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Analysis of the Effect of Monetary Policy on Green Bonds in ASEAN-5 Countries

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ABSTRACT: This study aims to examine the impact of monetary policy on green bonds in ASEAN-5 countries in both the short and long term. The monetary policy variables include foreign exchange reserves, exchange rates, and reference interest rates, with trading volume as a supporting variable. This study uses quarterly data from 2016:Q1 to 2023:Q4 and applies the ARDL Pooled Mean Group (PMG) approach. The results show that, in the short term, all independent variables have no significant effect on green bonds. However, in the long term, foreign exchange reserves and interest rates have a negative effect, while exchange rates and trading volume have a positive effect on green bonds. These findings provide important implications for policymakers in promoting sustainable finance development.

KEYWORD: Green Bonds, Monetary Policy, Pooled Mean Group

1. INTRODUCTION

In recent years, global economic growth has led to increasing pressure on natural resources and environmental sustainability. This condition has encouraged the development of sustainable financial instruments, one of which is green bonds. Green bonds serve as an innovative financing tool that supports environmentally friendly projects while providing financial returns to investors. The growing potential of the green bond market will help mobilize funding for environmentally friendly projects that contribute significantly to the Sustainable Development Goals (SDGs). Despite the rapid growth of the green bond market, particularly in emerging economies such as ASEAN-5 countries, the role of monetary policy in influencing green bond performance remains relatively underexplored. Therefore, this study aims to analyze the effect of monetary policy on green bonds in ASEAN-5 countries, both in the short and long term.

The Green Bond market, first issued by the European Investment Bank in 2007, has opened the doors to a green bond market that is increasingly expanding to the ASEAN-5 region. Malaysia launched the world's first green sukuk in 2017 to finance climate-resilient growth (Saputro, 2023). The World Bank issues sustainable development bonds worth $50 billion to $60 billion annually in global capital markets. Proceeds from these bonds will be used to fund development programs in line with the World Bank's mission to eradicate extreme poverty, promote shared prosperity, and support the sustainable development goals.

Global economic crises such as the COVID-19 pandemic have significantly impacted monetary policy and the green bond market. Central banks' responses to these crises can lead to sharp price fluctuations in the green bond market. Climate change and sustainability are global challenges that require timely and responsive action (World Bank, 2018).

Despite the growing literature on green bonds and monetary policy, limited studies have specifically examined the dynamic relationship between monetary policy variables and green bond performance in ASEAN-5 countries. Most previous studies focus on developed markets or analyze green bonds without incorporating comprehensive monetary policy indicators. Therefore, this study aims to fill this gap by analyzing both short-term and long-term effects of monetary policy on green bonds using the ARDL Pooled Mean Group (PMG) approach. This research provides a more comprehensive understanding of how monetary policy influences sustainable financial instruments in emerging economies, particularly in the ASEAN-5 region.

2. LITERATURE REVIEW

Green Bonds

Green bonds are bonds that promote economic sustainability and can support specific environmental projects related to climate and other issues (Chen, 2019). The first institution to issue green bonds was the World Bank, which launched a program called the Strategic Framework for Development and Climate Change (Kenny T. 2019). Green bonds have become one of the world's leading sustainable securities (Friede et al., 2015). The Financial Services Authority (OJK) reported a study on green bond development, showing that most green bonds are climate

bonds (OJK, 2016). The purpose of green bonds is to target environmentally sound capital projects (Maltais & Nykvist, 2021).

Foreign Exchange Reserve

Adam Smith (1937) emphasized that through free trade, countries can specialize in producing goods that are truly profitable and import goods that are less profitable. This increases global production and is mutually beneficial (Salvatore, 1995). This principle also applies to the issuance of green bonds, as they are financial instruments that allow countries and companies to raise the funds they need for environmentally friendly projects. Furthermore, financing green bonds will increase the production of environmentally friendly energy, improve resource management, and reduce carbon emissions.

Exchange Rate

The theory of purchasing power parity was proposed by Swedish economist Gustav Cassel (1921). Purchasing power parity theory states that a consumer's ability to purchase domestic products will be in line with their ability to purchase foreign products (Madura, 2006). If the value of the domestic currency is higher than the value of a foreign currency, imported goods can be valued higher in the domestic currency (Carlos, et al., 2023).

Interest Rate

Interest rates, operating costs, and expected returns are all considerations when making investments. The expected rate of return is called the "Marginal Efficiency of Capital" (MEC). If the expected rate of return (MEC) is lower than the interest rate, then investment will not be made (Astuti, 2018). However, Keynes also stated that interest rates are not the only factor influencing investment; other factors influence investment, such as the economic situation (Amin, 2003); (Rahajeng, 2014).

Trading Volume

Portfolio Theory, according to Harry M. Markowitz (1927), refers to selecting a portfolio that maximizes expected returns depending on the level of risk accepted. The basic form of portfolio theory assumes that future returns on securities can be predicted (Nadiva, 2016). Portfolio theory is the foundation or starting point for all current financial theory (Manurung, 2021). It emphasizes that increasing the number of bonds in a portfolio will generate greater returns.

3. RESEARCH METHODS

Time series data analysis, also known as time series analysis, is the process of understanding and creating predictive values from time series data patterns (Robison & Sciences, 2020). Economic analysis shows that in the long run, the relationship between the variables under consideration is as established by theory. This means that in the long run, the properties of the relationship remain intact. Therefore, researchers used a suitable method, namely the pooled mean group.

Stationarity Test

This test is considered stationary if the probability value of the tested variable is (<0.05). The PARDL test procedure uses the Levin, Lin & Chu methods, the Augmented Dickey-Fuller (ADF)-Fisher Chi-Square test, and the PP-Fisher Chi-Square test, all of which must meet the requirements of stationarity at the first difference (1df) and level levels.

Lag Cointegration Test

Methods that can be used to conduct cointegration tests include the KAO Residual Cointegration Test (Engle Granger Based) and the Pedroni Residual Cointegration Test, provided cointegration occurs.

Pooled Mean Group

To identify variables that may influence green bonds in this study, pooled mean group (PMG) data was used. Pasaran et al. (1999) introduced the PMG approach to the ARDL panel. In research conducted by (Ramdhani et al., 2020), (Bahera & Mishra, 2020) and (Anwar, Lestari, & Chendrawan, 2020) the ARDL panel model can generally be written as follows:

$$Y_{i,t} = \alpha_{0i} + \sum_{i}^{n} \lambda 1_i Y_{i,\,t-i} + \sum_{i}^{n} \lambda n_i Y_{i,\,t-i} + \beta 1X1_{i,\,t-i} + \beta nXn_{i,\,t-i} + \mu_{i,t}$$

Thus, the long-term relationship equation model can be written as follows (Anwar, Lestari, & Chendrawan, 2020):

$$Gb_{i,t} = \alpha_{0i} + \sum_{i=1}^{n} \beta 1FER_{i,t-1} + \sum_{i=1}^{n} \beta 2ER_{i,t-1} + \sum_{i=1}^{n} \beta 3IR_{i,t-1} + \sum_{i=1}^{n} \beta 4VT_{i,t-1} + \mu_{i,t}$$

Where:

GB = Green Bonds
FER = Foreign Exchange Reserves
ER = Exchange Rate
IR. = Interest Rate
VT = Trading Volume

4. RESULTS AND DISCUSSION

Stationarity Test Results

The stationarity test is used to determine whether time series data contains a unit root. Data stationarity was tested using the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests.

Table 1. Panel Unit Root Test Results

Variable GB		
(1st Diff)		
Method	Statistic	Prob
ADF - Fisher Chi-square	97.2885	0.0000
PP - Fisher Chi-square	135.532	0.0000
Variable FER		
(1st Diff)		
Method	Statistic	Prob
ADF - Fisher Chi-square	53.8348	0.0000
PP - Fisher Chi-square	79.0926	0.0000
Variable ER		
(1st Diff)		
Method	Statistic	Prob
ADF - Fisher Chi-square	61.9222	0.0000
PP - Fisher Chi-square	72.2319	0.0000
Variable IR		
(1st Diff)		
Method	Statistic	Prob
ADF - Fisher Chi-square	.	0.0000
PP - Fisher Chi-square	32.5604	0.0000
Variable VT		
(1st Diff)		
Method	Statistic	Prob
ADF - Fisher Chi-square	67.9656	0.0000
PP - Fisher Chi-square	161.129	0.0000

Source: Eviews 12

The results in Table 4.1 show that the variables GB, FER, ER, IR, and VT are stationary at the first difference level at a significance level of α = 5 percent, indicating that one of the requirements of the pooled mean group model has been met.

Cointegration Test

The cointegration test in this study aims to determine whether there is a long-term relationship between the variables. In this Pooled Mean Group model, the KAO Residual Cointegration Test is used at a significance level of α = 10 percent (10%).

Table 2. Cointegration test results

ADF	t-Statistic	Prob
	-1.552053	0.0603
Residual Variance	24.04721	
HAC Variance	3.936322	

Source: Eviews 12

The test results indicate cointegration, or a long-term relationship, between the dependent variable (Green Bonds) and the independent variables (Foreign Exchange Reserves, Exchange Rate, Interest Rate, and Trading Volume), as seen from the probability value of 0.0603 (prob. Value <0.10).

PMG Estimation Results

The PMG estimation can explain dynamic regression in the analysis of short- and long-term effects. This model is accepted if it has a cointegration lag. The main assumption is that the coefficient value has a negative slope with a significance level of 5%. To analyze the direction of the variables' influence in the short and long term, a significance test was conducted using a t-statistic. The t-test was conducted at a significance level of α = 5 percent, with a t-table value of 1.9754.

Table 3. Pooled mean group estimation results

Long Term			
Variable	**Coefficient**	**T-Statistic**	***Prob.***
LN_GB			
LN_FER	-0.965161	-3.015360	0.0032
LN_ER	1.160503	2.184382	0.0309
LN_IR	-0.467036	-2.027818	0.0449
LN_VT	3.162287	4.900126	0.0449
Short Term			
COINTEQ01	-0.612451	-2.337172	0.0211
D(LN_GB(-1))	-0.308260	-1.067716	0.2879
D(LN_GB(-2))	-0.271066	-1.203511	0.2312
D(LN_GB(-3))	-0.248364	-1.518001	0.1317
D(LN_FER)	9.782218	0.882279	0.3795
D(LN_ER)	0.044334	0.004336	0.9965
D(IR)	1.765978	1.698350	0.0921
D(LN_VT)	-1.643105	-1.699455	0.0919

Source: Eviews 12

The pooled mean group estimation is used to assess both long-term and short-term performance. The next requirement is that COINTEQ01 must be significant at a level below 0.05 percent and must be negative. The COINTEQ01 value of -0.612451 is already negative with a probability of 0.0211 and is significant, thus meeting the PMG requirement. The ECT value is negative and significant at -0.612451 with a probability of 0.0211, indicating that the independent variable is undergoing long-term equilibrium adjustment with a speed of adjustment of 6.12 percent per quarter.

Based on the short-term PMG estimation results, The t-statistic value for foreign exchange reserves is 0.882279, which is lower than the critical value of 1.9753, indicating that the variable has no significant effect on green bonds in the short term.This means that there is no partial effect of foreign exchange reserves on short-term green bonds in ASEAN-5 countries. The t-statistic value for foreign exchange reserves is 0.004336, which is lower than the critical value of 1.9753, indicating that the variable has no significant effect on green bonds in the short term. This means there is no effect of the exchange rate on green bonds in the short term. The t-statistic value for foreign exchange reserves is 1.698350, which is lower than the critical value of 1.9753, indicating that the variable has no significant effect on green bonds in the short term. This means there is no effect of the benchmark interest rate on green bonds in the short term in ASEAN-5 countries. The t-statistic value for foreign exchange reserves is -1.699455, which is lower than the critical value of 1.9753, indicating that the variable has no significant effect on green bonds in the short term. This means

there is no effect of trading volume on green bonds in the short term in ASEAN-5 countries.

Based on the long-term PMG estimation results, the t-statistic value for foreign exchange reserves is -3.015360, which is lower than the critical value of -1.975387 at $\alpha = 5\%$, indicating that H_0 is rejected. This result implies that foreign exchange reserves have a significant long-term effect on green bonds in ASEAN-5 countries. The coefficient of -0.965161 indicates that a 1% decrease in foreign exchange reserves in the previous period leads to an increase of 0.965161% in green bonds in the long term, ceteris paribus. This finding is consistent with Kocaarslan (2021), who found that foreign exchange reserves negatively affect green bonds. This may occur because the appreciation of reserve currencies, such as the US dollar, increases the diversification capacity of green bond investments.

Furthermore, the t-statistic value for the exchange rate is 2.184382, which exceeds the critical value of 1.975387 at $\alpha = 5\%$, indicating that H_0 is rejected. This suggests that the exchange rate has a significant long-term effect on green bonds in ASEAN-5 countries. The coefficient of 1.160503 implies that a 1% increase in the exchange rate in the previous period increases the value of green bonds by 1.160503% in the current period, ceteris paribus. This result is in line with Reboredo and Ugolini (2019), who found a positive relationship between exchange rates and green bonds.

Meanwhile, the t-statistic value for the benchmark interest rate is -2.027818, which is lower than the critical value of -1.975387 at $\alpha = 5\%$, indicating that H_0 is rejected. This implies that the benchmark interest rate has a significant long-term effect on green bonds. The coefficient of -0.467036 indicates that a 1% decrease in the benchmark interest rate in the previous period reduces the value of green bonds by 0.467036% in the current period, ceteris paribus. This finding is consistent with Dewi et al. (2016), who found that interest rates negatively affect bond prices, as increases in interest rates tend to reduce bond values.

Finally, the t-statistic value for trading volume is 4.900126, which exceeds the critical value of 1.975387 at $\alpha = 5\%$, indicating that H_0 is rejected. This suggests that trading volume has a significant positive effect on green bonds in ASEAN-5 countries. The coefficient of 3.162287 indicates that a 1% increase in trading volume in the previous period increases green bond demand by 3.162287% in the current period, ceteris paribus. This result is consistent with Reboredo and Ugolini (2019), who found that trading volume positively influences green bonds.

5. CONCLUSION

This study concludes that monetary policy variables do not significantly affect green bonds in the short term in the ASEAN-5 countries during the period from 2016:Q1 to 2023:Q4. However, in the long term, foreign exchange reserves and interest rates have a negative impact, while exchange rates and trade volumes have a positive impact on green bonds. These findings suggest that monetary policy plays a more significant role in influencing the performance of green bonds in the long term compared to the short term.

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