รายงานวิจัย

เรื่อง

ผลกระทบของการประชุมคณะกรรมการตลาดเสรีกลางต่อราคาคริปโต ในช่วงปี พ.ศ. 2564 ถึง พ.ศ. 2566

The Impact of Federal Open Market Committee Meeting toward Crypto Prices during 2021 to 2023

โดย

เศรษฐพงศ์ วัฒนพลาชัยกูร

การวิจัยครั้งนี้ได้รับเงินทุนการวิจัยจากมหาวิทยาลัยราชพฤกษ์

ปีการศึกษา 2566

ชื่องานวิจัย: ผลกระทบของการประชุมคณะกรรมการตลาดเสรีกลางต่อราคาคริปโต ในช่วงปี พ.ศ. 2564 ถึง พ.ศ. 2566

ชื่อผู้วิจัย: เศรษฐพงศ์ วัฒนพลาชัยกูร

ปีที่ทำการวิจัยแล้วเสร็จ: 2566

บทคัดย่อ

งานวิจัยนี้เป็นการศึกษาเชิงประจักษ์ที่เจาะลึกถึงอิทธิพลของนโยบายการเงินของสหรัฐฯ ที่สื่อสารผ่านการประชุมคณะกรรมการตลาดเสรีกลางเกี่ยวกับราคาสกุลเงินดิจิทัล ในช่วงเวลาระหว่างปี 2564-2566 โดยจุดมุ่งหมายหลักคือการตรวจสอบผลกระทบทันทีของการประชุมคณะกรรมการตลาดเสรีกลางที่มีต่อราคาสกุลเงินดิจิทัล โดยเฉพาะในระหว่างการเผยแพร่รายงานการประชุมโดยการวิเคราะห์ความผันผวนของ บิทคอยน์ และ อีเธอเรียม ซึ่งรวมกันมีมูลค่าตลาดสูงสุดในสกุลเงินดิจิทัล

วิธีการวิจัยได้มีการรวบรวมข้อมูลราคาสกุลเงินดิจิทัลสำหรับ บิทคอยน์ และ อีเธอเรียม ในระหว่างการประชุมคณะกรรมการตลาดเสรีกลางทั้ง 24 ครั้งระหว่างปี 2564-2566 แต่ละครั้งใช้เวลาประมาณสองชั่วโมง โดยข้อมูลที่บันทึกไว้ในช่วงเวลา 5 นาที ชุดข้อมูลที่ครอบคลุมนี้มีจุดมุ่งหมายเพื่อให้ข้อมูลเชิงลึกเกี่ยวกับการเคลื่อนไหวของราคาในช่วงเวลานี้

เพื่อประเมินความผันผวนในตลาดสกุลเงินดิจิทัลในระหว่างการประชุมคณะกรรมการตลาดเสรีกลาง งานวิจัยนี้ได้ใช้แบบจำลอง GARCH(1,1) เพื่อที่จะหาปริมาณและทำความเข้าใจผลกระทบทันทีของการประชุมคณะกรรมการตลาดเสรีกลาง ต่อราคาสกุลเงินดิจิทัลภายในกรอบเวลาที่กำหนดผ่านแบบจำลองทางเศรษฐมิติ โดยพื้นฐานแล้ว การวิจัยเชิงประจักษ์มีส่วนให้ข้อมูลเชิงลึกที่มีคุณค่าต่อความเข้าใจที่กว้างขึ้นเกี่ยวกับความสัมพันธ์ระหว่างนโยบายการเงินของสหรัฐฯ และการเปลี่ยนแปลงของตลาดสกุลเงินดิจิทัล

ผลลัพธ์เผยให้เห็นรูปแบบที่ลดลงของตัวแปรในช่วงเวลาต่างๆ สำหรับทั้ง บิทคอยน์ และ อีเธอเรียม ในระหว่างการประชุมคณะกรรมการตลาดเสรีกลาง แนวโน้มที่ลดลงนี้บ่งชี้ถึงความผันผวนของพื้นฐานที่ลดลงเมื่อการประชุมผ่านไป โดยส่วนเริ่มต้นแสดงความผันผวนของพื้นฐานที่สูงขึ้น และช่วงต่อๆ มาพบการลดลง

โดยสรุป หลักฐานแสดงให้เห็นว่าความผันผวนของตลาดที่เพิ่มขึ้นเกิดขึ้นในช่วงเริ่มต้นการประชุมคณะกรรมการตลาดเสรีกลางโดยสรุปข้อมูล พบว่ามีการเกิดความผันผวนของตลาดสูงขึ้นเมื่อมีการประชุมคณะกรรมการตลาดเสรีกลางเริ่มต้น การเพิ่มอัตราดอกเบี้ยลดความต้องการในสกุลเงินดิจิตอลเนื่องจากนักลงทุนให้ความสำคัญกับทรัพย์สินแบบดั้งเดิม ค่าใช้จ่ายในการกู้ยืมสูงขึ้นลด

กิจกรรมการซื้อขาย นำไปสู่ความสามารถในการแลกเปลี่ยนที่ต่ำลงและความผันผวนในราคาเพิ่มขึ้น นโยบายการเงินที่เข้มงวดยังทำให้ความรู้สึกของนักลงทุนลดลง มีส่วนสร้างความกดดันลงในราคาสกุลเงินดิจิตอลโดยรวมการเพิ่มอัตราดอกเบี้ยส่งผลกระทบลบต่อราคาสกุลเงินดิจิตอลเนื่องจากการลดความต้องการและเพิ่มค่าใช้จ่ายในการกู้ยืมขึ้น

คำสำคัญ: การประชุมคณะกรรมการตลาดเสรีกลาง, คริปโต

Research Title: The Impact of Federal Open Market Committee Meeting toward Crypto Prices during 2021 to 2023

Researcher: Sethapong Watanapalachaikul

Year: 2023

Abstract

This research was an empirical study that delved into the influence of US monetary policy, as communicated through FOMC meetings, on cryptocurrency prices, specifically examining the period from 2021 to 2023. The primary focus was to investigate the immediate effects of FOMC meetings on cryptocurrency prices, particularly during the release of minutes addressing interest rate policy. Bitcoin and Ethereum, with significant market capitalization, were among the diverse range of cryptocurrencies analyzed.

The research methodology involved collecting cryptocurrency price data for Bitcoin and Ethereum during 24 FOMC meetings during 2021-2023, each lasting approximately two hours, with data recorded at 5-minute intervals. This comprehensive dataset aimed to provide insights into price movements during these critical periods.

To assess volatility in the cryptocurrency market during FOMC meetings, the study employed GARCH(1,1) model. Through this econometric model, the research sought to quantify and comprehend the immediate impact of FOMC meetings on cryptocurrency prices within the specified timeframe. In essence, the empirical research contributed valuable insights to the broader understanding of the relationship between US monetary policy and the dynamics of the cryptocurrency market.

The results revealed a diminishing pattern in variables across various time intervals for both Bitcoin and Ethereum during FOMC meetings. This decreasing trend indicated a reduction in baseline volatility over the specified temporal epochs, with initial segments displaying higher foundational volatility and subsequent periods witnessing a decline.

In summary, the evidence suggests that heightened market fluctuations occurred at the initiation of FOMC meetings. The increase in interest rates reduced demand for cryptocurrencies as investors favored traditional assets. Higher borrowing costs decreased trading activity, leading to lower liquidity and increased price volatility. Tightened monetary policy also dampened investor sentiment, contributing to downward pressure on cryptocurrency prices. Overall, rising interest rates had a negative impact on cryptocurrency prices due to reduced demand and increased borrowing costs.

Keywords: Federal Open Market Committee Meeting, Crypto,

Acknowledgement

This research paper has benefited from the generosity of Associate Professor Dr.Duangta Saranrom for making the necessary resources available, sharing knowledge, experience and encouragement in bringing it to completion. We would like to express our special thanks of gratitude to our parents and colleague for their support.

Sethapong Watanapalachaikul

January 2024

Table of Content

Table of Content (Con't)

List of Table

Table **Page**

List of Figure

Figure **Page**

Chapter 1
Introduction

The Federal Open Market Committee (FOMC), a key component of the U.S. Federal Reserve, holds substantial influence over asset prices through its decisions on monetary policy. By setting the federal funds rate, the FOMC directly impacts short-term interest rates, influencing borrowing costs and spending. Changes in interest rates affect various asset classes, impacting stock prices, bond markets, currency exchange rates, and crypto currency market. FOMC communication, including statements and meeting minutes, provides crucial insights for market participants, shaping expectations and influencing risk sentiment. Overall, FOMC decisions have widespread implications for investors and traders across equity, fixed-income, and currency markets, contributing to fluctuations in asset prices.

With 14 million Bitcoins already in circulation, cryptocurrencies, particularly Bitcoin, have proven their worth recently. Much of the current market capitalization has been driven by investors speculating on the potential uses of this new technology, and this is expected to continue until a certain level of price stability and market acceptability is attained. Those who have invested in cryptocurrencies seem to be depending on something other than the stated price, or inherent worth, of the currency. This covers the decentralized network, the security of the cryptographic code, and the technology and network itself (DeVries, 2016).

It's important to note that while there can be correlations, the cryptocurrency market is also influenced by a variety of factors unique to its ecosystem, including technological developments, regulatory changes, market sentiment, and adoption trends. Cryptocurrency prices are often characterized by high volatility, and market participants should consider a wide range of factors when analyzing and predicting price movements. Additionally, the impact of the FOMC on cryptocurrencies may not be as direct or pronounced as its impact on traditional financial markets.

The outline structure of this chapter are as follows:

1.1 Background

1.2 Problem Statement

1.3 Research Questions

1.4 Research Objectives

1.5 Research Hypothesis

1.6 Research Scope and Limitation

1.7 Significance of the Study

1.8 Definition

1.1 Background

The world of finance has undergone a significant transformation in recent years with the emergence of cryptocurrencies. These digital assets, which utilize blockchain technology to enable secure and decentralized transactions, have gained substantial popularity as both investment vehicles and mediums of exchange. Cryptocurrencies like Bitcoin, Ethereum, and Ripple have seen dramatic fluctuations in their prices, attracting the attention of investors, traders, and regulators worldwide.

By managing open market operations (OMOs), the Federal Open Market Committee (FOMC), a division of the Federal Reserve System (FRS), sets the course of monetary policy in the United States. Twelve people make up the group, including the president of the Federal Reserve Bank of New York, four of the other eleven Reserve Bank presidents, and seven members of the Board of Governors.

The FOMC's 12 members gather eight times a year to deliberate potential adjustments to short-term monetary policy. To support the wholesome expansion of the national economy, a vote to change policy would result in either buying or selling U.S. government securities on the open market. Members of the committee are often divided into three groups: hawks, who advocate tighter monetary policy, doves, who favor stimulus, and centrists/moderates, who fall somewhere in between.

In this research, using an empirical study, we examined the effect of US monetary policy via FOMC meeting toward crypto prices. There were many types of crypto, which could be ranked from the popularity i.e. Bitcoin and Ethereum accounted for 48.5% and 18.8% of the total market capitalization of cryptocurrencies as of 8th September 2023, respectively (Coinmarketcap, 2023).

Crypto could be affected by an increase of the Federal fund rate. As a result, capital fund flow could leave the cryptocurrency market, decreasing demand and perhaps resulting in price corrections or drops. Additionally, higher interest rates might lead to greater borrowing costs, which could deter trading and leveraged positions in the cryptocurrency industry.

Simultaneously, traditional financial markets are influenced by macroeconomic events, one of the most pivotal being the meetings of the Federal Open Market Committee (FOMC) in the United States. The FOMC is the policymaking arm of the Federal Reserve, responsible for formulating and implementing monetary policy. Their decisions, particularly regarding interest rates and economic outlook, have far-reaching consequences on various asset classes, including equities, bonds, and foreign exchange.

The intersection of these two worlds, cryptocurrencies and FOMC meetings, is a subject of growing interest and significance. Cryptocurrencies have often been touted as a hedge against traditional financial systems and government monetary policies. However, the influence of traditional monetary policy decisions, such as those made during FOMC meetings, on cryptocurrency prices is a complex and relatively unexplored area of research.

1.2 Problem Statement

Crypto is commonly regarded as a volatile asset class due to the possibility of large upward and downward swings over shorter time periods. The volatility of stocks is said to range widely, from the comparatively stable large-cap stocks (such as Apple or Berkshire Hathaway) to the sometimes unstable "penny stocks." In comparison, bonds are thought to be a less volatile investment. Volatility is a measurement of how much an asset's price has fluctuated upwards or downwards over time. Generally speaking, the riskier an asset is to invest in, the more potential it has to deliver bigger returns or higher losses over shorter time periods than assets that are generally less volatile.

The cryptocurrency market is influenced by diverse factors within its ecosystem, such as technological advancements, regulatory shifts, market sentiment, and adoption trends. Cryptocurrency prices are notably volatile, requiring market participants to assess a broad range of elements for accurate analysis and prediction. It's crucial to recognize that correlations exist, but the impact of the Federal Open Market Committee (FOMC) on cryptocurrencies may not be as direct or significant as its influence on traditional financial markets, given the unique dynamics of the digital asset space.

1.3 Research Questions

1. What are immediate effects of FOMC meeting toward crypto prices? (During the period of Minutes releases particularly on interest rate policy)

1.4 Research Objectives

1. To investigate immediate effects of FOMC meeting toward crypto prices.

1.5 Research Hypothesis

1. We hypothesize high volatility during the release of FOMC minutes toward crypto prices.

1.6 Research Scope and Limitation

This research is an empirical research that focuses on finding the impact of FOMC Meeting toward Crypto Prices during 2021 to 2023. The research gathered and analyzed interest rate, crypto historical transaction prices and volume data to develop statistical models. The research is limited to the use of quantitative methods such as statistical models and does not include other qualitative methods.

1.7 Significance of the Study

The proposed research is significant in several ways. First, it will contribute to the existing literature on the effect of FOMC via increase/decrease of interest rate toward the cryptocurrency market, by developing a method for detecting volatility in immediate effect. Second, it will provide investors, exchanges and regulators with a guideline/direction for investing in the cryptocurrency market, which can help prevent financial losses and maintain market integrity.

1.8 Definition

Federal Open Market Committee Meeting, Crypto

Federal Open Market Committee (FOMC) Meeting – The FOMC Meeting Minutes serve as a detailed account of the discussions that took place during these meetings. They provide insights into the Committee's analysis of economic conditions, their outlook on inflation and employment, and their considerations regarding potential policy actions, such as changes in interest rates or adjustments to the Federal Reserve's asset purchase programs.

Crypto – Crypto is a term that refers to cryptography or the practice of secure communication. In recent years, however, the term has also become synonymous with cryptocurrency, which is a type of digital currency that uses cryptographic techniques to secure and verify transactions.

Chapter 2
Literature Review

This chapter provides a comprehensive review of the existing literature relevant to the impact of Federal Open Market Committee (FOMC) meetings on crypto prices during the period from 2021 to 2023. By examining prior research and studies in this area, we aim to establish a foundation for understanding the dynamics between traditional monetary policy decisions and the crypto market. The literature review aims to provide a theoretical foundation for the proposed research and identify gaps in the existing literature. The outline structure of this chapter are as follows:

2.1 Effect of FOMC Meetings toward Traditional Markets

2.2 Cryptocurrency Market Behavior

2.3 The Influence of FOMC Meetings on Cryptocurrency Prices

2.4 Measuring Volatility of Traditional Markets

2.1 Effect of FOMC Meetings toward Traditional Markets

The Federal Open Market Committee plays a crucial role in shaping traditional financial markets through its monetary policy decisions. Key elements of FOMC meetings include interest rate decisions, economic outlook projections, and announcements related to monetary policy. Existing research has shown that these meetings can significantly impact traditional asset classes, leading to abnormal returns in equity markets, fluctuations in bond yields, and changes in exchange rates.

FOMC played a pivotal role in the history of the United States' monetary policy. Established in 1933 as part of the Banking Act, also known as the Glass-Steagall Act, the FOMC was created to address issues related to the implementation of open market operations and the conduct of monetary policy. Throughout its history, the FOMC consisted of 12 members, including the seven members of the Board of Governors of the Federal Reserve System and five Federal Reserve Bank presidents. The New York Fed president held a permanent position, while the other four regional bank presidents served on a rotating basis (Federal Open Market Committee, 2023).

The primary responsibilities of the FOMC included setting monetary policy to achieve the dual mandate of maximum sustainable employment and stable prices. Over the years, the Federal Reserve recognized the importance of promoting moderate long-term interest rates and maintaining financial stability. The FOMC met approximately eight times a year to assess economic conditions and make decisions on monetary policy. Open market operations, involving the buying or selling of U.S. government securities, were key tools used by the committee to influence the money supply and interest rates. The Federal Reserve, including the FOMC, has undergone changes in its approach to monetary policy. It has transitioned through periods of targeting money supply growth, inflation targeting, and a more flexible approach that considers a range of economic indicators (Federal Open Market Committee, 2023).

Efforts to enhance transparency were evident as the FOMC increased communication with the public. After its meetings, the committee released statements providing information on its assessment of economic conditions, policy decisions, and forward guidance. The decisions made by the FOMC throughout its history had a profound impact on interest rates, inflation, and overall economic conditions in the United States.

Following each FOMC meeting, the FOMC established the custom of issuing a "balance of risks" statement along with their policy decision. Rasche, et al. (2002) assessed the application of the balance-of-risks statement and how the market perceives it. The research discovered that one of the criteria market participants use to assess the possibility that the FOMC would change its target for the federal funds rate at its upcoming meeting is the balance-of-risks statement. Additionally, this research found that the FOMC occasionally acted in a way that encouraged the adoption of the balance-of-risks statement for this objective. Additional pertinent information could be found in the clarifying statements that occasionally followed these balance-of-risks declarations as well as the Chairman's broad observations.

2.1.1 FOMC Meeting Schedule during 2021-2023

Table 2.1 FOMC Meeting Schedule during 2021-2023

Number	Year - Month	Date	Event
01	2021 January	26	FOMC Meeting (Jan)
02	2021 March	16	FOMC Meeting (Mar)
03	2021 Apr	27	FOMC Meeting (May)
04	2021 June	15	FOMC Meeting (Jun)
05	2021 July	27	FOMC Meeting (Jul)
06	2021 September	21	FOMC Meeting (Sep)
07	2021 November	2	FOMC Meeting (Nov)
08	2021 December	14	FOMC Meeting (Dec)
09	2022 January	25	FOMC Meeting (Jan)
10	2022 March	15	FOMC Meeting (Mar)
11	2022 May	3	FOMC Meeting (Apr)
12	2022 June	14	FOMC Meeting (Jun)
13	2022 July	26	FOMC Meeting (Jul)
14	2022 September	20	FOMC Meeting (Sep)
15	2022 November	1	FOMC Meeting (Oct)
16	2022 December	13	FOMC Meeting (Dec)
17	2023 February	1	FOMC Meeting (Jan)
18	2023 March	22	FOMC Meeting (Mar)
19	2023 May	3	FOMC Meeting (Apr)
20	2023 June	14	FOMC Meeting (Jun)
21	2023 July	26	FOMC Meeting (Jul)
22	2023 September	20	FOMC Meeting (Sep)
23	2023 November	1	FOMC Meeting (Oct)
24	2023 December	13	FOMC Meeting (Dec)

Source: Federal Open Market Committee (2023)

The FOMC Meeting Schedule outlines the timetable for meetings held by the Federal Open Market Committee, a crucial policymaking body within the U.S. Federal

Reserve System. These meetings, occurring approximately eight times a year, play a pivotal role in shaping monetary policy by determining the federal funds rate, a key interest rate influencing economic activity. Market participants closely monitor the outcomes and statements from these meetings, as they offer valuable insights into the Fed's assessment of economic conditions and its future policy intentions. The FOMC Meeting Schedule includes press conferences by the Federal Reserve Chair, providing additional context to the decisions made during the meetings, and may indicate whether the Summary of Economic Projections, containing forecasts for key economic indicators, will be released. Overall, the schedule serves as a crucial guide for understanding the timing of significant monetary policy decisions and gaining a comprehensive view of the Federal Reserve's economic outlook.

FOMC wielded considerable influence over monetary policy in the United States. Its decisions had far-reaching implications for traditional financial markets, shaping investor sentiment, influencing asset prices, and impacting economic conditions. This literature review synthesizes existing research on the effect of FOMC meetings on traditional financial markets, focusing on key areas such as stock markets, bond markets, and foreign exchange markets (Rasche, et al., 2002).

2.1.2 Effect of FOMC toward Stock Markets

Numerous studies explored the relationship between FOMC meetings and stock market behavior. Research by Bernanke and Kuttner (2005) found evidence of a significant stock market response to FOMC policy surprises, with equity prices exhibiting notable movements following unexpected changes in interest rates. Gurkaynak et al. (2005) extended this analysis, emphasizing the importance of understanding market expectations and how deviations from those expectations during FOMC meetings could lead to market reactions.

Moreover, the impact of FOMC communication on stock volatility was investigated. Lucca and Moench (2015) highlighted the role of FOMC statements in shaping market expectations, with the clarity of communication affecting stock market volatility. This underscored the market's sensitivity to the FOMC's guidance and the importance of clear messaging in minimizing market uncertainty.

2.1.3 Effect of FOMC toward Bond Markets:

FOMC decisions also exerted a profound influence on bond markets, affecting yields and prices. Rigobon and Sack (2004) demonstrated that both expected and unexpected components of monetary policy announcements significantly impacted Treasury yields. The yield curve, a key indicator of economic expectations, was shown to respond sensitively to FOMC meetings, as documented by Wright (2011).

Research by Gurkaynak et al. (2005) delved into the impact of FOMC communication on bond markets, finding that market participants extracted valuable information from the committee's statements. This underscored the importance of linguistic analysis in understanding the nuanced impact of FOMC communication on bond market dynamics.

2.1.4 Effect of FOMC toward Foreign Exchange Markets:

The effect of FOMC meetings extended to foreign exchange markets, where changes in interest rates influenced currency values. Ehrmann and Fratzscher (2005) highlighted the significant impact of U.S. monetary policy surprises on exchange rates, with the dollar experiencing substantial movements following FOMC announcements. Additionally, research by Beine et al. (2008) emphasized the role of global risk sentiment in mediating the relationship between FOMC decisions and currency markets.

In summary, the literature revealed a rich and complex relationship between FOMC meetings and traditional financial markets. Stock markets, bond markets, and foreign exchange markets all exhibited sensitivity to FOMC decisions, with the nature and magnitude of the impact varying across different economic conditions. Understanding the dynamics of this relationship was crucial for market participants, policymakers, and researchers alike, as it contributed to a comprehensive understanding of the channels through which monetary policy affected the broader economy.

2.2 Cryptocurrency Market Behavior

Studies on cryptocurrency market behavior have identified several factors influencing cryptocurrency prices, including market sentiment, supply and demand dynamics, technological advancements, regulatory changes, and macroeconomic events. While the cryptocurrency market is known for its volatility, the exact drivers of price fluctuations remain a subject of ongoing research. The origins of cryptocurrency date back to the idea of digital cash, which was explored in the 1980s and 1990s. The true breakthrough occurred with the introduction of Bitcoin, documented in the Bitcoin whitepaper released by Satoshi Nakamoto in 2008, followed by the launch of the Bitcoin network in 2009. These milestones marked the genesis of cryptocurrencies, paving the way for further innovations in the field (Ajao, et al., 2023). The history of cryptocurrency was a relatively short but dynamic and fascinating journey. The concept of digital currency has roots in the late 20th century, but the development and widespread adoption of cryptocurrencies began in the 21st century (DeVries, 2016; Cossu, 2022; Topuria & Chechelashvili, 2023).

Kim, et al. (2021) reseach based on the model that consisted of two six-month datasets that determined how the cryptocurrency market responded to social mood in two hidden states i.e. an upward trend and a downward trend, as well as in bull and bear markets. The results revealed that social sentiment matters more in a bull market than in a bear one. Positive social attitude tends to have a greater impact on the bitcoin market when it is in a negative situation, or when there is a local declining tendency. When the market is rising, that is, when there is a localized trend toward growth, it tends to interact more effectively with negative social mood. More and more people throughout the world are becoming aware of the developing cryptocurrency sector. Policymakers, institutional investors, and individual investors are now all very interested in it. In contrast to more conventional methods, the new encrypted blockchain technology gives individual investors modern investment alternatives. The cryptocurrency market, on the other hand, causes instability and uncertainty for market participants, leaving a research void for academics to look into what causes these challenges (Rajan et al., 2021).

According to Bui (2022), consumer characteristics are what motivates individual investors to adopt Bitcoin. To elaborate, people's subjective norms influence how they feel about Bitcoin, and the approval and opinions of their peers as investors are vital to their participation in the market. The most important factor influencing investors' propensity to adopt was the herding trend. Bui’s findings also indicated a strong relationship with the technology acceptance model. However, this study lacked empirical support for the idea that market factors influenced the adoption intentions of private investors.

Wanidwaranan and Termprasertsakul (2023) examined herd behavior in the cryptocurrency market at the aggregate level and the determinants of herd behavior, such as asymmetric market returns, the coronavirus disease 2019 (COVID-19) pandemic, 2021 cryptocurrency's bear market and the network effect. The findings showed that herding behavior is captured in the cryptocurrency market to a substantial extent when market returns tend to decrease and when the investor network tends to grow (e.g. such as during the COVID-19 epidemic or 2021 Bitcoin crisis). Investors in the cryptocurrency market in making more logical judgments based on their determinants. The effectiveness of portfolio diversification in cryptocurrencies is directly impacted by herd behavior, as imitation trading results in return comovement. In order to fully reap the rewards of asset allocation, particularly in times of market uncertainty, market players or investors should take herd behavior and its underlying variables into account.

According to Habib, et al. (2019), the cryptocurrency ecosystem has expanded well beyond Bitcoin. Thousands of alternative cryptocurrencies (altcoins) have emerged, each with distinct features and use cases. This proliferation has led to diverse communities and a dynamic landscape of trading, investment, and innovation.

Researchers, developers, investors, regulators, and speculators are drawn to the blockchain-based cryptocurrency ecosystem because of its rapid expansion, which is driving the development of new business and economic models for trade, investment, and taxation. The bitcoin ecosystem is still in its infancy and has numerous trust challenges that affect everyone from users to governments to technology suppliers. The trust issues in the cryptocurrency ecosystem are thoroughly examined in Habib, et al. (2019) and Berkhout, et al. (2018) papers, along with a taxonomic discussion of the main factors that contribute to trust, such as price manipulation, price volatility, insider trading, reputation systems, transparency, centrality, token economy, governance, regulations, design, usability, privacy, and security.

The emergence of cryptocurrencies has prompted governments and regulatory bodies worldwide to address the legal and regulatory challenges they pose. This literature review explores the evolving regulatory landscape, discussing how nations are dealing with issues like taxation, anti-money laundering (AML), and Know Your Customer (KYC) requirements. The regulatory environment varies significantly from one country to another, influencing the adoption and acceptance of cryptocurrencies (Kalnina and Mazure, 2023).

Cryptocurrencies had a profound impact on the traditional financial system. They have disrupted established financial institutions, introduced new investment opportunities, and challenged conventional payment methods. This review examines the economic implications of cryptocurrencies, including their role in cross-border payments, their potential to provide financial services to the unbanked, and the rise of decentralized finance (DeFi) platforms (Hubbard, 2023).

The emergence of cryptocurrencies had a significant social and cultural impact. It has fostered online communities and a new way of thinking about money and finance. The review delves into the growth of the crypto culture, the role of social media, and how it has influenced the perception of wealth and success.

According to Cossu, (2022), the increasing mainstreaming of cryptocurrencies demonstrates their link to precarization and emerging class structures. By analyzing the effects of ICTs (Information and Communications Technologies) on the socialization and re-signification processes of finance, it takes into account how this shift has been accomplished. These changes may be connected to the establishment of a unique type of cultural and digital commons. Granted, the latter point may seem strange, unrealistic, or even inappropriate given that the world of cryptocurrency financing is characterized by individual investors making investments for their own personal gain. Behind these individualistic acts is an ambivalence wherein a redefining of the financial industry's genetic code coexists with exploitation, giving rise to a common resource and shared culture.

Fakhfekh and Jeribi, (2019) research paper attempted to simulate the volatility of sixteen of the most widely used cryptocurrencies. Five GARCH models are fitted, each with a different error distribution. Following that, the best model or group of models is chosen by optimizing likelihood information criteria. The findings suggested an asymmetric effect on crypto that was different from what was typically seen in stock markets, where volatility turned out to increase more in reaction to positive shocks than to negative shocks. The herding tactics used by ignorant investors may have contributed to the increase in volatility that was observed in reaction to positive shocks. High volatility of crypto prices and returns was also evidence in Poudel, et al. (2023) research.

2.3 The Influence of FOMC Meetings on Cryptocurrency Prices

Despite the growing relevance of cryptocurrencies, the influence of FOMC meetings on cryptocurrency prices has received relatively limited scholarly attention. However, a few key insights have emerged from prior research (Benchimol, et al., 2023)

- Interest Rates: Changes in interest rates announced during FOMC meetings can affect the attractiveness of cryptocurrencies as investments. When interest rates rise, traditional assets like bonds may become more appealing, potentially reducing demand for cryptocurrencies. Conversely, lower interest rates may drive investors towards cryptocurrencies in search of higher returns.
- Economic Outlook: The economic outlook projections provided by the FOMC can shape market sentiment and risk appetite. Positive economic forecasts may lead to increased investor confidence in cryptocurrencies as speculative assets, while negative forecasts may have the opposite effect.
- Risk Aversion: FOMC meetings can lead to changes in market risk sentiment, which can impact cryptocurrency prices. In times of uncertainty or financial

instability, some investors may turn to cryptocurrencies as a form of digital gold or a safe haven asset.

2.4 Measuring Volatility of Traditional Markets

Volatility played a pivotal role in financial markets, influencing risk assessment, portfolio management, and option pricing. The Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model, specifically GARCH(1,1), emerged as a widely employed tool for measuring and forecasting volatility in traditional financial markets. The GARCH(1,1) model, introduced by Tim Bollerslev in 1986, extended the Autoregressive Conditional Heteroskedasticity (ARCH) model by incorporating lagged squared returns and lagged conditional variances. The model assumed that volatility was time-varying, capturing the persistence and clustering of financial market volatility Numerous empirical studies utilized the GARCH(1,1) model to measure volatility in traditional financial markets. These studies explored various asset classes, including equities, currencies, and commodities, to gain insights into market dynamics and inform investment decisions (Guillaume, 2000).

2.5.1 Equities Markets:

In equities markets, researchers applied GARCH(1,1) to model volatility in stock returns. Studies examined how market shocks, such as financial crises or unexpected economic events, influenced volatility persistence. Additionally, GARCH(1,1) was employed to analyze the impact of trading volume and market liquidity on stock market volatility (Nazarova & Shumeiko, 2023).

2.5.2 Foreign Exchange Markets:

The foreign exchange market became a focus of research using the GARCH(1,1) model, particularly in understanding the volatility patterns of currency returns. Studies investigated the role of macroeconomic indicators, interest rates, and geopolitical events in explaining currency market volatility (Mahtab et al., 2022).

2.5.3 Commodities Markets:

Commodities markets, including energy and agricultural products, were also studied using the GARCH(1,1) model. Researchers explored how supply and demand factors, geopolitical tensions, and weather conditions contributed to volatility in commodity prices (Chen, 2023).

2.5.4 Critiques and Challenges of GARCH(1,1)

Regarding to methodological advancements of GARCH(1,1) that proved to be a powerful tool for modeling volatility, researchers extended and refined the methodology. Some studies proposed modifications to the traditional GARCH framework, such as incorporating asymmetry or allowing for time-varying parameters, to better capture the nuances of market volatility (Fawzi & Alam, 2021).

Despite its popularity, the GARCH(1,1) model was not without criticisms. Some researchers argued that the model might oversimplify the dynamics of financial markets, especially during extreme events. Additionally, challenges such as model misspecification and parameter estimation uncertainty impacted the reliability of volatility forecasts (Nugroho et al., 2023).

In summary, the literature on measuring volatility using the GARCH(1,1) model in traditional financial markets highlighted its widespread application and utility. The model significantly contributed to understanding and managing market risk across various asset classes. However, ongoing research continued to explore alternative methodologies and address challenges associated with volatility modeling, ensuring a nuanced and comprehensive understanding of past market dynamics.

Chapter 3
Methodology

This chapter describes the methodology for detecting volatility of Crypto prices using econometric models such as GARCH(1,1). The methodology includes data collection, data preprocessing, model development, and model evaluation. The outline structure of this chapter are as follows:

3.1 Data Collection

3.2 Data Preprocessing

3.3 Model Development

3.4 Model Evaluation

3.1 Data Collection

To conduct this research, a diverse range of data sources was utilized:

Cryptocurrency Price Data: Bitcoin and Ethereum prices for each session that consist of 5 minutes time period during FOMC meetings (about 2 hours duration of each meeting) for major cryptocurrencies such as Bitcoin (BTC) and Ethereum (ETH) were obtained, 24 sessions of 5-minute duration altogether. BTC and ETH accounted for 48.5%, 18.8% (67.3% in combination of Crypto market capitalization). The data covered the period from January 1, 2021, to December 30, 2023. Cryptocurrency prices were sourced from reputable cryptocurrency exchanges and market data providers.

Federal Open Market Committee Meeting Dates: Information regarding the dates of FOMC meetings, including details of interest rate decisions, economic outlook projections, and related announcements, were collected from official Federal Reserve publications and press releases (see Table 2.1).

3.2 Data Preprocessing

Prior to analysis, the data underwent preprocessing steps to ensure accuracy and consistency. This included:

- Data normalization to account for differences in cryptocurrency price levels particularly in different countries' currency. In this research, all prices of Bitcoin and Ethereum were recorded in US dollar.
- Date and time alignment to ensure that cryptocurrency price data aligns with FOMC meeting dates and announcement time.

3.3 Model Development

The research employed the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model as an employed tool for measuring volatility in Crypto currency market. The GARCH(1,1) model with one lag in the ARCH term and one lag in the GARCH term, was a time-series model employed to describe and forecast the volatility of financial returns. Volatility, in this context, referred to the variability or dispersion of returns over time.

The GARCH(1,1) model was defined by the following equations:

<u>Return Model:</u>

$$r_t = \mu + \varepsilon_t$$

where r_t represented the return at time t, μ was the mean return, and ε_t was the standardized residual.

<u>Volatility Equation (Conditional Variance Model):</u>

$$\sigma_t^2 = \omega + \alpha\varepsilon^2_{t-1} + \beta\sigma^2_{t-1}$$

where σ_t^2 denoted the conditional variance of the return at time

ω was a constant, α and β were parameters, ε^2_{t-1} was the squared residual at time and

σ^2_{t-1} was the conditional variance at time $t-1$.

The GARCH(1,1) model captured the concept that volatility was time-varying and influenced by past squared residuals (ARCH term) and past conditional variances (GARCH term). The ω term represented the constant or long-term average level of volatility, the α term measured the impact of the past squared residual on the current volatility, and the β term measured the persistence or autocorrelation of past volatility in the model.

Parameter estimation ω, α and β was typically conducted using statistical methods such as maximum likelihood estimation. Once the model was estimated, it could be used to forecast future volatility based on observed historical data.

3.4 Model Evaluation

For GARCH(1,1) evaluation, residual analysis was used in order to examine the standardized residuals that could help assess the adequacy of the model. Ideally, residuals should be normally distributed with zero mean and constant variance. Autocorrelation in the residuals may indicate that the model is not capturing all relevant information. A well-specified model should have residuals that are uncorrelated.

Chapter 4
Empirical Results

This chapter presented the empirical results of the research, focusing on the impact of Federal Open Market Committee (FOMC) meetings on cryptocurrency prices during the period from 2021 to 2023. The analyses provided insights into how these traditional monetary policy events had influenced the behavior of major cryptocurrencies, including Bitcoin (BTC) and Ethereum (ETH).

GARCH(1,1) was used to examine the immediate volatility (short-run effect) of FOMC meetings on cryptocurrency prices. Having utilized the GARCH(1,1) model in the crypto market, the application involved applying this statistical framework to analyze and forecast volatility in cryptocurrency price returns. The crypto market, characterized by its high volatility and susceptibility to sudden price movements, made GARCH models particularly relevant for risk management and trading strategies.

This chapter structured as follows:

4.1 GARCH(1,1) Results

4.2 Discussion of the Results

4.1 GARCH(1,1) Results

The release of the FOMC minutes caused market participants to revise their expectations, and this should be reflected in higher volatility of asset prices compared with a period free of such an event. Since Crypto price volatility might be time-varying, it was important to properly control for intraday effects when gauging whether the release of the minutes induces elevated price fluctuations.

Crypto currency returns were calculated from the 5-minute duration provided by Coin Market Cap. Crypto returns were calculated assuming that crypto prices and returns follow a geometrical random walk (geometric average prices/returns). Denoted by I_t was the price of the closing price at time (day/month) t and l_n is the logarithm neperiano. It is assumed that the model's variable $\boldsymbol{\alpha}$ is a constant with a zero mean and is a normal random variable. The simple net return, R_t, on the Crypto between dates *t-1* and *t*, is defined as:

$$R_t = \ln\left(\frac{I_t}{I_{t-1}}\right) \times 100 = \alpha + u \ .$$

Below figures showed 5-Minute duration of Bitcoin and Ethereum returns during FOMC minutes released between 2021 to 2023, for approximately 2 hours period (see Table 2.1, for FOMC meetings schedule). Each interval on X-Axis represented 5-minute duration.

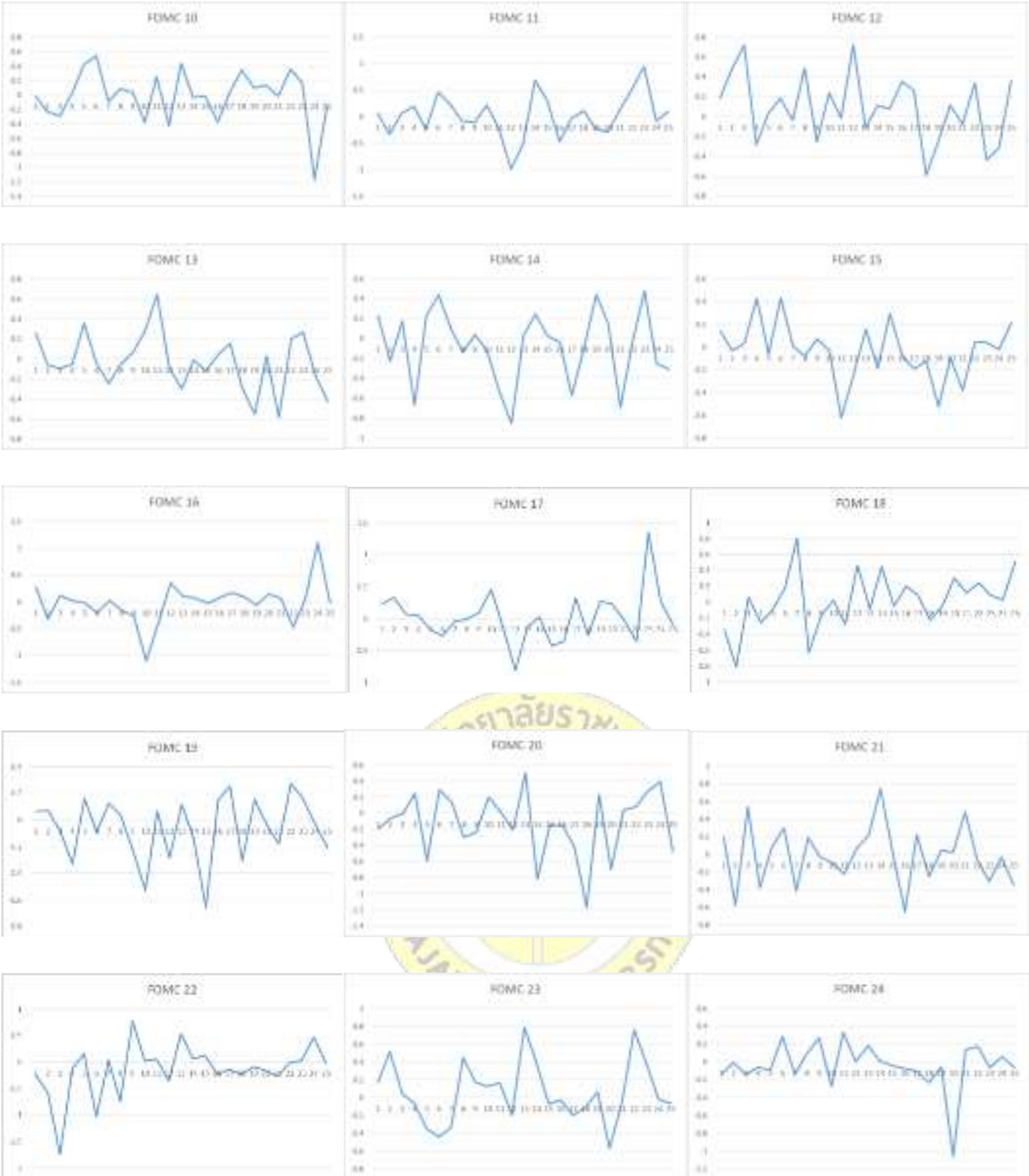

Figure 4.1 5-Minute duration of Bitcoin Returns during FOMC 2021-2023

Figure 4.1 represented the returns of Bitcoin over different time intervals for 24 FOMC meetings during 2021-2023. Each interval corresponded to a specific time range (e.g., 0-5 minutes, 6-10 minutes, until 116-120 minutes).

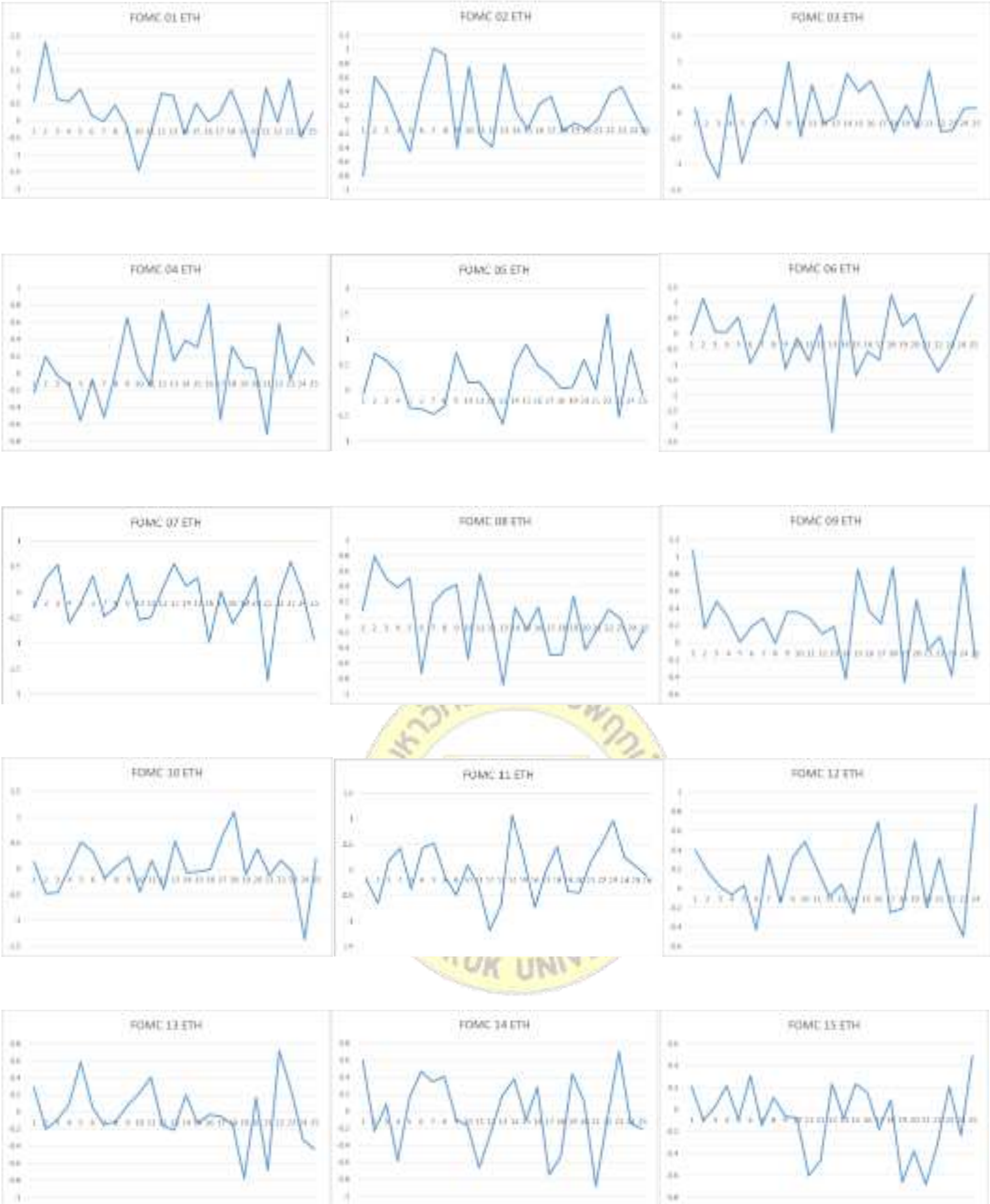
FOMC 01 ETH
FOMC 02 ETH
FOMC 03 ETH
FOMC 04 ETH
FOMC 05 ETH
FOMC 06 ETH
FOMC 07 ETH
FOMC 08 ETH
FOMC 09 ETH
FOMC 10 ETH
FOMC 11 ETH
FOMC 12 ETH
FOMC 13 ETH
FOMC 14 ETH
FOMC 15 ETH

Figure 4.2 5-Minute duration of Ethereum Returns during FOMC 2021-2023

Figure 4.2 represented the returns of Ethereum over different time intervals for 24 FOMC meetings during 2021-2023. Each interval corresponded to a specific time range (e.g., 0-5 minutes, 6-10 minutes, until 116-120 minutes).

<u>GARCH (1,1)</u>

In the context of GARCH(1,1) modeling, the parameter ω represented the constant term in the conditional variance equation, which was integral for estimating volatility in financial time series data. To compute ω for a specific time interval, such as the 0-5 minute range, it was employed the following formulation:

$$\hat{\omega}_{0-5} = \frac{\sum_{i=1}^{24} \text{Conditional Variance}_{0-5,i}}{24}$$

The Conditional Variance $_{0-5,i}$ denoted the conditional variance for the i-th observation within the 0-5 minute interval. The computation involved squaring the returns and averaging across all 24 observations (24 FOMC meetings) within the specified time window.

To find the parameter α, an optimization algorithm was used to find the value of α that minimizes the difference between the observed squared returns and the predicted conditional variances by utilizing Maximum Likelihood Estimation (MLE) method. The α term measured the impact of the past squared residual on the current volatility.

The parameter β represented the coefficient of the lagged conditional variance in the conditional variance equation. The process of finding β involved estimating its value through numerical optimization methods.

For the constant term ω, the values seem to vary across different time intervals, indicating that the baseline level of volatility changes over time. The α values represent the impact of the past squared innovation on the current conditional variance. Higher values suggest a stronger persistence of past volatility shocks. The β values indicate the impact of the past conditional variance on the current conditional variance. Higher values suggest a higher degree of volatility clustering. The ε values represent the standard deviation of the white noise innovations.

Table 4.1 and 4.2 showed results of GARCH(1,1) of Bitcoin and Ethereum at different time interval of FOMC Meetings starting from 0-05 mins to 116-120 mins of FOMC meetings during 2021-2023, where ω represents the baseline volatility that is not explained by past squared innovations or conditional variances. α measures the immediate impact of a volatility shock on the conditional variance. β measures the persistence of past volatility. ε represents the standard deviation of the white noise innovations.

Table 4.1 GARCH(1,1) Results of Bitcoin during FOMC Meetings

Variables Interval	Constant (ω)	Impaction (α)	Coefficient (β)	Residual (ε)
0-05 mins	0.0610	0.4845	0.1867	0.0990
06-10 mins	0.0450	0.3570	0.2348	0.1970
11-15 mins	0.0365	0.2893	0.1231	0.1654
16-20 mins	0.0350	0.2776	0.1267	0.1890
21-25 mins	0.0344	0.2730	0.1664	0.1766
26-30 mins	0.0320	0.2543	0.1262	0.1187
31-35 mins	0.0309	0.2455	0.1269	0.1552
36-40 mins	0.0294	0.2337	0.1327	0.0987
41-45 mins	0.0294	0.2332	0.1670	0.0818
46-50 mins	0.0292	0.2321	0.0966	0.1232
51-55 mins	0.0282	0.2237	0.1867	0.0818
56-60 mins	0.0245	0.1944	0.2232	0.1657
61-65 mins	0.0218	0.1730	0.1664	0.1766
66-70 mins	0.0207	0.1639	0.1356	0.1456
71-75 mins	0.0203	0.1615	0.1231	0.2011
76-80 mins	0.0150	0.1190	0.1267	0.1887
81-85 mins	0.0122	0.0964	0.1664	0.1308
86-90 mins	0.0117	0.0925	0.1262	0.1673
91-95 mins	0.0115	0.0910	0.1269	0.1108
96-100 mins	0.0107	0.0847	0.1327	0.0939
101-105 mins	0.0103	0.0818	0.1670	0.1353
106-110 mins	0.0098	0.0779	0.1231	0.0939
111-115 mins	0.0098	0.0777	0.1267	0.1778
116-120 mins	0.0097	0.0773	0.1664	0.1887

Table 4.2 GARCH(1,1) Results of Ethereum during FOMC Meetings

Variables Interval	Constant (ω)	Impaction (α)	Coefficient (β)	Residual (ε)
0-05 mins	0.0733	0.5819	0.2242	0.1189
06-10 mins	0.0540	0.4291	0.2822	0.2368
11-15 mins	0.0438	0.3480	0.1481	0.1990
16-20 mins	0.0420	0.3342	0.1525	0.2276
21-25 mins	0.0413	0.3290	0.2005	0.2128
26-30 mins	0.0384	0.3067	0.1522	0.1432
31-35 mins	0.0371	0.2963	0.1532	0.1873
36-40 mins	0.0353	0.2823	0.1603	0.1192
41-45 mins	0.0353	0.2819	0.2019	0.0989
46-50 mins	0.0351	0.2808	0.1169	0.1491
51-55 mins	0.0339	0.2709	0.2261	0.0991
56-60 mins	0.0294	0.2356	0.2705	0.2008
61-65 mins	0.0262	0.2098	0.2018	0.2142
66-70 mins	0.0249	0.1990	0.1646	0.1768
71-75 mins	0.0244	0.1962	0.1496	0.2443
76-80 mins	0.0180	0.1447	0.1541	0.2295
81-85 mins	0.0147	0.1173	0.2025	0.1592
86-90 mins	0.0141	0.1127	0.1537	0.2038
91-95 mins	0.0138	0.1109	0.1547	0.1351
96-100 mins	0.0129	0.1033	0.1619	0.1146
101-105 mins	0.0124	0.0999	0.2039	0.1652
106-110 mins	0.0118	0.0952	0.1504	0.1147
111-115 mins	0.0118	0.0950	0.1550	0.2174
116-120 mins	0.0116	0.0946	0.2037	0.2310

4.2 Discussion of the Results

4.2.1 Returns during FOMC Minutes Released

In Figure 4.1, the chart delineated various time intervals, spanning from 0-5 minutes to 116-120 minutes. Each interval along the X-axis represented a distinct time period during which the returns of Bitcoin were assessed. The returns of Bitcoin demonstrated notable variability, with values oscillating between positive and negative, signifying fluctuations in Bitcoin's performance over short-term periods. Specifically, during the initial minutes (0-5 and 6-10), there were conspicuous fluctuations, indicating a high level of volatility and rapid changes in market sentiment during those time frames. Examining different time intervals in Figure 4.1, the returns displayed mixed trends with both positive and negative values. No consistent directional trend was apparent from the data. Certain intervals exhibited higher volatility, evident in larger absolute return values, suggesting increased price fluctuations and potential market uncertainty during those specific periods. Notably, there was no distinct overall upward or downward trend in the returns over the observed time intervals.

Figure 4.2 produced similar results as Figure 4.1, but with higher fluctuation in returns (volatility), the figure was divided into various time intervals, ranging from 0-5 minutes to 116-120 minutes. Each interval in X-Axis represented a distinct time period during which the returns of Ethereum were measured. The returns of Ethereum exhibited considerable variability. The values varied between positive and negative, indicating that the performance of Ethereum fluctuated over short-term periods. Particularly in the initial minutes (0-5 and 6-10), there were notable fluctuations where returns changed rapidly. This suggested a high level of volatility or quick changes in market sentiment during those time frames. Across different time intervals, the returns in Figure 4.2 showed mixed trends with both positive and negative values. There wasn't a consistent directional trend evident from the data. Some intervals showed higher volatility, as indicated by larger absolute return values. Higher volatility suggested greater price fluctuations and potential market uncertainty during those periods. There didn't seem to be a clear overall upward or downward trend in the returns over the observed time intervals.

4.2.2 The constant term in the GARCH model (ω)

The results of Table 4.1 and 4.2 showed the context of a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model with a specification of GARCH(1,1), the parameter denoted as ω (omega) assumed significance as it represented the constant term, encapsulating the foundational level of volatility unexplained by preceding squared innovations or conditional variances. The provided table delineated the estimations of ω across distinct time intervals, and its interpretation is elucidated as follows:

Temporal Evolution (0-05 mins to 116-120 mins): The values attributed to ω exhibited a discernible diminishing pattern, transitioning from 0.0610 (at 0-05 mins) to 0.0097 (at 116-120 mins) for volatility of Bitcoin during FOMC Meetings. The value attributed to ω of Ethereum produced similar results, which transitioning from 0.733 to 0.0116. This progressive decrement suggested a trend of declining baseline volatility throughout the specified time intervals. In essence, the initial segments manifested a relatively elevated foundational volatility, while subsequent periods witnessed a reduction in this baseline volatility.

Significance: The ω parameter in Table 4.1 and 4.2 encapsulated the enduring or unconditional volatility inherent in the temporal series. The observed diminishing trajectory in ω implied an average decrease in the foundational volatility of the process over the stipulated time intervals. This inference may have signified a propensity for time series under consideration to demonstrate a diminishing baseline volatility over the specified temporal epochs.

4.2.3 The coefficient on the lagged squared innovation term α

Table 4.1 and 4.2 provided estimations of the α parameter within the framework of a GARCH(1,1) model across discrete time intervals. This parameter held significance as it represented the coefficient governing the influence of squared innovations (ε^2_{t-1}) on the contemporaneous conditional variance. The interpretations of the α values, as delineated in the provided table, were expounded upon as follows:

Temporal Variation (0-05 mins to 116-120 mins): For Bitcoin, the α values exhibited a conspicuous diminishing trend, decreasing from 0.4845 to 0.0773. While, the α values of Ethereum were ranging from 0.5819 to 0.0946. This discernible pattern of both tables indicated a reduction in the immediate impact of past volatility shocks on the current conditional variance over successive time intervals. Initially, the influence of squared innovations on volatility was notably pronounced, gradually attenuating as temporal progression ensued.

Implication: Table 4.1 and 4.2 produced α parameter that quantifying the instantaneous effect of a volatility shock on the current conditional variance. The observed diminishing trend in α suggested a gradual attenuation in the immediate influence of past squared innovations on volatility. This attenuation may have signified a mitigated short-term persistence of volatility shocks over the stipulated time intervals.

4.2.4 The coefficient on the lagged conditional variance β

The Table 4.1 and 4.2 results presented estimations of the β parameter within the GARCH(1,1) model across discrete temporal intervals. Within the GARCH(1,1) framework, β served as the coefficient delineating the impact of the lagged conditional variance (σ^2_{t-1}) on the contemporaneous conditional variance. The explication of the β values, as delineated in the table, was expounded upon as follows:

Temporal Dynamics (0-05 mins to 116-120 mins): The β values of Bitcoin GARCH(1,1) exhibited variations across distinct temporal segments, ranging notably from 0.1867 to 0.1664. Whereas The β values of Ethereum produced higher value, ranging from 0.2242 to 0.2037, which resulted in higher fluctuation or volatility comparing to Bitcoin results. This observed pattern suggested temporal fluctuations in the influence of past conditional variance on the current conditional variance.

Implications: For both tables, the β parameter quantified the persistence of prior volatility in the current conditional variance. The documented variations in β

values indicated temporal changes in the degree of volatility clustering. Higher β values connoted a more pronounced persistence of preceding volatility, contributing to an accentuated clustering of volatility over time.

4.2.5 The standard deviation of the white noise innovations ε

The Table 4.1 and 4.2 provided values for the ε parameter within the context of a GARCH(1,1) model across discrete time intervals. In the GARCH(1,1) framework, ε represented the standard deviation of the white noise innovations, reflecting the magnitude of volatility shocks. The interpretations of the ε values, as presented in the tables, were explained as follows:

Temporal Variation (0-05 mins to 116-120 mins): ε values exhibited variations across different time intervals, ranging from 0.0990 to 0.1887 for Bitcoin, and ranging from 0.1189 to 0.2310 for Ethereum. These variations suggested temporal fluctuations in the standard deviation of the white noise innovations, indicating changes in the magnitude of volatility shocks over the specified time intervals.

Implications: The ε parameter quantified the extent of volatility shocks in the time series. The observed variations ε values implied temporal changes in the magnitude of white noise innovations, signifying fluctuations in the level of unpredictability or volatility in the underlying process.

Chapter 5
Conclusions, Discussion and Recommendation

This chapter presented the conclusions, discussion and recommendations based on the data analyzed in the previous chapter. The results of findings had been identified following the research objectives in comparison of statistical models. This chapter structured as follows:

5.1 Conclusions

5.2 Discussion

5.3 Recommendation and Future Research

5.1 Conclusions

In this empirical research, the impact of US monetary policy, as communicated through Federal Open Market Committee (FOMC) meetings, on cryptocurrency prices was investigated, with a focus on the period from 2021 to 2023. The research specifically aimed to examine the immediate effects of FOMC meetings on crypto prices, particularly during the release of minutes, which pertained to interest rate policy. This research encompassed a variety of cryptocurrencies, with Bitcoin and Ethereum holding significant market capitalization. The research methodology involved the collection of cryptocurrency price data for Bitcoin and Ethereum during FOMC meetings, consisting of 24 sessions, each lasting approximately two hours. The data was gathered at 5-minute intervals, providing a comprehensive overview of price movements.

To analyze volatility in the cryptocurrency market during FOMC meetings, the research employed the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model. By utilizing this statistical tool, the study aimed to quantify and understand the immediate impact of FOMC meetings on crypto prices during the specified time frame. Overall, this empirical research contributed to the broader understanding of the effect of US monetary policy and the cryptocurrency market.

The results, presented in Table 4.1 and 4.2, indicated a diminishing pattern of all variables such as ω, α, and β values across distinct time intervals for both Bitcoin and Ethereum during FOMC Meetings. This decreasing trend suggested a decline in baseline volatility over the specified temporal epochs, with initial segments exhibiting higher foundational volatility and subsequent periods witnessing a reduction. In summary, it was evidence that elevated market fluctuations occurred at the commencement of FOMC meeting.

In summary, the evidence suggests that heightened market fluctuations occurred at the initiation of FOMC meetings. This decreasing trend indicated a reduction in baseline volatility over the specified temporal epochs, with initial segments displaying higher foundational volatility and subsequent periods witnessing a decline.

5.2 Discussion

High volatility during the opening of Federal Open Market Committee (FOMC) meetings was attributable to several factors related to market participants' reactions to the release of crucial information and policy decisions. The FOMC meetings, during which the Federal Reserve discussed and announced monetary policy decisions, could impact cryptocurrency market.

Overall, the high volatility observed during the opening of past FOMC meetings was a result of the market's rapid adjustment to new information, combined with the uncertainty and potential surprises associated with central bank policy decisions. Traders and investors had to carefully navigate these periods to manage risk effectively.

The results of this research were consistent with Rosa, C. (2013), where Rosa’s publication was demonstrated to have a substantial impact on the volatility and trading volume of U.S. asset prices, with both economic and statistical significance in the observed effects. The unveiling of the minutes was demonstrated to cause "elevated" volatility across various asset classes. Specifically, the volatility of two-year Treasury yields was approximately three times higher on days associated with the event compared to periods without such occurrences. This observation implied that the FOMC minutes conveyed information relevant to the market. Reasons for high volatility during the opening of FOMC meetings could be seen as follows:

Uncertainty and Speculation: Traders and investors closely monitored past FOMC meetings for signals about changes in interest rates, economic conditions, and the overall monetary policy stance. The uncertainty surrounding these decisions led to increased speculation and rapid market movements as participants tried to anticipate the outcomes.

Interest Rate Decisions: One of the primary focuses of FOMC meetings was the discussion of interest rates. Any unexpected changes or shifts in the language used by the committee members regarding interest rates caused abrupt reactions in financial markets. Higher interest rates led to a sell-off in equities and bonds, while lower rates prompted increased buying.

Forward Guidance: The FOMC provided forward guidance on its future policy intentions. Any unexpected changes in this guidance, such as hints at future rate hikes or cuts, led to rapid adjustments in market positions, contributing to heightened volatility.

Market Participants' Reactions: Traders and algorithms were programmed to respond swiftly to new information. As soon as the FOMC released its statements, market participants adjusted their positions accordingly, contributing to sharp and immediate price movements.

Liquidity Issues: The opening moments of past FOMC meetings experienced reduced market liquidity as participants were hesitant to trade until the new information was fully digested. Lower liquidity levels exaggerated price movements, leading to increased volatility.

Macro-Economic Impact: FOMC decisions were closely tied to broader economic conditions. Any changes in the committee's outlook on inflation, employment, or economic growth had a profound impact on various asset classes, causing rapid price changes.

Algorithmic Trading: Automated trading algorithms were programmed to respond to specific keywords or phrases in FOMC statements. When these algorithms detected such signals, they triggered a cascade of trades, amplifying market movements.

Effect of FOMC Decision on Interest Rate

The increase in interest rates had various effects on cryptocurrency prices. Firstly, it led to reduced demand for cryptocurrencies as traditional investments like bonds became more attractive. This shift in investor preferences caused a decrease in cryptocurrency prices. Additionally, higher borrowing costs due to increased interest rates made trading activities less profitable, resulting in reduced liquidity and increased price volatility in the cryptocurrency markets. Furthermore, the tightening of monetary policy signaled by higher interest rates dampened investor sentiment and risk appetite, further contributing to downward pressure on cryptocurrency prices. Overall, the impact of rising interest rates on cryptocurrency prices was influenced by a combination of reduced demand, increased borrowing costs, and negative shifts in investor sentiment.

However, the study acknowledged limitations, including reliance on historical cryptocurrency price data, overlooking real-time news and market sentiment, and the complexity of cryptocurrency markets influenced by various factors. Future research was encouraged to address these limitations and explore additional drivers of cryptocurrency price movements.

5.3 Recommendation and Future Research

It is recommended that policy implications, highlighting the need for regulators to understand the influence of traditional monetary policy on cryptocurrency markets when crafting policies. Financial institutions and market participants are urged to consider the potential impact of FOMC meetings in managing cryptocurrency investments, incorporating diversification and risk mitigation strategies. Investors and stakeholders are advised to monitor FOMC meetings as part of their cryptocurrency investment strategies.

The future research could involve three key areas of investigation: Market Sentiment Analysis: A thorough examination of market sentiment and its influence on cryptocurrency price dynamics. This aims to provide a more comprehensive understanding of how sentiment impacts the fluctuations in cryptocurrency prices.

Regulatory Impact Study: Investigating the effects of regulatory developments on cryptocurrency prices. The study recognizes the interconnectedness of regulatory changes with FOMC meetings and aims to discern their combined impact on cryptocurrency markets.

Comparative Analysis of Cryptocurrencies: Exploring the responses of various cryptocurrencies, beyond Bitcoin and Ethereum to FOMC meetings. This comparative analysis seeks to identify and understand the differing behaviors exhibited by different cryptocurrencies in response to FOMC-related events.

References

Ajao, Owolabi & Osanyinbi, Tunde. (2023). **The Historical Evolution, Developments and Accounting Implications of Cryptocurrency Operations**. European Journal of Accounting, Auditing and Finance Research. 11. 55-72.

Beine, Cosma & Vermeulen (2008). **The Dark Side of Global Integration: Increasing Tail Dependence.** SSRN Electronic Journal. 10.

Berkhout, et al. (2018). **Software Ecosystem Health of Cryptocurrencies**.

Bernanke, B. & Kuttner, K. (2005). **What Explains the Stock Market's Reaction to Federal Reserve Policy?**. Journal of Finance. 60.

Bui L. (2022). **Investor Behavior in the Cryptocurrency Market**. UMEA University.

Chen, S. (2023). **Multiple Stock Prediction Based on Linear and Non-linear Machine Learning Regression Methods**. Advances in Economics, Management and Political Sciences. 46. pp 225-232.

Coinmarketcap. (2023). **Today's Cryptocurrency Prices by Market Cap** [Online]. Retrieved September, 09, 2023. https://coinmarketcap.com/.

Cossu, A. (2022). **The unexpected consequences of a pandemic: Crypto-finance as cultural commons**. European Journal of Cultural Studies. 26.

DeVries, P. (2016). **An Analysis of Cryptocurrency, Bitcoin, and the Future**. International Journal of Business Management and Commerce. Vol. 1.

Ehrmann, M. & Fratzscher, M. (2005). **Communication and Decision-Making by Central Bank Committees: Different Strategies, Same Effectiveness?**. SSRN Electronic Journal. 10.

Fakhfekh, Mohamed & Jeribi, Ahmed. (2019). **Volatility dynamics of crypto-currencies' returns: Evidence from asymmetric and long memory GARCH models**. Research in International Business and Finance. 51.

Fawzi, A. & Alam, M. (2021). **Event Study Analysis**. [Online]. Retrieved December, 15, 2023. https://www.researchgate.net/publication/356040673.

Ferreira, Agata & Sandner, Philipp. (2021). **Crypto assets and their place in the financial markets' infrastructure**. Computer Law & Security Review. 43.

Federal Open Market Committee (2023), [Online]. Retrieved January, 02, 2024. https://www.federalreserve.gov/monetarypolicy/fomc.htm

Guillaume, D. (2000). **On the Intradaily Performance of GARCH Processes**. 10.

Gurkaynak, Sack & Swanson. (2007). **Market-Based Measures of Monetary Policy Expectations**. Journal of Business & Economic Statistics. 25.

Habib et al. (2019). **Trust in Blockchain Cryptocurrency Ecosystem**. IEEE Transactions on Engineering Management. 10.

Hubbard, B. (2023). **Decrypting crypto: implications of potential financial accounting treatments of cryptocurrency**. Accounting Research Journal. 36.

Kalnina, Anete & Mazure, Gunita. (2023). **Opportunities for use of crypto-assets in renewable energy sector within European Union legal framework**. [Online]. Retrieved September, 27, 2023. https://www.researchgate.net/publication/371895294.

Kim, et al. (2021). **The dynamics of cryptocurrency market behavior: sentiment analysis using Markov chains**. Industrial Management & Data Systems. ahead-of-print. 10.1108/IMDS-04-2021-0232.

Lucca, K. and Moench, M. (2015). **The Disappearing Pre-FOMC Announcement Drift**. Finance research letters. 40.

Mahtab, et al. (2022). **Stock Price Prediction: An Incremental Learning Approach Model of Multiple Regression**. AIUB Journal of Science and Engineering (AJSE). 21.

Nazarova, V. & Shumeiko, A. (2023). **Stock Market Reaction to the Blockchain-Related Technologies Adoption: An Event Study Analysis**. 10.1007/978-3-031-32719-3_48.

Nugroho, et al. (2023). **The GARCH-X(1,1) Model with Exponentially Transformed Exogenous Variables**. JST. 12.

Poudel, et al. (2023). **Cryptocurrency price and volatility predictions with machine learning**. Journal of Marketing Analytics. 10.

Rajan, et al. (2021). **A Critical Analysis of the Emergence and Development of Cryptocurrencies and How It Impacts the Current Economic Activities**. [Online]. Retrieved September, 13, 2023. https://www.researchgate.net/publication/362489873.

Rasche, et al. (2002). **The FOMC's Balance-of- Risks Statement and Market Expectations of Policy Actions**. Review. 84. 37-50.

Rigobon, R. & Sack, B. (2004). **The Impact of Monetary Policy on Asset Prices**. Journal of Monetary Economics. 51.

Rosa, C. (2013). **The financial market effect of FOMC minutes**. FRBNY Economic Policy Review. 67-81.

Topuria, G. & Chechelashvili, M. (2023). **Bitcoin as an Investment: Advantages and Risks**. Economics. 105. 101-113.

Wanidwaranan, P. & Termprasertsakul, S. (2023). **Herd behavior in cryptocurrency market: evidence of network effect**. Review of Behavioral Finance. 10.

Zheng, Zibin & Xie. (2017). **An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends**. BigDataCongress. 85.

About Author

Name	Dr.Sethapong Watanapalachaikul
Date of Birth	20th January 1977, Bangkok
Education	Monash University Bachelor of Business Administration, Management, 2000 Swinbourne University Master of International Business, International Business, 2002 Victoria University Doctor of Business Administration, Econometric and Finance, 2005
Current Position	Full-time Lecturer, Rajapruk University, Nontaburi
Work Experience	TVSA, Melbourne (Pilot Instructor) 2014 – 2017 KPN Land (General Manager) 2004 – 2014
Other Qualifications	Level 6 English Proficiency (Australia) Private Pilot License (PPL) Commercial Pilot License (CPL) CASA Single and Multi-Engine Land Instrument (Airplane)