the two policies (Ascarya, 2014). According to Coibion *et al*. (2017), monetary policy can affect inequality through five channels: the income composition channel, the financial segmentation channel, the portfolio channel, the earning heterogeneity channel, and the saving redistribution channel. These channels explain the relationship between monetary policy and inequality. To explain the positive impact of monetary policy on income inequality, however, there are two channels to consider. They are earning heterogeneity channel and saving redistribution channel.

In earning heterogeneity channel, as the largest composition of income in the household is from wages, where Indonesian households has 60.72% of their income from wages (Badan Pusat Statistik, 2019), the earnings of high-income and low-income households may respond differently to contractionary monetary policy due to the disproportionate increase in unemployment for the low-income group that results from contractionary monetary policy. This is consistent with what Galli and Hoeven (2001) and Samarina and Nguyen (2019) have stated, namely that a contractionary monetary policy slows economic growth due to an increase

in the cost of funds. Ascarya (2012) also provides evidence that an increase in the monetary policy rate will reduce loan and output, which may lead to a decrease in workers and a rise in unemployment.

According to Galli and Hoeven (2001), workers with low skills are more likely to suffer from job termination than workers with high skills. This is due to the fact that the loss of higher-skilled workers will necessitate higher costs for severance pay and other benefits. In contrast to the reduction of workers with limited skills, which typically incurs fewer costs in terms of employment termination. Therefore, as a result of the disproportional reduction in employment caused by contractionary monetary policy, low-skilled workers will lose their wage income, resulting in a rise in income inequality.

According to Coibion *et al.* (2017), the second channel is the saving redistribution channel, in which the financial intermediary institution acts as a collector and distributer of funds. Through this channel, it is assumed that capital or person owners are upper-middle-class individuals with higher incomes. Those who borrow money from banks belong to the lower middle class. If there is an increase in policy interest rates that leads to an increase in real interest rates, then those who own funds in a bank will profit from the increase in interest income. The party borrowing funds will incur a loss if the amount of the loan to be repaid increases.

E. Robustness Test

To examine the consistency of our results, we conduct a robustness test with another measure of inequality using top 1% income share in Indonesia (*TOP1*). The variable described as total pre-tax national income that includes personal income flows accruing to the owners of the production factors, labor and capital, before considering the operation of the tax/transfer system, but after taking into account the operation of pension system. The result exhibits some different result with the base model.

The robustness test indicates that the conventional monetary policy rate has a negative effect in the short run on the share of top 1% income share. This result is aligned with the previous studies (Herradi and Leroy, 2021; Xiang *et al*., 2022) that found different result of the impact of monetary policy on Gini and top 1% income share. According to Herradi and Leroy (2021) this result is probably caused by the sample of data where the top 1% income share is not mirrored the entire income distribution. The Gini index that used in the baseline model is based on survey where top income share is low represented compared to income share data that based on fiscal definition (see Table 1 for further explanation). However, the result of Islamic model in aligned with the baseline model that shows positive short run effect on income inequality. The results are shown in Tables 9 to 11. The diagnostic test models also passed the robustness test model. This is shown in Table 12.

Table 9.
Robustness Long-run Estimation

This table summarizes the long-run estimates of the conventional and Islamic models in ARDL estimation. * denotes a statistically significant result at the 5% level. The variables are consist of *CMP* denotes conventional monetary policy; *IMP* denotes Islamic monetary policy; *LGDP* denotes log of gross domestic product; *LCPI* denotes log of consumption price index; and *LEMPL* denotes log of amount of employment.

Regressors	Conventional Model		Islamic Model	
	Coefficient	*P*-value	Coefficient	*P*-value
CMP	0.3335	0.3908		
IMP			0.7974*	0.0001
LGDP	-0.6487*	0.0000	-0.5204	0.6115
LCPI	1.1755*	0.0233	27.3750*	0.0000
LEMPL	0.2539*	0.0274	-2.4566*	0.0133

Table 10.
Robustness Conventional Short-run Estimation

This table shows the significant results of ECM regression of Conventional Model at 5% level. The variables are consist of *TOP1* denotes top 1% income share in Indonesia; *CMP* denotes conventional monetary policy; *IMP* denotes Islamic monetary policy; *LGDP* denotes log of gross domestic product; *LCPI* denotes log of consumption price index; and *LEMPL* denotes log of amount of employment.

Variables	Coefficient	*P*-value
C	-0.0056	0.0000
Δ(*TOP1*(-1))	1.4069	0.0000
Δ(*TOP1* (-2))	-0.4791	0.0447
Δ(*TOP1* (-4))	-0.7149	0.0080
Δ(*TOP1* (-5))	0.9038	0.0005
Δ(*TOP1* (-6))	-0.3222	0.0038
Δ(*CMP*)	-0.0267	0.0355
Δ(*CMP* (-1))	-0.0542	0.0009
Δ(*CMP* (-2))	-0.0427	0.0014
Δ(*CMP* (-5))	-0.0515	0.0003
Δ(*CMP* (-7))	0.0385	0.0038
Δ(*LGDP*)	-0.0012	0.0002
Δ(*LGDP* (-1))	0.0602	0.0000
Δ(*LGDP* (-2))	0.0604	0.0000
Δ(*LGDP* (-3))	0.0600	0.0000
Δ(*LGDP* (-4))	0.0681	0.0000
Δ(*LGDP* (-5))	0.0528	0.0000
Δ(*LGDP* (-6))	0.0382	0.0012
Δ(*LGDP* (-7))	0.0263	0.0057
Δ(*LEMP*)	0.0297	0.0269
Δ(*LCPI*)	0.0110	0.0001
Δ(*LCPI* (-1))	0.0284	0.0000

Table 10.
Robustness Conventional Short-run Estimation (Continued)

Variables	Coefficient	*P*-value
Δ(*LCPI* (-2))	0.0255	0.0000
Δ(*LCPI* (-3))	0.0266	0.0000
Δ(*LCPI* (-4))	0.0254	0.0004
Δ(*LCPI* (-5))	0.0179	0.0109
CointEq(-1)	-0.0963	0.0000

Table 11.
Robustness Islamic Model Short Run Estimation

This table displays the significant result of the robustness test at the 5% level. We only use dummy variables to test the robustness of the Islamic model. The variables are consist of *TOP1* denotes top 1% income share in Indonesia; *CMP* denotes conventional monetary policy; *IMP* denotes Islamic monetary policy; *LGDP* denotes log of gross domestic product; *LCPI* denotes log of consumption price index; and *LEMPL* denotes log of amount of employment.

Variables	Coefficient	*P*-value
C	-2.5340	0.0000
Δ(*TOP1*(-1))	1.3759	0.0000
Δ(*TOP1* (-4))	-2.0052	0.0093
Δ(*TOP1* (-5))	-0.5848	0.0157
Δ(*TOP1* (-7))	-0.2752	0.0462
Δ(*IMP*)	0.0136	0.0073
Δ(*IMP* (-1))	-0.1908	0.0001
Δ(*IMP* (-2))	-0.1636	0.0000
Δ(*IMP* (-3))	-0.1259	0.0001
Δ(*IMP* (-4))	-0.0839	0.0006
Δ(*IMP* (-5))	-0.0437	0.0020
Δ(*IMP* (-6))	-0.0132	0.0379
Δ(*LGDP*)	0.0007	0.0049
Δ(*LGDP* (-1))	0.0135	0.0000
Δ(*LGDP* (-2))	0.0144	0.0000
Δ(*LGDP* (-3))	0.0136	0.0000
Δ(*LGDP* (-6))	-0.0176	0.0075
Δ(*LGDP* (-7))	-0.0220	0.0024
Δ(*LEMPL*(-1))	-0.1408	0.0008
Δ(*LEMPL*(-2))	-0.1997	0.0001
Δ(*LEMPL*(-3))	-0.1478	0.0013
Δ(*LEMPL*(-4))	-0.1787	0.0016
Δ(*LEMPL*(-5))	-0.0875	0.0005
Δ(*LEMPL*L(-6))	-0.0659	0.0179
Δ(*LCPI*)	-0.0110	0.0308
Δ(*LCPI*(-1))	0.0257	0.0007
Δ(*LCPI* (-2))	0.0257	0.0001
Δ(*LCPI*(-3))	0.0175	0.0001
Δ(*LCPI* (-4))	0.0082	0.0368
Δ(*LCPI* (-7))	-0.0079	0.0074
CointEq(-1)	-0.2961	0.0000

Table 12.
Robustness Diagnostic Test

This table displays the diagnostic tests for robustness tests performed in the Islamic model. The serial correlation test investigates the null hypothesis of no serial correlation up to two lags. The normality test determines whether the residual is normally distributed. The heteroskedasticity test investigates whether the null hypothesis is homoskedasticity. The values shown below are F-statistics/ Jarque-Bera values. The P-values are presented in parenthesis.

Diagnostic Test Statistics	Conventional Model	Islamic Model
Serial Correlation	0.1720 (0.9175)	3.1028 (0.0854)
Normality	15.6472 (0.0004)	1.3718 (0.5036)
Heteroskedasticity	0.7219 (0.7960)	0.6330 (0. 8698)

Figure 3.
Robustness Model Stability Test

The figures depict the stability test for the Robustness model, which was performed using the CUSUM and CUSUM of Squares tests. The CUSUM line remains between the 5% significance line, indicating stability.

A. CUSUM of Conventional Model

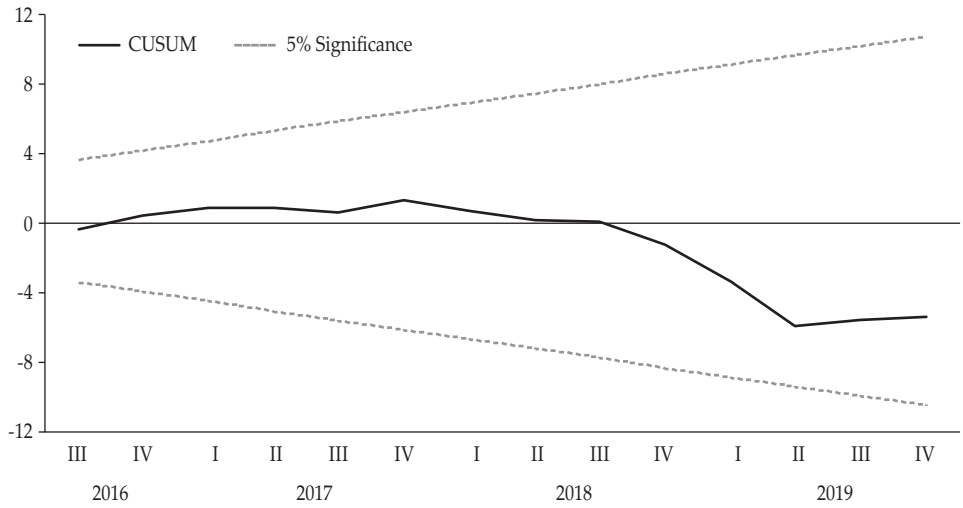
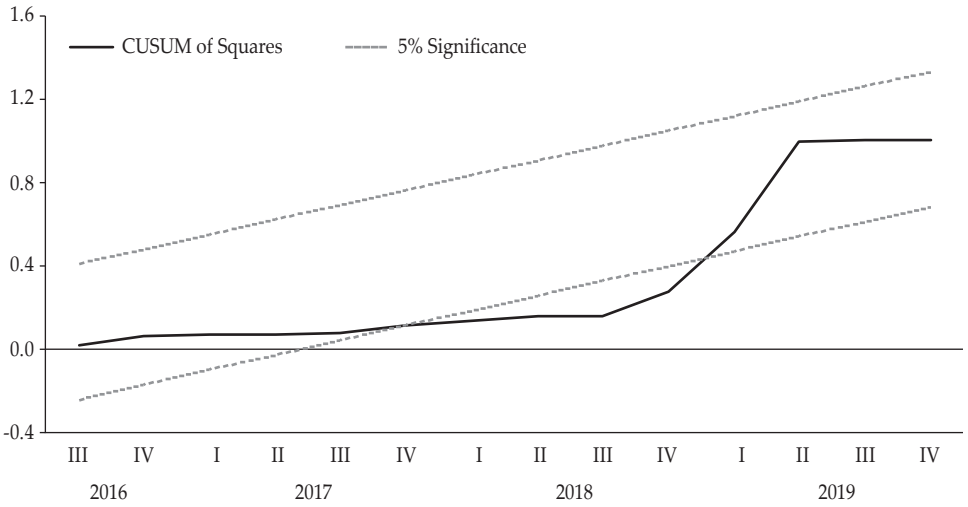


Figure 3.
Robustness Model Stability Test (Continued)

B. CUSUM of Squares of Conventional Model



C. CUSUM of Islamic Model

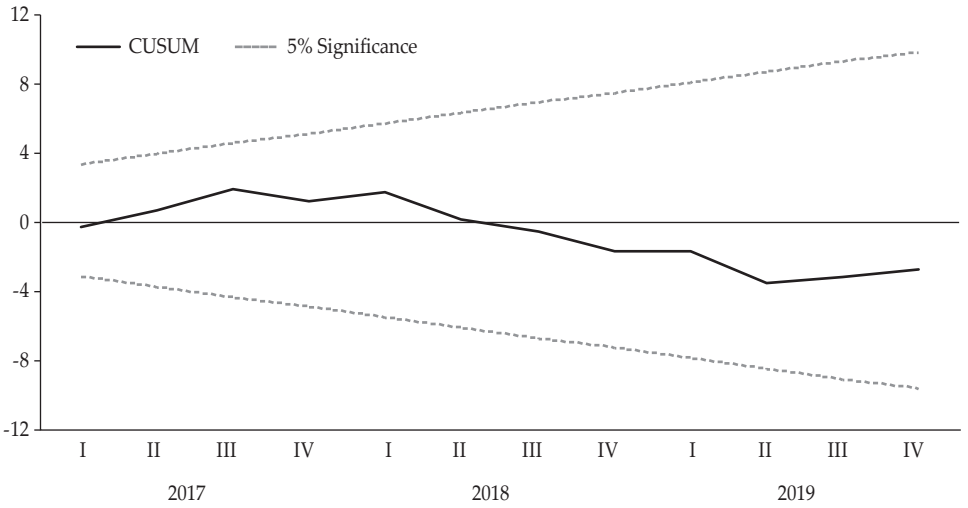
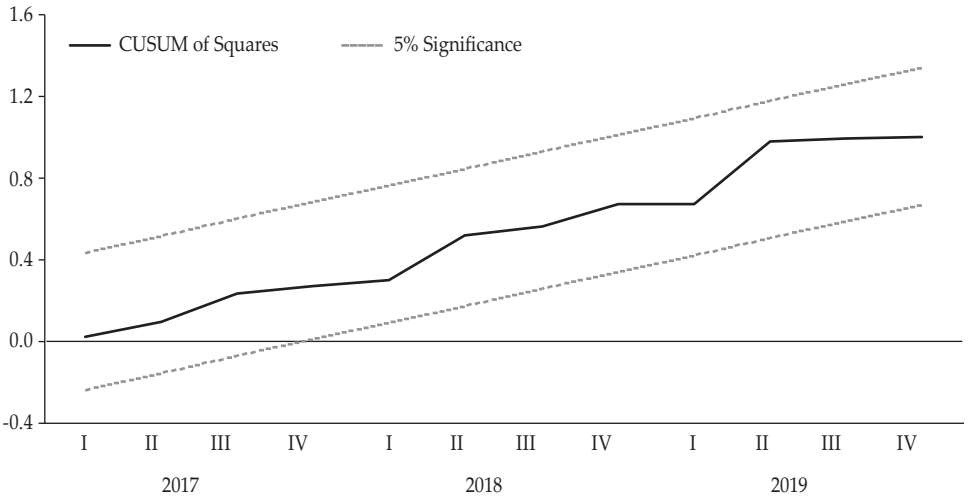


Figure 3.
Robustness Model Stability Test (Continued)

D. CUSUM of Squares of Islamic Model



IV. CONCLUSION

This study investigates the impact of monetary policy as well as macroeconomic variables on income inequality. The results show that both policy rates have a positive effect on income inequality. Whereas conventional monetary policy has an effect both in the short and long run, Islamic monetary policy has an effect only in the short run.

As a result, we have several recommendations for the government and monetary authority in carrying out monetary policy. Monetary policy must be implemented with caution because it is known to affect not only monetary and economic targets, but also income inequality, albeit only in the short run. However, as the Islamic monetary policy likely give improvement on income inequality, the policy rate could be determined flexibly as it also give small significance on income inequality.

More research should be done on this topic to examine the impact of monetary policy on income inequality in greater detail. This study should be investigated further by utilizing various sets of data, particularly microdata, to gain a thorough understanding of income distribution in Indonesia. Further research could look into a broader topic of inequality in Indonesia, such as consumption and wealth, which have been studied previously and are also influenced by monetary policy.

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