

ORIGINAL ARTICLE



Examining the Static and Dynamic Relationship Between Policy Rates and Stock Prices: A Panel Data Analysis

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Abstract

This study aims to examine the impact of the central bank's interest rate on the stock price of the top five largest capitalization companies in Indonesia from January 2009 to December 2022. The research method employs both static and dynamic approaches, including Ordinary Least Squares (OLS), Robust Least Squares (RLS), Dynamic Ordinary Least Squares (DOLS), and Fully-Modified Ordinary Least Squares (FMOLS) methods. The results of econometric estimation align with the theory and this study's hypothesis, indicating that the increase of the central bank's interest rate negatively impacts company stock prices, especially in the long term. This valuable empirical evidence suggests that investors with a long-term perspective may need to reassess their portfolios in light of anticipated changes in monetary policy. Proactively monitoring these developments can help companies and investors make timely and well-informed decisions.

Introduction

Stock prices are influenced by overall economic conditions, and changes in policy rates are often viewed as indicators of the health of the economy [1–4]. When policy rates rise, it often signals a strong economy, but it can also increase borrowing costs for companies, potentially reducing their profitability. Conversely, lower policy rates can stimulate economic growth by encouraging borrowing and investment, but may also suggest an economy in need of stimulus [5–10].

These policy rate changes are closely watched by investors as they can affect company earnings, investor sentiment, and the overall stock market performance [11–13]. Additionally, different sectors may react differently to these changes, adding another layer of complexity to the relationship between policy rates and stock prices. Understanding these nuances is crucial for investors when making informed decisions in a fluctuating economic landscape [14–18].

In a more specific manner, when policy rates rise, the yields on fixed-income investments such as bonds also tend to rise. Investors may find these higher yields more attractive compared to the potential returns from stocks. This shift in preference from stocks to bonds, driven by the allure of higher bond yields, causes a decrease in demand for stocks and, consequently, a potential decline in stock prices [19–22].

Furthermore, the valuation of stocks is often based on future expected cash flows. The present value of these future cash flows is determined by discounting them at a certain rate, often referred to as the discount rate. This rate is influenced by policy rates. When policy rates rise, the discount rate used to evaluate future cash flows also increases. This, in turn, results in lower present values and, consequently, lower stock prices [23–26]. Additionally, companies often use debt to finance their operations. When policy rates rise, the cost of borrowing increases, negatively impacting a company's profitability and, consequently, its stock price [27–32]. Based

on this conceptual framework, this study hypothesizes that policy rates have a negative influence on a firm's stock price.

Earlier studies, such as research conducted on the All Share Price Index (ASPI) in the Colombo Stock Exchange, have discovered a significant impact of policy rates on stock prices [33]. Additionally, studies focusing on non-financial firms listed in DJIA30 and NASDAQ100 have reported that policy rates lead to significant changes in stock prices [34]. Similarly, investigations into U.S. stock markets, including S&P 500, DJIA, and NASDAQ, have consistently identified a noteworthy negative relationship between policy rates and stock prices, particularly in the long term [35].

Notably, several studies in the past have focused on the Indonesian context, such as one that utilized monthly Jakarta Composite Index (JCI) data spanning from 2015 to 2019. This particular study revealed a significant impact of policy rates on the stock price [36]. Furthermore, another investigation delved into the relationship between policy rates and stock prices, utilizing monthly Composite Stock Price Index (CSPI) data from the Indonesia Stock Exchange (IDX) for the period 2009-2013. The findings indicated a noteworthy negative and significant effect of policy rates on stock prices [37]. Similarly, a study covering the period 2015-2018 and utilizing monthly CSPI data in IDX replicated these results, reinforcing the evidence of a negative and significant influence of policy rates on stock prices [38]. Previous studies in Indonesia have predominantly employed either static or dynamic approaches independently. In contrast, our study integrates these approaches to provide a more comprehensive and robust empirical analysis.

Based on the theoretical concept and previous studies explained, this study provides new insights by integrating both static and dynamic approaches to examine the impact of policy rates on stock prices in Indonesia's top five largest capitalization companies. The objective of this study is to offer a more comprehensive empirical understanding, particularly from a long-term perspective, of the relationship between monetary policy, represented by policy rates, and the fluctuation in the performance of firms' stock prices.

Materials and Methods

Detailed information regarding the policy rate and stock price variables utilized in this study is available in Table 1. The study employed monthly data covering the period from January 2009 to December 2022 for the top five companies listed on the Indonesia Stock Exchange (IDX) with the largest market capitalization as of January 2023. These companies include PT. Bank Central Asia Tbk (BBCA), PT. Bank Rakyat Indonesia Tbk (BBRI), PT. Bayan Resources Tbk (BYAN), PT. Bank Mandiri Tbk (BMRI), and PT. Telekomunikasi Indonesia Tbk (TLKM). Data for this study was sourced from Yahoo Finance (YF) [39] and Bank Indonesia (BI) [40].

Table 1. Variable details.

Variable (Symbol)	Units (Sources)	Logarithmic Form	Definition
Stock Price (STP)	Rupiah (YF)	lnSTP	A stock price is the price of a single share within a group of tradable equity shares owned by a company.
Policy Rate (POR)	Percentage (BI)	lnPOR	A policy rate is the rate at which a central bank lends money to commercial banks.

The mathematical function of this study is as follows:

$$STP = f(POR) \quad (1)$$

Where STP refers to the stock price, and POR stands for the policy rate. Consequently, the econometric model of the relationship between variables is as follows:

$$STP_{it} = \beta_0 + \beta_1 POR_{it} + \varepsilon_{it} \quad (2)$$

Furthermore, the variables STP and POR in Equation 2 were transformed into logarithmic form, as follows:

$$\ln STP_{it} = \beta_0 + \beta_1 \ln POR_{it} + \varepsilon_{it} \quad (3)$$

Where i represents the company, t represents the time of the study period, β_0 signifies the intercept, while β_1 represent the coefficient, and ε denotes the error term.

The methodologies employed in this study encompass both static and dynamic approaches. The static methods include Ordinary Least Squares (OLS) and Robust Least Squares (RLS), while the dynamic methods consist of Dynamic OLS (DOLS) and Fully-Modified OLS (FMOLS).

OLS, a widely used method in regression analysis, seeks to identify a line that minimizes the sum of squared differences between observed and predicted values. It operates under the assumption that errors (residuals) are normally distributed, possess constant variance, and are independent. Conversely, RLS is a modification of OLS designed to address the impact of outliers or influential data points. OLS can be sensitive to extreme values, but RLS mitigates this by assigning less weight to outliers, thereby enhancing the robustness of the regression [41,42].

Moving to dynamic approaches, DOLS is a technique employed in time-series analysis to tackle the issue of nonstationarity in variables. It incorporates lagged differences of the variables in the model to ensure stationarity, rendering it suitable for analyzing cointegrated time series. On the other hand, FMOLS is another method utilized in time-series analysis, specifically for cointegration analysis. It extends the standard OLS method by introducing additional adjustments to account for potential endogeneity and serial correlation in the data. FMOLS incorporates a set of corrections to the OLS estimates, making it more suitable for estimating the parameters of cointegrated relationships in nonstationary time series data [43].

Results and Discussion

Descriptive Statistics

As presented in Table 2, BYAN company holds the records for both the highest and lowest stock prices observed during the study period, reaching a peak of IDR21,500 and a trough of IDR85. Additionally, BBKA company claims the highest average stock price at IDR3,742. The standard deviation values indicate significant volatility in the stock prices of all companies throughout the study period. To address this issue, we opted to transform the data into logarithmic form. This transformation not only helps mitigate the problem of high volatility but also ensures uniform percentage econometric results for the policy rate variable. Among the companies, BYAN exhibits the most volatile stock price, followed by BBKA, making them the top two in terms of volatility.

Table 2. Descriptive statistics.

Variable	Ticker	Mean	Median	Maximum	Minimum	Std. Dev.
STP	BBKA	3742.22	2697.50	9300.00	470.00	2503.38
	BBRI	2564.32	2315.00	5650.00	340.00	1383.23
	BYAN	2319.13	1096.25	21500.00	85.00	4116.26
	BMRI	2691.70	2581.25	6025.00	366.28	1152.97
	TLKM	2930.08	2995.00	4690.00	1080.00	1063.39
POR	-	5.76	5.75	8.75	3.5	1.36

Unit Root Test

The unit root test is employed to ascertain the stationarity of a dataset, a crucial consideration in dynamic models as it influences the applicability of various statistical methods. Stationarity implies the absence of trends or systematic patterns in the data. In this study, the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are utilized to identify any unit root issues in the dataset [44]. As demonstrated in Table 3, both variables show stationarity in the 1st difference order. This suggests that there are no unit root problems, and the average and variability of the data remain consistent over time, enhancing the reliability of dynamic estimation.

Table 3. The results of Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root test.

Data Type	Model	STP				POR			
		ADF		PP		ADF		PP	
		Level	1 st Diff.	Level	1 st Diff.	Level	1 st Diff.	Level	1 st Diff.
Panel	Top 5 Companies	0.34	0.00*	0.015**	0.00*	0.21	0.00*	0.18	0.00*

Note: Significant *(1%), **(5%)

Cointegration Test

A cointegration test is utilized to assess whether a group of variables is cointegrated, and in this research, the Johansen-Fisher cointegration test [45] is applied. As depicted in Table 4, the model displays robust and statistically significant cointegration at a 1% confidence level. This finding supports the conclusion that the dynamic estimation methods employed in this study reveal a stable long-term relationship among the variables.

Table 4. The results of Johansen-Fisher panel cointegration test.

Data Type	Model	Hypothesized No. of CE(s)	Fisher Stat.* (from trace test)	Prob.
Panel	Top 5 Companies	None	23.40*	0.0094
		At most 1	26.74*	0.0029

Note: Significant *(1%)

Econometric Results of Static Approach

The outcomes of OLS and three RLS methods—M-estimation, S-estimation, and MM-estimation—regarding the static impact of POR on STP are intriguing. As presented in Table 5, results from all four estimation methods consistently demonstrate a highly significant influence of POR on STP, with probability levels well below 1%. Despite the relatively low R-squared value, attributed to the utilization of only one independent variable, the Standard Error (S.E.) of the regression value is notably close to zero. This indicates high precision in the results, leading us to conclude that POR significantly affects STP.

The coefficients in all four estimation results consistently indicate a negative impact of POR on STP, aligning with the hypothesis of this study. Specifically, according to the OLS results, a 1.0% increase in POR is associated with a potential decrease in STP by as much as 1.4001%. Moreover, the RLS methods—M-estimation, S-estimation, and MM-estimation—suggest that a 1.0% increase in POR could lead to decreases in STP by approximately 1.3646%, 0.9599% and 1.3646%, respectively.

Econometric Results of Dynamic Approach

Consistent with the static results, the dynamic results also indicate a significant impact of POR on STP, especially in the long term. As shown in Table 6, both DOLS and FMOLS present probability values at a highly significant level, well below 1%. Although the R-squared value slightly falls below the standard 60% level, the S.E. of the regression provides a similar indication to the static results, with a value close to zero, implying high precision in the results.

Table 5. The static results of OLS and RLS estimation for the impact of POR on STP.

Method	Independent Variable	Coefficient	Std. Error	t-Statistic	Prob.
OLS	Constant	10.0809	0.1363	73.9912*	0.0000
	POR	-1.4001	0.0784	-17.8662*	0.0000
		R-squared = 0.2758 S.E. of regression = 0.5725			
RLS (M-estimation)	Constant	10.048	0.1354	74.1900*	0.0000
	POR	-1.3646	0.0779	-17.5171*	0.0000
		R-squared = 0.2451 S.E. of regression = 0.5733			
RLS (S-estimation)	Constant	9.5224	0.1772	53.7285*	0.0000
	POR	-0.9599	0.1019	-9.4166*	0.0000
		R-squared = 0.1979 S.E. of regression = 0.6162			
RLS (MM-estimation)	Constant	10.0528	0.1363	73.7751*	0.0000
	POR	-1.3646	0.0784	-17.4103*	0.0000
		R-squared = 0.2417 S.E. of regression = 0.5736			

Note: Significant *(1%)

The long-run variance value is also relatively low, which is below 1.0, signifying a stable long-term relationship between POR and STP.

The results from both DOLS and FMOLS also yield coefficient values that align with the hypothesis of this study, indicating that POR has a negative impact on STP in the long term. Specifically, the DOLS results suggest that a 1.0% increase in POR can lead to a long-term decrease in STP by 1.4002%. Similarly, the FMOLS results indicate that a 1.0% increase in POR may lead to a long-term decrease in STP by 1.3969%.

Table 6. The dynamic results of DOLS and FMOLS estimation for the impact of POR on STP.

Method	Independent Variable	Coefficient	Std. Error	t-Statistic	Prob.
DOLS	POR	-1.4002	0.1358	-10.3099*	0.0000
		R-squared = 0.5126			
		S.E. of regression = 0.4709			
		Long-run variance = 0.9774			
FMOLS	POR	-1.3969	0.1302	-10.7335*	0.0000
		R-squared = 0.5078			
		S.E. of regression = 0.4637			
		Long-run variance = 0.8806			

Note: Significant *(1%)

Discussion

The findings suggest a consistently significant and negative relationship between policy rate and stock price across different techniques. The OLS and RLS methods employed are reflected in the highly significant influence of policy rates on stock price, as indicated by probability levels well below 1%. The precision of the results, emphasized by the low standard error of the regression value, strengthens the conclusion that policy rate has a significant impact on stock price.

The negative coefficients consistently observed across all estimation methods further support the study's hypothesis. The directionality of the impact indicates that an increase in policy rate is associated with a decrease in stock price. This aligns with economic intuition, as higher policy rates often imply increased borrowing costs, which can negatively affect corporate profitability and, consequently, stock prices.

The analysis also extends to the dynamic aspect, with the examination of DOLS and FMOLS. The findings in the dynamic analysis echo those of the static analysis, reinforcing the long-term

negative impact of policy rates on stock prices. The stability of the long-term relationship, as indicated by the low long-run variance value, adds credibility to the conclusion. Despite the slightly lower R-squared value in the dynamic analysis, the consistency of results and the precision indicated by the low S.E. of the regression value bolster the argument for a significant and negative influence of policy rate on stock price in both static and dynamic contexts.

Conclusions

The study's estimation results consistently reveal a significant negative correlation between the central bank's policy rates and the firm's stock prices across static and dynamic methods. The negative coefficients indicate that an increase in policy rates is associated with decreased stock prices, aligning with economic intuition. Dynamic analysis reinforces these findings, emphasizing a long-term perspective. The relationship's stability, low long-run variance, and consistent precision across static and dynamic analyses collectively support the argument for a significant and negative influence of policy rates on a firm's stock prices.

The identified decrease in stock prices following an increase in policy rates emphasizes the importance of considering this factor in investment decisions. Investors and policymakers should be aware of this significant and enduring influence of policy rates on stock prices, urging a cautious approach in times of potential rate adjustments. Strategic financial planning should incorporate this insight, focusing on risk mitigation and long-term resilience to navigate the potential impact on firms' stock values.

While the valuable findings of this study are crucial, it is essential to address the limitation that arises from using only a single macroeconomic factor, namely policy rates, to examine the impact on stock prices. Future studies could incorporate additional macroeconomic variables, such as economic growth, tax rates, consumer price index, as well as global events and geopolitical risks, to provide a more comprehensive understanding of the impact of macroeconomic factors on stock prices.

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