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Article

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The impact of a crisis on monetary policy's influence on financial markets: Evidence from the COVID-19 pandemic

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ABSTRACT

This study analyzes the effect of monetary policy, measured by interest rates and money supply, on financial markets. Furthermore, it studies the impact of a crisis on monetary policy's influence on financial markets. The stock and the bond market are used to reflect financial markets. This quantitative study is based on daily data from Thailand before, during and after the COVID-19 pandemic for 15 years. The article finds that interest rate and money supply increases lead to increased stock returns and increased government bond yields. Moreover, during a crisis, interest rate and money supply changes have a larger impact on stock returns and bond yields. The greater the severity of a crisis, the larger the effect of interest rate and money supply changes on financial markets. The results suggest that the central bank may use monetary policy to a different extent during a crisis than during normal times. Investors should consider adjusting their investment strategies during times of crisis to account for the larger impact of monetary policy on financial markets.

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1. Introduction

The effects of monetary policy are stated in monetary economic factors like employment, output and inflation. There are substantial delays in dissemination of policies, and monetary policy measures like variations in the central bank's interest rate only have a tangential effect on these variables. The stock market, corporate and government bonds, mortgage markets, currency markets, and other bigger financial markets, on the other hand, are quick to assimilate new information. Hence, adjustments to the tools of monetary policy can be found more directly and immediately using data of financial markets. Knowing the connection between monetary policy and the values of financial assets is crucial for comprehending the mechanism by which monetary policy is transmitted, as changes in asset values are important in a number of channels. Romer and Romer (2000) found that the communication from the central bank of its policy intentions can also have a substantial impact on interest rates. A crucial instrument that central banks utilize to control an economy is monetary policy. The goals of monetary policy are to promote economic growth, price stability, and employment. Bernanke (2002) contended that by modifying the money supply and interest rates, the central bank can ensure price stability. By controlling the total quantity of money available to the nation's businesses, consumers, and banks as well as by

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altering the target interest rate, the central bank of a country can support sustainable economic growth. As pointed out by Friedman (2000), the way monetary policy is handled can have a significant impact on various aspects of the economy. This includes its effects on employment levels, overall economic activity, the total output of goods and services, and even the rate at which prices rise or fall in the market. In a study conducted by Clarida et al. (2002), they discovered that a policy centered on keeping inflation in check can play a vital role in stabilizing both the economy's output and inflation rates, especially when faced with unexpected economic shocks. Additionally, Taylor (1993) argued that implementing a clear and defined policy rule can be more effective when it comes to controlling inflation. This approach provides transparent guidance to participants in the financial markets, making it easier for them to make informed decisions. Through adjustments in the money supply and interest rates, monetary policy can also exert its influence on financial markets, including the bond and stock markets. The effect of monetary policy can potentially cause movements in stock values and bond yields. Interest rates are a crucial tool employed by central banks to manage monetary policy. When a central bank lowers interest rates, borrowing becomes cheaper, encouraging businesses and consumers to take out loans and invest in the economy. This can stimulate economic growth, increase employment and increase stock prices. To the contrary, when a central bank rises interest rates, borrowing becomes more expensive, deterring borrowing and investment, which can slow down economic growth, curb inflation and lower stock prices. In a recent article, Sekandary and Bask (2023) used the Panel Smooth Transition Regression model and found a negative relation between monetary policy surprises and stock market returns. Gürkaynak et al. (2022) showed that stock prices respond to monetary policy announcements and the reaction depends on the form and maturity of debt issued by the companies. The money supply plays a pivotal role in shaping monetary policy. The central bank has the power to influence it through actions such as purchasing government assets or lowering the reserve requirements for banks. When the central bank takes such measures to increase the money supply, it effectively pumps more funds into the lending system, leading to a boost in stock values. Conversely, if the central bank sells government securities or raises reserve requirements, it can trim down the money supply. This reduction in available money for lending can have the effect of lowering the quantity of money circulating in the economy. Understanding the connection between interest rates and the money supply is essential for the effectiveness of monetary policy. For example, if the central bank aims to stimulate economic growth by reducing interest rates, it may opt to increase the money supply to make more funds available for borrowing. On the other hand, if the central bank seeks to combat inflation by raising interest rates, it might choose to decrease the money supply, thereby restricting the availability of credit. Sellin (2001) discovered that when projecting future stock returns, money can be useful. If the central bank takes measures to stimulate economic growth, such as by increasing the money supply, this can create a positive outlook for the economy and result in improved investor confidence, which can raise stock prices. Conversely, if the central bank takes measures to curb inflation, such as by reducing the money supply, this can create a negative outlook for the economy and lead to decreased investor confidence, which can drive down stock prices. Recently, Wen et al. (2022) discovered a negative effect of monetary policy uncertainty on stock returns in most countries, using a quantile-on-quantile approach. In an event study, Harjoto et al. (2021) showed that monetary policy stimulus lead to positive abnormal stock returns. Monetary policy can exert a significant effect on bond markets, particularly by influencing bond yields. When the central bank implements measures to lower interest rates, it often results in reduced bond yields. This occurs because investors become more inclined to accept lower returns on their investments in fixed-income securities. Conversely, when the central bank decides to raise interest rates, it typically leads to higher bond yields. This happens because investors begin to seek a greater return on their investments in fixed-income instruments as interest rates climb. In a recent study, Pflueger and Rinaldi (2022) demonstrated a surge in long-term bond yields in response to a sudden increase in policy rates using a model of monetary policy and time-varying risk aversion.

In this article, I present concrete empirical data that sheds light on the relationship between monetary policy and two pivotal financial markets: the stock market and the bond market. Stocks are widely regarded as one of the most frequently monitored asset classes within the economy. They are often considered sensitive to fluctuations in economic conditions. Monetary policy decisions exert a noticeable influence on stock prices, and they are closely linked to the real economy through two significant

channels: the wealth effect channel, which affects consumer spending, and the balance sheet channel, which impacts investment spending. A recent study showed that monetary policy has a significant impact on the stock market (Prabu et al., 2020). Using a structural spatial autoregression (SAR) model, Di Giovanni and Hale (2022) found a direct link between US monetary policy shocks and stock returns. The first objective of this study is to analyze the effect of monetary policy on financial markets. This involves examining how changes in monetary policy, such as changes in interest rates and money supply, affect the behavior of financial markets. The study investigates how changes in monetary policy impact stock returns and bond yields. The second objective is to study the impact of a crisis on monetary policy's influence on financial markets. This involves examining how changes in the economic and financial environment during a crisis may alter the success of monetary policy tools. During a crisis, investors may become more risk-averse and less responsive to interest rate changes or other policy tools. Alternatively, policymakers may need to adopt unconventional policy tools to address the specific challenges posed by the crisis. The first objective contributes to the existing body of research by analyzing the relationship between monetary policy and financial markets. While this relationship has been studied before, new findings, using a multiple regression approach with recent data from Thailand can provide new insights. This study focuses on specific aspects of monetary policy, i.e. interest rate changes and money supply adjustments and investigates their impacts on various financial markets, i.e. the stock market and bond market. Moreover, the novelty comes from using a combination of data from Thailand of monetary policy and financial markets to provide a comprehensive analysis of how monetary policy influences financial markets. The second objective recognizes the importance of analyzing the interaction between monetary policy and financial markets during a crisis, which presents unique challenges and dynamics. By investigating the impact of a crisis on the relationship between monetary policy and financial markets, this study can shed light on how central banks' actions and market reactions may differ in times of stress compared to normal economic conditions. This research examines the effectiveness of monetary policy tools in stabilizing financial markets during a crisis. This study also investigates how the impact of monetary policy on different financial markets (stock and bond market) varies during a crisis, highlighting potential asymmetries or changing dynamics. These objectives contribute to the research gap by focusing on the specific interaction between monetary policy, financial markets, and crises. By combining these elements, the study aims to provide a better understanding of how monetary policy influences financial markets in different economic contexts and during times of heightened volatility or uncertainty. The novelty lies in examining the specific dynamics and effects of monetary policy in crisis situations, which can provide valuable insights for policymakers, investors, and researchers. In contrast to the existing literature, I investigate the impact of a crisis. The effect of monetary policy on financial markets was investigated in earlier studies. The impact of a crisis should be considered when looking into the effect. The central bank might have to use monetary policy in a different way and to a different extent during a crisis than during normal times. This study uses multiple regressions to analyze the effect of monetary policy on financial markets. Furthermore, it studies how a crisis may affect monetary policy's impact on financial markets. The stock and the bond market are used to reflect financial markets. This quantitative study is based on daily data from Thailand before, during and after the Covid-19 pandemic. The study aims to extend the understanding of the relation between the central bank's policy and financial markets, and to provide insights into how this relationship may change in different economic and financial contexts. By achieving these objectives, the study may help inform policymakers' decisions about how to use monetary policy to achieve their objectives, such as stabilizing the economy or promoting financial stability. The impact of a crisis on monetary policy's effectiveness and influence on financial markets is an important subject of discussion, which is more relevant than ever. Recently, central banks worldwide have been increasing interest rates to curb inflation. The increased interest rates may reduce economic activities and investments due to a higher cost of borrowing and consequently leading to lower stock prices, which affects both consumers and firms. In addition, higher interest rates reduce the market value of bonds, which in turn lowers the value of the balance sheet's assets and may create solvency issues for banks and other firms. Banks are obligated to keep a certain level of capital adequacy to cover potential losses. A significant drop in the value of their bond holdings can erode their capital, potentially leading to solvency issues. Similarly, firms that have issued bonds with fixed interest rates may face higher debt servicing costs as rates rise. Hence, it is crucial to investigate the effect of a crisis on the

link between monetary policy and financial markets as monetary policy and interest rate rises may have a larger impact during a crisis and therefore, affect banks, other firms and private borrowers severely. During crises, investors may react differently and traditional relationships between monetary policy actions and market responses may change. Exploring these shifts in market behavior adds novelty to the research. Understanding how monetary policy affects financial markets during crises can inform central banks and governments about the appropriate actions to take during such times and how to mitigate negative consequences. This complex web of interactions underscores the importance of central banks carefully considering the impact of interest rate and money supply changes during a crisis.

This article follows the following format: Chapter 2 provides an overview of the literature on current theories, before the research methodology, sample and data collection are explained in chapter 3, the analyses and findings are presented in chapter 4, the discussions are covered in chapter 5. This research study is summarized in chapter 6.

2. Literature review

2.1 Theoretical background

The impact of monetary policy on financial markets is a subject that draws insights from various economic theories and frameworks. The monetary policy transmission mechanism explores how changes in monetary policy, particularly interest rates and money supply, influence the real economy and financial markets. It encompasses numerous channels through which monetary policy impacts economic variables such as investment, consumption, inflation, and asset prices. The channels through which monetary policy affects the real economy and financial markets have been extensively studied. Bernanke and Blinder (1992) offered valuable insights into the role of the federal funds rate and the channels of monetary transmission. They emphasized how alterations in interest rates can impact economic variables. The interest rate channel, in particular, operates by influencing the cost of borrowing for households and businesses. When the central bank decides to hike interest rates, it tends to elevate the cost of borrowing, which, in turn, can lead to reduced investment and consumption spending. Conversely, a reduction in interest rates often stimulates borrowing and economic activity. Bernanke and Blinder (1992) also underscored the significance of the interest rate channel, underscoring its impact on lending rates, mortgage rates, and other interest-sensitive expenditures. Romer and Romer (2004) found that monetary policy shocks have substantial and persistent impacts on the economy. Mishkin (1996) investigated the lessons for monetary policy from the channels of transmission, shedding light on the mechanisms through which monetary policy actions affect the economy. Furthermore, the asset pricing theories focus on understanding the determinants of asset prices, including stocks, bonds, and other financial instruments. The Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT) explain how changes in interest rates, risk factors and investor expectations influence asset prices. The Capital Asset Pricing Model established by Sharpe (1964) explores how changes in risk factors and investor expectations influence asset prices.

2.2 Effect of an interest rate and money supply change on the stock and bond market

A decrease in the interest rate encourages people to spend money as borrowing becomes cheaper. People tend to save less and spend or invest more. Therefore, stock prices tend to increase and bond yields decrease. Many studies show the effect of an increase in the interest rate on stock returns and bond yields. Hafer (1986) stated in his study that a rise in interest rates will lower stock returns. Bernanke and Kuttner (2005) discovered that stock prices rise by 1% when the federal funds rate is dropped by 25 basis points. Ahmad et al. (2010) argued that rising interest rates would make it more expensive for firms to expand and result in a decrease in the firm's stock return. Bissoon et al. (2016) found in their research that there is a negative relation between stock price and interest rate value. An increase in stock prices is significantly impacted by a decrease in the loan rate (Huy et al., 2020). Stock prices fall as short-term interest rates rise, and the yield curve moves upward as a result (Rigobon & Sack, 2004). Ogbebor et al. (2021) examined the connections between interest rates, inflation, and

stock prices. Their findings imply that the increase in interest rates has a negative impact on stock returns. This negative relation between interest rates and stock returns can be explicated by the cash flow hypothesis. It is predicated that as interest rates rise, investors shift their funds from the stock market to the bond market in search of better yields, resulting in reduced stock returns.

However, other articles discovered a positive correlation between stock prices and interest rates. Interest rates exercise a positive and significant influence on stock market returns (Okpara, 2010). Schrank (2022) revealed that there is a positive relationship between interest rate changes and stock returns. Stock returns and 10-year government bond yields, which serve as proxies for interest rates, change in the same way in European nations. (Ferrer et al., 2016). Bayraci et al. (2018) discovered that fluctuations in 10-year government bond yields and market returns are correlated. A positive relation between interest rates and stock returns can be explained by applying the economic prospects hypothesis (Shahzad et al., 2017). Macroeconomic indicators like inflation expectations and economic forecasts are followed by both policy rates and stock indexes.

Other studies showed the relation between money supply and financial markets. The central bank's expansion of the money supply causes the interest rate to decline. The demand for money rises as a result of the drop in interest rates, matching the increased money supply. Tiryaki et al. (2019) found that money supply is positively related with stock returns. Pícha (2017) discovered that the stock market benefits from an increase in the money supply. Sun (2020) concluded that monetary policy announcements have a substantial influence on the yield curve. Ioannidis and Kontonikas (2008) showed that monetary policy changes substantially affect stock returns. When the stock market experiences both positive and negative shocks, the money supply and real interest rate decrease (Suhaibu et al., 2017). Macroeconomic information, including macroeconomic activities and financial factors, has predictive power for bond excess returns (Li et al., 2022). Camilleri et al. (2019) revealed that a key predictor of stock prices is the relation between policy rates set by the central bank and the amount of money in circulation. Tight monetary policies measured by money supply appear to retard the stock returns (Tiryaki et al., 2019). Money supply of the United States influences Canadian stock indices (Bhuiyan & Chowdhury, 2020).

Overall, several research indicate that bond yields will increase and stock returns would decrease in response to an increase in interest rates. Based on the existing literature, I can derive the following hypotheses.

Hypothesis 1: A decrease in the interest rate and an increase in money supply leads to an increase in stock index returns.

Hypothesis 2: An increase in the interest rate and a decrease in money supply result in an increase in government bond yields.

2.3 Impact of a crisis (Covid-19 pandemic) on monetary policy's influence on the stock and bond market

The existing literature of the effect of a crisis on monetary policy's influence is limited. Changes in interest rates throughout the pandemic period had a significant negative impact on the values of stock indices, according to Ozili and Arun (2020). Yilmazkuday (2022) analyzed the influence of monetary policy on exchange rates before and during the Covid-19 pandemic and discovered US monetary policy spillover impacts for various nations prior to Covid-19, but only for certain countries during Covid-19. Wei and Han (2021) showed that compared to the period before Covid-19, there has been a decline in the transmission of monetary policy by the central bank to several financial markets during the Covid-19 period. Prior to the 2007–2009 financial crisis, stock prices did not react strongly to changes in monetary policy (Paul, 2020). During the Covid-19 pandemic, the Federal Reserve Bank announcement on 9 April 2020 led to positive abnormal returns of the US stock market (Harjoto et al., 2021). Compared to the times before and after the crisis, more aspects and economic indicators had a major impact on stock returns during the crisis (Celebi & Hönig, 2019). During a crisis, monetary policy actions may be able to calm the markets (Heyden & Heyden, 2021).

Based on the existing studies, I can establish the following hypotheses.

Hypothesis 3: During the Covid-19 pandemic, interest rate and money supply changes have a greater impact on the stock market than before/after the pandemic.

Hypothesis 4: During the Covid-19 pandemic, interest rate and money supply changes have a greater impact on the bond market than before/after the pandemic.

Hypothesis 5: The greater the severity of the Covid-19 pandemic, the larger the effect of interest rate and money supply changes on the stock market.

Hypothesis 6: The greater the severity of the Covid-19 pandemic, the larger the effect of interest rate and money supply changes on the bond market.

3. Methodology and data

This study uses daily data from Thailand for the last 15 years, i.e. before, during and after the Covid-19 pandemic. The results are shown separately for the period of the Covid-19 pandemic and for the full period (before, during and after the pandemic) in the fourth chapter. The dependent variables are the log return of the stock market price index (SET) and the change in 10-year government bond yield. The independent variables are changes in money supply and interest rate (3 months interbank rate). The deposits at commercial banks are used as an approximation for money supply and are available daily. Bank deposits are a crucial component of money supply and can be considered a reasonable proxy for the money supply. By considering various types of bank deposits, a significant portion of the money supply within the banking system can be captured. Bank deposits provide a reliable and convenient measure that reflects the majority of money circulating in the economy and is closely tied to economic activity and monetary policy. Bank deposits play a significant role in the money supply and are the largest component of the money supply (Goodhart, 2013). Therefore, bank deposits serve as a reliable approximation for assessing the money supply within an economy. The data source is the Refinitiv Eikon Datastream. The data of the Covid-19 pandemic are the daily new cases provided by the WHO. The period of the Covid-19 pandemic in Thailand is defined as 13 January 2020 to 30 September 2022. On 13 January 2020, the first confirmed case of Covid-19 was discovered in Thailand. On 1 October 2022, Thailand declared Covid-19 as endemic and ended the Covid-19 Emergency Decree. The pandemic's level of severity is measured by the number of new daily confirmed cases. A high severity is defined as more than 249 new confirmed cases per day, which is the 50th percentile of the new daily confirmed cases. The data is analyzed by SPSS28. The data regressions are estimated using the pooled ordinary least square (OLS) model. The F test has been used to choose the estimation method that best fits the data. The following multiple linear regressions are used to test the hypotheses.

Log return of stock market price index and change in 10-year gov. bond yield: $y_t = \beta_0 + \beta_1 r_t + \beta_2 BD_t + \epsilon_t$ for the full period and Covid-19 period

Log return of stock market price index and change in 10-year gov. bond yield: $y_t = \beta_0 + \beta_1 r_t + \beta_2 BD_t + \beta_3 cov_t + \beta_4 cov_t * r_t + \beta_5 cov_t * BD_t + \epsilon_t$ for the full period

Log return of stock market price index and change in 10-year gov. bond yield: $y_t = \beta_0 + \beta_1 r_t + \beta_2 BD_t + \beta_3 sev_t + \beta_4 sev_t * r_t + \beta_5 sev_t * BD_t + \epsilon_t$ for Covid-19 period

r_t : interest rate change

BD_t : bank deposit change

cov_t : dummy variable for the Covid-19 pandemic (1 on days during the Covid-19 period, 0 otherwise)

sev_t : dummy variable for the severity of the pandemic (1 on days with a high severity, i.e. high number of new confirmed cases, 0 otherwise)

t: daily (either full period or only Covid-19 period)

4. Results and discussion

The following section shows the results of the analysis and discusses the findings.

Table 1 shows the descriptive statistics of the variables.

Robustness tests have been conducted. The White's test has been used to check for heteroscedasticity, with a p -value > 0.05 corresponding with no heteroscedasticity (White, 1980). The data partially exhibit heteroscedasticity effects (Tables 2–4). Hence, regressions with robust standard errors have been applied (Long & Ervin, 2000). The Durbin-Watson test has been used to check for autocorrelation (serial correlation), with a test statistic of 2.0 corresponding with zero autocorrelation (Durbin & Watson, 1950). The test results are shown in Tables 2 to 4 and indicate the absence of autocorrelation.

Table 2 shows the outcomes of the impact of interest rate and money supply changes on stock returns and bond yields. Interest rate increases and money supply increases lead to increased stock returns. All variables are significant. This finding partially confirms the first hypothesis. It is consistent with the existing literature as described in chapter 2. One possible explanation for the positive relation between interest rate changes and stock returns is that higher interest rates may indicate that the economy is growing and inflation is under control, which can boost investor confidence and lead to increased demand for stocks. Additionally, higher interest rates can lead to a stronger currency, which can benefit export-oriented companies and boost their stock prices. Additionally, if interest rates rise in response to inflation concerns, stocks may continue to perform well if firms are able to pass on higher costs to customers with the help of higher prices. Similarly, an expansion of the money supply can lead to higher stock returns as it increases consumer spending and business investment, leading to higher corporate earnings and stock prices. Moreover, when money supply is large, investors may be more likely to invest in riskier assets such as stocks, as the potential returns may be higher. Investors need to be ready for the possibility of short-term ups and downs in stock prices as a response to shifts in interest rates and the money supply. Central banks may consider the potential impact of their policy actions on stock markets. If they believe that expanding the money supply or adjusting interest rates can stimulate stock returns, they may incorporate this consideration into their policy-making process. Central banks may factor in the positive relation between interest rate changes and stock returns when making monetary policy decisions. They may be more willing to consider interest rate hikes as a tool to stimulate stock market returns, especially during economic recoveries. An increase in stock returns, if sustained, can have a wealth effect on consumers. When people perceive themselves as wealthier due to higher stock prices, they may be more inclined to spend, potentially boosting economic growth. A positive relationship between interest rate changes and stock returns can influence investors' asset allocation decisions. They may allocate a larger portion of their portfolios to equities to capitalize on the expected stock market gains during periods of rising interest rates. A positive relationship can contribute to positive market sentiment. When investors expect higher returns in stocks due to rising interest rates, it can lead to increased confidence in the overall economy.

Furthermore, interest rate increases lead to increased government bond yields. Money supply change is insignificant. This finding confirms the second hypothesis which stated a positive relationship between interest rate changes and bond yields. This positive relation can be explained as bond yields are closely tied to interest rates. The interest paid on bonds represents the return that investors receive for lending money to the government. When interest rates rise, investors demand higher yields on government bonds to compensate for the opportunity cost of holding these bonds instead of other investments that offer higher returns, such as stocks or corporate bonds. Higher interest rates also increase the risk of inflation, which can reduce the value of fixed-income investments. To compensate for this increased risk, investors demand higher yields on government bonds. The yield curve also illustrates the link between interest rates and bond yields. The relation between bond yields and their time to maturity is depicted

Table 1. Descriptive statistics.

Variable	Number of observations	Minimum	Maximum	Mean	Standard deviation
Log return of stock market price index	3977	−0.0496	0.0332	0.0001	0.0049
Change in 10-year gov. bond yield	3977	−0.3730	0.6500	−0.0007	0.0489
Interest rate change	3977	−0.7472	0.2255	−0.0005	0.0203
Bank deposit change (THB billion)	3977	−395.6696	735.3070	4.0550	30.8208

Table 2. $y_t = \beta_0 + \beta_1 r_t + \beta_2 BD_t + \epsilon_t$ for the full period and Covid-19 period.

	Full period		Covid-19 period	
	Log return of stock market price index	Change in 10-year gov. bond yield	Log return of stock market price index	Change in 10-year gov. bond yield
Interest rate change	0.034** (2.033)	0.075** (2.458)	0.156*** (3.941)	0.079** (2.319)
Bank deposit change	0.031* (1.832)	0.019 (1.330)	0.105** (2.389)	0.046 (1.356)
Observations	3977	3977	710	710
Durbin-Watson (test statistic)	1.990	1.816	2.107	2.063
White's test (p-value)	0.001	0.514	0.001	0.992

By using the OLS approach, the coefficient estimates are derived. T values in parentheses show significance at 99%, 95%, and 90% confidence levels and ***/**/* denotes this significance. The standardized coefficients betas are shown. Robust standard errors are used.

Table 3. $y_t = \beta_0 + \beta_1 r_t + \beta_2 BD_t + \beta_3 cov_t + \beta_4 cov_t * r_t + \beta_5 cov_t * BD_t + \epsilon_t$ for the full period.

	Log return of stock market price index	Change in 10-year gov. bond yield
Interest rate change	0.012 (0.551)	0.070*** (4.037)
Bank deposit change	0.001 (0.058)	0.008 (0.411)
Cov	-0.010 (-0.605)	0.027 (1.562)
Cov*r	0.069*** (3.912)	0.014 (0.700)
Cov*BD	0.049** (2.222)	0.017 (0.992)
Observations	3977	3977
Durbin-Watson (test statistic)	1.980	1.819
White's test (p-value)	0.001	0.401

By using the OLS approach, the coefficient estimates are derived. T values in parentheses show significance at 99%, 95%, and 90% confidence levels and ***/**/* denotes this significance. The standardized coefficients betas are shown. Robust standard errors are used.

Table 4. $y_t = \beta_0 + \beta_1 r_t + \beta_2 BD_t + \beta_3 sev_t + \beta_4 sev_t * r_t + \beta_5 sev_t * BD_t + \epsilon_t$ for Covid-19 period.

	Log return of stock market price index	Change in 10-year gov. bond yield
Interest rate change	0.005 (0.524)	0.049 (1.509)
Bank deposit change	0.160*** (4.481)	0.043 (0.736)
Sev	-0.035 (-0.769)	0.024 (0.679)
Sev*r	0.243*** (5.418)	0.045 (1.293)
Sev*BD	-0.085*** (-2.796)	0.007 (0.157)
Observations	710	710
Durbin-Watson (test statistic)	2.020	2.068
White's test (p-value)	0.127	1.000

By using the OLS approach, the coefficient estimates are derived. T values in parentheses show significance at 99%, 95%, and 90% confidence levels and ***/**/* denotes this significance. The standardized coefficients betas are shown. Robust standard errors are used.

by the yield curve. Typically, a rising interest rate environment leads to a steeper yield curve, with longer-term bond yields increasing more than short-term bond yields. This is because longer-term bonds are exposed to inflation and interest rate risks over a longer time horizon, which investors require compensation for in the form of higher yields. Rising government bond yields can make fixed-income investments, such as government bonds, more attractive. Investors seeking income from their investments may benefit from higher yields on bonds. However, existing bondholders may experience capital losses on their bond holdings. When interest rates rise, bond prices tend to fall. Therefore, bondholders who sell their bonds before maturity may receive less than the initial investment. Moreover, rising government bond yields can lead to higher interest rates for borrowers across the economy, including individuals, businesses and other levels of government. This can increase the cost of financing for mortgages, loans and other forms of credit. Central banks may respond to rising government bond yields by

adjusting their monetary policy. They can choose to raise interest rates to curb inflation or stabilize financial markets.

Moreover, the results show that the coefficients of interest rate and money supply changes for the Covid-19 period are larger and more significant than for the entire period. This confirms hypotheses 3 and 4. During the Covid-19 pandemic, interest rate and money supply changes have a larger impact on the stock and bond market. Money supply's effect on bond yields remains insignificant. All other variables are significant. During the Covid-19 pandemic and other crises, interest rate and money supply changes tend to have a larger impact on the stock and bond market than during normal times. This is because crises can lead to increased uncertainty, volatility, and risk aversion, which can amplify the impacts of monetary policy on the bond and stock market. During a crisis, investors may become more sensitive to interest rate changes and monetary policy as they try to assess the potential impact of the crisis on the economy and corporate earnings. This can lead to increased volatility in financial markets and greater fluctuations in stock and bond prices in response to policy changes. Moreover, during a crisis, central banks may reduce interest rates or increase the money supply to provide additional liquidity and support financial stability. However, these policy actions can also have unintended consequences, such as inflationary pressures or asset price bubbles, which can further disrupt financial markets. In addition, during a crisis, investors may be more focused on short-term market developments and may be more likely to react to policy changes quickly, rather than taking a longer-term perspective on market trends and underlying economic fundamentals. This can lead to increased volatility in stock and bond markets, as investors may be more likely to buy or sell assets based on short-term price movements, rather than on a careful assessment of market conditions. Furthermore, during a crisis, central banks often implement more aggressive monetary policy instruments, such as cutting interest rates and increasing the money supply, to boost the economy and support financial stability. These measures can lead to increased demand for stocks and bonds as market participants look for greater returns in a situation where interest rates are low. Additionally, during a crisis, interest rate and money supply changes can have a greater impact on investor sentiment and market expectations. If investors trust that the central bank is taking decisive action to support the economy and stabilize financial markets, they may become more optimistic about the future and more willing to invest in riskier assets like stocks and corporate bonds. During a crisis, the effect on financial markets is likely to be more pronounced, but the effects may vary depending on the specific type and severity of the crisis and the policies being implemented by central banks and other policymakers. Given the substantial influence of monetary policy in times of crises, investors may need to adapt their strategies for allocating assets accordingly. They should take into account how central bank decisions can impact various asset classes, including both stocks and bonds. In such challenging times, policymakers should also contemplate the benefits of collaborating closely with fiscal authorities. Coordinated efforts, combining monetary stimulus with targeted fiscal measures, can offer a more comprehensive and effective response to a crisis. This approach addresses not only demand-side issues but also supply-side shocks, providing a more balanced approach. Policymakers should have a flexible toolkit to address the amplified impact of monetary policy during crises. This may include unconventional policy tools such as asset purchases, yield curve control, or liquidity injections. It is crucial for central banks to recognize that their monetary policy decisions can have a heightened impact on financial markets during crises. This underscores the importance of carefully calibrated and timely policy responses. Effective communication becomes even more critical during such turbulent times. Central banks should maintain transparent communication regarding their policy intentions and objectives. This helps manage market expectations and reduces uncertainty. Overall, the stronger impact of monetary policy during crises suggests that central banks should exercise extra caution and use monetary policy more carefully. During crises, financial markets can become highly sensitive to variations in interest rates and money supply. Even small policy adjustments can lead to significant market reactions. Therefore, central banks should carefully consider the possible results of their actions on market stability.

Table 3 shows further evidence for hypothesis 3 and 4. During the Covid-19 pandemic, interest rate and money supply changes have a larger effect on the stock and bond market. The results display that the interaction variables $cov*r$ and $cov*MS$, which show the effect of interest rate and money supply changes during the crisis, are highly significant and indicate a strong effect of monetary policy on stock

markets. The effect of interest rate changes and money supply changes are greater and more significant during the crisis. During a crisis, there is typically increased uncertainty and volatility in financial markets. This heightened uncertainty can amplify the impacts of monetary policy on markets. Investors might become more careful and risk-averse, leading to greater sensitivity to changes in interest rates and money supply. During a crisis, liquidity conditions in financial markets can become strained. Interest policy rate and money supply changes can have a more significant impact on liquidity conditions during a crisis than during usual periods. For example, a cut in interest rates during a crisis can lead to a larger increase in lending and borrowing activity as businesses and households seek to manage cash flows and maintain liquidity. Central banks often implement more aggressive monetary policy measures during a crisis to support the economy and stabilize financial markets. These measures can lead to larger and more significant effects on financial markets than during normal times. For example, during the Covid-19 pandemic, many central banks reduced policy rates to almost zero levels and implemented extensive asset purchase programs to provide additional liquidity to financial markets. During a crisis, interest rate and money supply changes can have a larger impact on market expectations. If investors perceive that central banks are taking resolute steps to support the economy and secure financial market stability, they tend to grow more optimistic about the future. This optimism often translates into a greater willingness to invest in riskier assets like stocks and corporate bonds. The pronounced effects of monetary policy during crises imply that central banks should utilize monetary policy with greater attention and extra caution. Rapid or aggressive monetary policy actions can have unintended consequences. While the primary goal may be to stabilize markets and support the economy, such actions can sometimes lead to excessive risk-taking or asset bubbles in certain segments of the market. Hence, clear and consistent communication becomes crucial. Central banks should manage market expectations effectively to avoid surprises that can trigger market turbulence.

Table 4 shows support for hypothesis 5 and 6. The greater the severity of the Covid-19 pandemic, the larger the effect of interest rate changes and money supply changes on the stock and bond markets. The interaction variables $Sev*r$ and $Sev*MS$ show the impact of interest and money supply changes for periods with a high severity of the crisis. The interaction terms are significant and display a large impact of monetary policy during times of a high severity. During a more severe pandemic, there may be higher levels of economic uncertainty, which can increase the sensitivity of financial markets to changes in interest rates and money supply. A more severe pandemic can have a more significant impact on the underlying economy, causing more significant and extensive economic effects. This can make monetary policy changes more impactful as central banks seek to stabilize financial markets and support the economy. During a more severe pandemic, central banks may adopt more aggressive monetary policy measures to support the economy and stabilize financial markets. Such measures may have a larger impact on financial markets during a more severe pandemic, leading to larger movements in stock prices and bond yields. During a more severe pandemic, investors may adopt more defensive investment strategies, favoring safer assets like bonds and cash. As a result, changes in interest rates and changes in money supply may have a larger impact on bond markets, as investors seek out safe-haven assets. This can result in larger movements in bond yields and prices, which can spill over into the stock market. The relationship between money supply changes and stock returns becomes negative. This can be explained as during a severe pandemic, investors may become more risk-averse, and they may view increased money supply as a signal of potential future inflation or economic instability. The finding that the intensity of a crisis amplifies the influence of interest rate and money supply changes on financial markets carries several important implications. Investors should anticipate and be ready for heightened market volatility when severe crises strike. The larger impact of interest rate and money supply changes can lead to more pronounced and rapid market fluctuations. To navigate these challenges effectively, diversifying investment portfolios becomes even more crucial during severe crises. Investors should consider holding a mix of assets that respond differently to interest rate and money supply changes. This diversification strategy helps manage risk and balance the potential impact of market fluctuations. Policymakers must be well-prepared for more pronounced market reactions in the face of severe crises. They should formulate and execute crisis management strategies that address both immediate and longer-term economic challenges. Given the more substantial impacts of monetary policy changes on financial markets during severe crises, these impacts can swiftly spill over into the broader economy.

Policymakers need to carefully manage these effects to prevent economic downturns. The findings emphasize the heightened responsibility on central banks to exercise even greater caution and precision in their policy decisions as the severity of a crisis escalates. A more severe crisis necessitates a more nuanced and well-thought-out approach. Central banks should avoid overreacting to short-term market fluctuations and maintain a focus on the broader economic stability objectives.

The Granger causality test has been used to establish the direction of causality and to ensure that another variable is not causing movements in the data (Granger, 1969). The causality test is used to determine which variable causes another variable. The Granger causality test has been performed to validate the integrity of the results and to scrutinize the temporal precedence and statistical associations among variables. Hence, it can be assured that the identified variables under consideration are not overly influenced by external factors. The results from Granger causality test are presented in Table 5.

There is a unidirectional relationship from interest rate changes to log return of stock market price. Interest rate changes Granger cause log return of stock market price. Changes in interest rates could be used to predict log return of stock market price. The reverse causality shows that log return does not Granger cause interest rate change. Hence, log return of stock price has no significant influence on interest rate changes. The Granger causality results indicate that interest changes can cause stock market price returns. Furthermore, there is a unidirectional relationship from interest rate changes to bond yield changes. Interest rate changes Granger cause bond yield changes. Moreover, there is a unidirectional relationship from money supply changes to log return of stock market price. Money supply changes Granger cause log return of stock market price. Furthermore, there exists a bidirectional Granger causality from money supply changes to bond yield changes and vice versa. The results show that interest rate changes and money supply changes are useful in forecasting log returns of stock market prices and changes in bond yields, which can provide evidence of causality.

5. Discussion

5.1 Research implications

The results suggest that monetary policy plays a critical role in shaping the behavior of financial markets. Understanding the effect of the central bank's policy on asset prices can help policymakers make informed decisions about how to manage the economy. The findings also shed light on how crises, such as the Covid-19 pandemic, can significantly alter the relationship between monetary policy and stock and bond markets. The finding that interest rate and money supply changes have a larger impact during this crisis highlights the importance of understanding how crises can affect the relation between monetary policy and markets. Understanding the dynamics of this relation during times of crises can provide insights into how central banks should respond to such events. Policymakers should recognize and acknowledge that during crises, monetary policy becomes an even more powerful tool for influencing financial markets and the broader economy. The research highlights the increased significance of central bank actions during times of financial stress. Effective communication becomes essential during crises. Policymakers should provide clear and timely information regarding their policy decisions and objectives. Clarity can help to reduce uncertainty and stabilize market sentiment. The results also suggest that policymakers need to carefully manage their monetary policy responses during times of crises. A more severe crisis may require a stronger policy response, but this response can also have a larger impact on

Table 5. Granger causality test results.

Null hypothesis	F-statistic	p value	Decision
r does not granger cause log return of stock market price	9.014	0.004***	Reject null hypothesis
Log return of stock market price does not granger cause r	2.144	0.164	Do not reject null hypothesis
r does not granger cause change in bond yield	9.674	0.003***	Reject the null hypothesis
Change in bond yield does not granger cause r	2.007	0.177	Do not reject null hypothesis
MS does not granger cause log return of stock market price	13.286	0.001***	Reject the null hypothesis
Log return of stock market price does not granger cause MS	1.448	0.295	Do not reject null hypothesis
MS does not granger cause change in bond yield	9.567	0.003***	Reject null hypothesis
Change in bond yield does not granger cause MS	12.407	0.001***	Reject null hypothesis

99%, 95%, and 90% confidence levels and ***/**/* denotes this significance.

financial markets. Policymakers need to balance the need for economic support with the potential risks associated with aggressive policy action. The larger influence of changes in interest rates and the money supply during the pandemic underscores the importance of policymakers' thoughtful development of their responses during times of crises. They might need to employ more precise, targeted policy measures to address specific areas of the economy or financial markets. Central banks may also use unconventional monetary policy in addition to conventional measures in order to stabilize financial markets during a crisis. The findings indicate that investor behavior can play a crucial role in shaping the impact of monetary policy on bond and stock markets. Understanding how investors respond to variations in monetary policy can help policymakers anticipate the likely effects of policy action and adjust their strategies accordingly. While policy action may be necessary to support the economy during times of crises, it can also have unintended consequences, such as exacerbating financial instability. The finding that interest rate and money supply changes have a larger impact during the pandemic has important implications for policymakers and for investors. It underscores the need for a nuanced understanding of the relation between monetary policy and financial markets, particularly during times of crises.

5.2 Research limitations & Future research

Future research may further investigate the impact of a crisis on the relationship between monetary policy and financial markets as the number of studies is very limited and the existing results contradictory. This research is based on data from Thailand. Future research might concentrate on other regions in order to increase the generalizability of the findings. Institutional differences, financial market structures and policy frameworks may influence the relationship between monetary policy and financial market outcomes across countries. Furthermore, future research may investigate other crises, in addition to the Covid-19 pandemic. A financial crisis might require a different monetary policy response than a crisis driven by external shocks like a pandemic. Research can help policymakers design more precise strategies. This article focuses on conventional monetary policy, i.e. interest rate and money supply changes. There are opportunities to study the impact of unconventional monetary policy tools. Future research may also study the part of central banks' communication in shaping market expectations and their impact on financial market outcomes. The dynamics of crises are complex and can evolve over time, requiring a deeper understanding, and further research into the link between monetary policy and financial markets during crises.

6. Conclusions

This study investigates the relation between monetary policy and financial markets and emphasizes on the impact of a crisis on this relationship. It collects and analyses daily data from Thailand for the last 15 years. The monetary policy is measured by interest rate and money supply changes. The financial markets are represented by the stock and bond market and measured by the return of the stock market index and by the change in the 10-year government bond yield. This study finds support for all hypotheses which are derived in the second chapter. This research paper finds evidence for a significant impact of monetary policy on financial markets. Interest rate and money supply increases lead to increased stock returns and bond yields. The positive relation between interest rates and stock returns is consistent with the studies of Okpara (2010), Ferrer et al. (2016) and Shahzad et al. (2017) as discussed in the literature review. An increase in interest rates can lead to an increase in the return on bonds and other fixed-income securities, as these become more attractive to investors looking for safe and stable returns. This can lead to an increase in bond yields. Additionally, an increase in money supply can increase economic activity by providing more liquidity in the market, which can lead to increased investment and spending. This can also lead to increased demand for stocks and bonds, which can drive up stock prices and lead to increased stock returns. Further, this paper finds that, during a crisis, interest rate and money supply changes have a larger effect on stock returns and bond yields. The greater the severity of a crisis, the larger the effect of interest rate changes and money supply changes on financial markets. When the Covid-19 epidemic was present and when it was most severe, interest rate and money supply changes have a larger effect on both the stock and bond markets. This finding is consistent with the

study of Celebi and Hönig (2019), which indicated that a larger quantity of factors had substantial impacts on stock returns in a crisis than before or after a crisis. However, this result is contrary to the article of Wei and Han (2021), which found that the transmission of monetary policy to financial markets is weaker during a crisis. The findings of my article can be clarified by the fact that during a crisis, investors become more sensitive to changes in monetary policy and respond more strongly to them. During a crisis, there is often increased uncertainty and risk aversion among investors. This can lead to a decrease in investment and economic activity, which can exacerbate the impact of changes in the interest rate and money supply on financial markets. The pandemic also created significant economic uncertainty and volatility, causing investors to pay closer attention to fluctuations in the money supply and interest rates. Additionally, during a crisis, there may be specific sectors or companies that are particularly vulnerable to economic shocks or disruption. In these cases, changes in interest rates and money supply can have a larger influence on the performance of these sectors or companies, which can in turn affect overall stock returns and bond yields. The findings suggests that monetary policy is a potent and effective tool for central banks to influence financial markets. Central banks can use interest rate and money supply changes to affect market conditions. Understanding the extent of this influence is crucial for policymakers as they formulate and adjust their strategies. The study also suggests that policymakers should take into account the effect of crises on the stock and bond market when making decisions about monetary policy. Policymakers should recognize the increased effectiveness of monetary policy during crises. This suggests that central banks have a powerful tool to influence market conditions and stabilize the financial system when is it most needed. The research indicates that swift and decisive actions can have a substantial impact on calming turbulent financial markets during crises. Given the heightened sensitivity of financial markets to monetary policy during crises, policymakers may need to implement macroprudential measures to ensure financial stability. These measures could involve increasing capital requirements for banks or imposing restrictions on certain types of lending to curb excessive risk-taking. Investors may need to be more aware of changes in interest rates and money supply, as these changes can have a greater impact on their portfolios. This can require more active portfolio management and a greater focus on risk management. Furthermore, during a crisis, there may be greater opportunities for investors to take advantage of market volatility and uncertainty. They can do so by considering investments in sectors or companies that are expected to benefit from government support or central banks' policy interventions. As interest rate and money supply changes have a greater effect on financial markets during a crisis, central banks need to be especially careful and prudent in their policy actions. They need to consider the potential effects of their decisions on stock and bond markets, as well as on the overall economy and take appropriate steps to stabilize markets and support economic recovery during a crisis.

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Data availability statement

Data are contained within the article.

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