

# FOMC Announcements and Market Reactions

## From 1998 to 2022

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This article examines the market reactions to Federal Open Market Committee (FOMC) announcements from 1998 to 2022. The study's key finding is that U.S. capital markets tended to consistently record a worse-than-average performance during the days leading to the announcements and especially following the announcements. Concurrently, volatility tended to be significantly higher during the same periods rather than other periods. The study analyzed the changes in the federal funds rate and the target rate that the FOMC sets and compared them with the changes in the futures market to account for the market's surprises. We found that the negative performance was most accentuated when the market did not fully anticipate FOMC decisions. With respect to volatility, our data indicated that the standard deviation of the daily returns was higher when the FOMC decision represented a surprise and lower when not. Specifically, the days leading the days prior to the FOMC announcement indicated higher volatility when the decision represented a surprise, effectively providing a clue to the market. We also observed that average volumes tended to increase while the momentum worsened for the periods leading to the announcement date. Overall, our findings suggest that the market may not always fully understand the implications of investing in the days that lead to the FOMC decisions, or some investors might take a speculative approach during those days. Our study also investigated the factors that may have contributed to the market's irrational response, including uncertainty about the future, unexpected economic conditions, and market sentiment. The article concludes that understanding the market's reaction to FOMC announcements is essential for investors and highlights the need for further research on this topic.

*Keywords:* Monetary Policy, Central Banks, Money Supply

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### 1. Introduction

The Federal Open Market Committee (FOMC) is the policy-making body of the United States Federal Reserve System, responsible for setting monetary policy and managing the country's money supply. It follows that the decisions made by the FOMC have far-reaching effects on the economy, and specifically on the stock market both domestically and internationally. For several reasons, understanding the impact of FOMC decisions on the stock market is important. First, the stock market is a key

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barometer of the overall health of the economy, and fluctuations in stock prices can have important implications for consumer and investor confidence. Second, the relationship between FOMC decisions and stock market performance can provide insight into the effectiveness of monetary policy in influencing economic outcomes. With this in mind, this paper aimed to systematically analyze the relationship between the FOMC decisions (either at the regularly scheduled FOMC meetings or the impromptu ones) and the subsequent reaction of the stock market. Specifically, in this article, we focused our attention on capital market reactions to FOMC decisions for the primary purpose of evaluating whether the impact of the FOMC decisions were in line with the EMH and such reactions could in any way be anticipated. This information can be valuable to investors who are trying to make informed investment decisions. Additionally, our findings illustrated in this article suggest that the FOMC's communication strategy can have a significant impact on stock market returns.

To investigate market reactions to the decisions of the FOMC, we measured market reactions both during the days leading to the FOCM meeting, post meeting, or both, and test whether the FOMC decision were correctly anticipated by market participants and to what extent and if any market breaks were present. It can be argued that if market reactions were known and inconsistent with efficient market behavior, over time any inefficiencies would be arbitrated away by 'smart money' or by market participants that would become aware of market behavior in conjunction with FOMC meetings.<sup>2</sup> This includes phenomena such as a decrease in the average daily return, an increase in volatility, an increase in volume, or a subdued market momentum. Even though we initially approached this investigation by expecting no significant structural breaks in the market, our study could not disprove the existence of anomalies in market behavior both pre and post FOMC announcements. Quite the opposite, we observed material and consistent departures from average daily returns, volatility and volume in conjunctions with the FOMC meetings. These results are consistent with behavioral biases such as overconfidence, and overreaction.

Several studies have investigated the impact of FOMC decisions on stock market returns, volatility, and trading volume. Researchers have examined the market's reaction to FOMC announcements, focusing on the timing and content of the statements. Some have explored the impact of different types of FOMC actions, including changes in interest rates, changes in the Federal Reserve's balance sheet, and changes in forward guidance. Other studies have examined the effect of macroeconomic conditions and the state of the economy on the relationship between FOMC decisions and the stock market. Nonetheless, we found only a few studies have investigated whether market reactions were in line with the tenets of the EMH

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<sup>2</sup> For example, if as a result of the FOMC meeting, we expect market returns to increase, over time market participant would identify the anomaly and as more investors enter the market at that time and market prices increase such abnormal return would eventually disappear. The reverse is also true; that is, if it is known that market returns turn negative at a certain time of the FOMC meeting, price would drop until eventually market returns would increase and, again, the anomaly would be arbitrated away.

or deviated from it and on the magnitude of such deviations, and in fact, the literature appeared quite scarce in this regard.<sup>3</sup> For those studies that did measure market performance and volatility the results are mixed. Some studies have found that FOMC meetings are associated with significant changes in stock market returns and volatility. In contrast, others have found little evidence of a relationship between FOMC decisions and stock market performance, especially if the such decisions were partially or fully anticipated by the market.

To contribute to this ongoing discussion, we used a comprehensive dataset of FOMC meeting dates and stock market returns to examine the relationship between FOMC decisions and stock market performance. Specifically, we investigated the reaction of the stock market to FOMC decisions during scheduled and unscheduled meetings and compared it to the response of the stock market during non-meeting periods. For this purpose, we measured market return and the volatility from 1998 through 2022 with specific focus on the period shortly before and shortly after every FOMC decision. We labeled every FOMC decision as either a surprise or largely anticipated based primarily on the difference between the federal fund rate and the federal fund future rate or based on the announcement of a change of open market operations (see [Gürkaynak, 2005](#) among others).

This paper contributes to the growing body of research by examining the relationship between FOMC decisions during scheduled meetings and the stock market reaction. In order to better inform policy choices and assist investors and market players in making more informed decisions, we strived to provide a greater understanding of the connection between FOMC actions and stock market performance.

## **2. Literature Review**

As mentioned above, the FOMC is the primary monetary policy-making body of the United States Federal Reserve System. Its decisions have a significant impact on the broader economy and financial markets, including the stock market. The relationship between FOMC decisions and stock market reactions has been the subject of considerable academic interest. Some studies have found that FOMC decisions have a positive impact on stock prices, while others have found a negative impact depending on the timing and specific business cycles. Some studies have also found that the impact of FOMC decisions on stock prices varies depending on the type of FOMC decision (e.g., interest rate cuts versus increases) and the economic conditions at the time. Using a wide range of statistical techniques to investigate a sizable dataset of FOMC decisions and stock market returns, we first reviewed the current literature on the connection between FOMC decisions and stock market performance before offering fresh empirical evidence on the subject.

The literature on the relationship between FOMC decisions and stock market reactions can be divided into two broad categories: theoretical and empirical.

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<sup>3</sup> The EMH was introduced in the seminal paper by Fama (1970). See Zhang et al. in the Literature Review section below.

Theoretical models typically examine how changes in monetary policy affect asset prices, including stock prices. For example, [Bernanke \(2011\)](#) argued that changes in monetary policy can influence stock prices by affecting expected future earnings, discount rates, and risk premiums. [Chen et al. \(2003\)](#) proposed a model that distinguishes between direct and indirect effects of monetary policy on stock prices, finding evidence of asymmetric volatility spillovers between the U.S. and regional stock markets.

Empirical studies have generally focused on measuring the impact of FOMC decisions on stock market performance using various econometric techniques. [Forbes and Rigobon \(2002\)](#) have used a factor analysis to examine the co-movement of global stock markets, and found evidence of strong co-movement during times of high economic uncertainty, such as during FOMC policy meetings. [Kuttner \(2001\)](#) used a novel approach to measure the effect of FOMC policy surprises on interest rates and found that unexpected changes in monetary policy had a significant impact on stock prices. [Romer and Romer \(2004\)](#) proposed a new measure of monetary policy shocks and used it to examine the response of stock prices to FOMC policy decisions. They found that unexpected policy changes have a significant effect on stock prices, but that the magnitude of the effect varies depending on the nature of the policy change. Similarly, [Sims and Zha \(2006\)](#) also found evidence that monetary policy shocks can generate significant changes in stock prices, but argue that the relationship between monetary policy and the stock market is complex and nonlinear. With more attention to the market sentiment, [Wheelock and Wohar \(2002\)](#) analyzed the impact of FOMC announcements on stock prices in the U.S. and Europe. According to the authors, stock prices typically rose the day after a FOMC statement that was viewed as being hawkish and fell the day after one that was viewed as being dovish. Similar findings were uncovered by the [Neely \(2005\)](#), with attentions also to the U.K market. Other studies have looked at the market reaction other than the stock market, such as [Hamilton and Mishkin \(1992\)](#), which analyzed the impact of FOMC announcements on bond yields and [Erten and Watson \(2014\)](#), where the authors studied the impact of FOMC announcements on exchange rates. Looking at risk and uncertainty, [Beckmeyer, Branger, and Grünthaler \(2020\)](#) examined the relationship connection of FOMC announcements with stock market uncertainty. High-frequency options data, meeting transcripts, stock market returns, and other data were used by the authors to analyze this association. They suggested that stock market turbulence often rises in the days before a FOMC pronouncement and subsides after it is made. The resolution of uncertainty, according to the authors, is not spread equally. In particular, they find that left-tail uncertainty, which measures the expectation of a large negative stock market move, is more likely to resolve after a hawkish FOMC announcement. Similarly, [Cieslak, Morse, and Vissing-Jorgensen \(2019\)](#) studied the relationship between stock returns and the Federal Open Market Committee (FOMC) cycle. The authors argued that the FOMC cycle can have a significant impact on stock returns,

particularly in the weeks leading up to and following FOMC meetings.<sup>4</sup> The authors found stock returns tend to be higher in the weeks leading up to an FOMC meeting, and then decline in the weeks following the meeting. However, the authors also find that the impact of the FOMC cycle on stock returns varies depending on the perceived stance of monetary policy.

With respect to impact of FOMC decisions on market volatility, in a compelling piece, [Rosa \(2013\)](#) examined the impact of the release of the Federal Open Market Committee (FOMC) minutes on financial markets. He found that the release of the FOMC minutes significantly affects the volatility not only of U.S. asset prices, including Treasury rates, stock prices, but also of the U.S. dollar exchange rate. The magnitude of the effect was economically meaningful and statistically significant, and it was similar in magnitude to the Institute for Supply Management Manufacturing Index release, although smaller than that of the FOMC statement and nonfarm payrolls releases. A few years later, in a quest to further investigate FOMC announcement and market volatility, [Du, Fung, and Loveland \(2018\)](#) studied the informational role of equity options markets around the time of the announcements. As they focused on U.S. banks due to their interest rate sensitivity; the authors found that the information contained in option trades prior to the announcements, measured as implied volatility spread, predicted bank stock returns to a greater degree than does volatility spread prior to non-meeting days.<sup>5</sup> However, they also showed that return predictability around rate changes is reliably stronger in all firms, across all industries that tend to be more interest rate sensitive. They found that return predictability is primarily driven by surprise changes in interest rates that occur during meetings with high degrees of information asymmetry. Finally, they documented that volatility spread impounds information about FOMC meetings before that information is reflected in stock prices; this effect appeared to be significantly greater during surprise events, suggesting that the option market is an important source of informed trading.

When it comes to market reactions that potentially depart from the EMH and, the existing literature is a lot more limited as we could identify only a handful of studies that strived to analyze behavioral biases that resulted from FOMC announcements. In this respect, [Zhang and Zheng \(2017\)](#) examined the impact of behavioral biases, such as overconfidence, loss aversion, and anchoring, on the market reaction to FOMC announcements. The authors found that these biases can lead to both overreactions and underreactions in the market. Looking at post announcement market behavior, [Gu, Kurov, and Wolfe \(2018\)](#) examined the relationship between FOMC announcements and stock market returns ex-post. They found that there are significant positive average stock returns after FOMC

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<sup>4</sup> The FOMC cycle refers to the period of time between two consecutive meetings of the Federal Open Market Committee (FOMC). The FOMC cycle is typically about six weeks long, but it can vary depending on the needs of the economy.

<sup>5</sup> A volatility spread is the difference between the implied volatilities of two options with the same underlying asset, strike price, and expiration date, but different types of options, like a call option vs. a put option.

announcements accompanied by the release of the Summary of Economic Projections (SEP) and press conference by the Fed Chair. They argued that these relief rallies were due to the resolution of uncertainty surrounding the FOMC's monetary policy decisions. The authors supported their argument by showing that several measures of uncertainty were significantly higher on days of FOMC announcements accompanied by SEP and press conference than on announcement days without SEP and press conference. As they used VIX changes as a measure of change in uncertainty, it remains unclear whether VIX indicated uncertainty rather than risk.

In an article published in 2018, [Ji and Zhang](#) studied the role of behavioral finance in the market reaction to FOMC announcements. The authors finding supported the notion that behavioral biases, such as herding and anchoring, could significantly affect the market reaction. In another study, [Zhang and Zhang \(2020\)](#) investigated the impact of investor sentiment on the market reaction to FOMC announcements. The authors reinforced the notion that that investor sentiment can amplify the market reaction to these announcements. In an article that investigated the relationship between investor sentiment and the pre-FOMC announcement drift, [Guo, Hung, and Kontonikas \(2021\)](#) found that the pre-FOMC announcement drift is significantly stronger during periods of high investor sentiment and low economic policy uncertainty.<sup>6</sup> They also found that buy-initiated trades associated with high sentiment were positively related to pre-FOMC returns. The authors interpreted their findings as evidence that the pre-FOMC announcement drift is driven by behavioral factors, such as investors' tendency to extrapolate recent trends and to overreact to new information. They argued that high investor sentiment led investors to become more optimistic about the stock market and to be more willing to buy stocks, even in the face of uncertainty.

Finally, in a more recent study, [Zhang et al. \(2021\)](#) examined once again the effect of FOMC announcements on the stock market from a behavioral finance perspective and confirmed that these announcements can trigger behavioral biases, such as overconfidence and loss aversion; this can lead to overreactions and underreactions in the market. The complex and dynamic relationship between FOMC announcements and the stock market has made it difficult to develop a general theory to interpret the effect. Most of the existing literature provides mixed evidence on the relationship between FOMC decisions and stock market reactions. While theoretical models suggest that changes in monetary policy should significantly affect stock prices, empirical studies have produced conflicting results. Some studies find evidence of a strong relationship between FOMC decisions and stock market performance, while others find no significant effect or a more complex, nonlinear relationship. In this paper, we provide new empirical evidence on this

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<sup>6</sup> The pre-FOMC announcement drift is a phenomenon in which stock market returns tend to be positive in the period leading up to FOMC announcements. In a previous article, [Lucca and Moench \(2015\)](#) documented large average excess returns on U.S. equities in anticipation of monetary policy decisions made at scheduled meetings of the Federal Open Market Committee (FOMC) in the past few decades. these pre-FOMC returns have increased over time and would account for a sizable fraction of total annual realized stock returns.

relationship using a comprehensive dataset while systematically confronting the results of regular periods with the periods leading to the FOMC decisions and the days following. Our analysis, intends to be valid for the analyzed dataset and shed some light on market behavior in conjunction with the Federal Reserve's policies and actions.

### **3. Data and Methodology**

For this study, we listed all the FOMC meetings and decisions for 24 years from 1998 until 2022.<sup>7</sup> This time frame was selected to analyze the recent past, and at the same time include the period before the "dot come bubble" and the Great Recession all the way to today (at the time this research had started). This time frame is relevant to the research question because it includes a variety of FOMC announcements and economic conditions, allowing for comparisons and contrasts of market reactions across different economic environments. At the same time, the time span is reasonable enough for the underlying economic structure to continue to hold.

The FOMC typically meets for two days to discuss monetary policy and economic conditions. It is important to note that the market's reaction to FOMC decisions can be influenced by a variety of factors, including economic indicators, geopolitical events, and other market-moving news. At the end of the meeting, the committee issues a statement that includes their decision on whether or not to adjust the target range for the federal funds rate, as well as their assessment of the current economic situation and their outlook for the future. The decision is usually released on the second day of the meeting, which is typically a Wednesday. The statement is released at 2:00 p.m. Eastern Time, shortly after the meeting concludes. However, the exact timing may vary depending on the specific meeting schedule and any changes to the regular meeting process. It is important to note that typically the FOMC's decision and statement can significantly impact financial markets and the economy as a whole, which is what sparked our interest in this study in the first place.

We then analyzed and recorded which decisions were aligned with expectations and which represented surprises. Customarily, a surprise decision by the FOMC can be defined as a decision that deviates from market expectations. There are various measures of market expectations for FOMC decisions, including surveys of market participants and analysis of federal funds futures prices. One of the most objective ways to measure market expectations is to look at the federal funds futures market, which is used to bet on future changes in the federal funds rate. Within this framework, a surprise decision by the FOMC could be defined as a decision that was not anticipated by the futures market, which is precisely the criterium that we used in our study to determine whether the FOMC was a surprise or not. So, to elect which decisions of the FOMC between 1998 and 2022 could be defined as a surprise, we compared the actual federal funds rate decisions made by the FOMC with the market's expectations implied by the federal funds futures market. However, it is important to note that the relationship between FOMC decisions and market

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<sup>7</sup> See appendix below.

reactions is complex and can be influenced by a variety of factors. Therefore, a comprehensive analysis of the relationship between FOMC decisions and market reactions would need to consider various factors, including market expectations, economic conditions, and other market-moving news that could be released at the time of the FOMC meeting. It is also worth noting that at times FOMC's decisions can have a delayed effect on the economy and the stock market. This may depend on the credibility of the FOMC decision as perceived by market participants and subsequent events that may alter such perception.

Fed Fund futures are contracts based on the Effective Fed Funds Rate (EFFR) rate as reported by the Federal Reserve Bank of New York (FRBNY). They are listed monthly, extending 60 months or five years out on the yield curve. Fed Fund futures are traded in IMM index terms, that is, as a price rather than a rate. The price is simply the implied rate subtracted from 100. For example, if the average monthly Fed Funds rate for September is 1.20% the futures price would be  $100 - 1.20 = 98.800$ .

For market data, we used the daily prices of the SPY ETF that tracks the S&P 500 index from January 1998 through December 2022. We preferred to use SPY rather than the S&P 500 index because the ETF can be traded, and the impact of the announcements in tradable terms can be immediately evaluated without any tracking error.

When analyzing the periods leading to and following the FOMC announcements, we identified the following periods and isolated the market returns accordingly:

- From 7 days prior to the FOMC decision to the 7 days after the FOMC decision;
- From 6 days prior to the FOMC decision to the 6 days after the FOMC decision;
- From 5 days prior to the FOMC decision to the 5 days after the FOMC decision;
- From 4 days prior to the FOMC decision to the 4 days after the FOMC decision;
- From 3 days prior to the FOMC decision to the 3 days after the FOMC decision;
- Seven days prior to the FOMC decision;
- Six days prior to the FOMC decision;
- Five days prior to the FOMC decision;
- Four days prior to the FOMC decision;
- Three days prior to the FOMC decision;
- Six days after the FOMC decision;
- Five days after the FOMC decision;
- Four days after the FOMC decision;
- Three days after the FOMC decision.
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In order to discriminate between anticipated and surprise announcements, for the time periods above we considered three possibilities as follows:

- Both anticipated and surprise announcements together;
- Solely anticipated announcements;
- Solely surprised announcements.

For the various time frames and the three categories above, for a total of 42 combinations, we computed daily returns and daily volatility; we then measured the averages and compared those to “normal periods,” which were defined as periods that were at least seven days away from pre-announcement or post announcement. These averages both for risk and return of the “announcements periods” were compared to “normal times” to evaluate whether the differences were statistically significant.<sup>8</sup> When measuring the statistical significance between two different sets of market returns, the commonly used methodology is the t-test. This test is used to determine if the difference in means between two groups is significant or simply due to random chance. To conduct a t-test, one needs to calculate the mean and standard deviation of each set of returns and then calculate the t-value using a formula that takes into account the sample size and the difference in means. The t-value is then compared to a critical value from a t-distribution table to determine if the difference in means is statistically significant. In general, this methodology can help measure the significance of the difference in returns and evaluate different investment strategies.<sup>9</sup> This can also help investors make informed decisions about which strategy to pursue. However, it's important to note that statistical significance alone does not necessarily indicate practical significance, and it is known that other factors should also be considered.

To test whether the volatility of the announcement periods and the normal periods were the same or differed in any meaningful way we used the F-test.<sup>10</sup> In the F-test (or variance ratio test) the square of the standard deviations is calculated to obtain the corresponding variances. If the two variances are not significantly different, their ratio will be close to 1. In the F-test the null hypothesis states that the standard deviation of the two distributions is equal.

In addition to risk and return we analyzed also the trading volume. This was done to measure whether there was either a drop or a rise in volume during the announcement's times. As known by academics and practitioners alike, market volume can help in understanding market sentiment. Market volume refers to the number of shares traded during a given time period, and it can provide insights into the level of activity and interest in a particular stock or market. High market volumes typically indicate strong investor interest and can signify bullish sentiment, while low market volumes may suggest a lack of investor confidence or bearish sentiment. By monitoring market volumes alongside other technical and fundamental indicators, investors and traders can gain a better understanding of market sentiment and make more informed decisions about buying and selling stocks. Also with market volumes,

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<sup>8</sup> The results are illustrated in the section below: “Analysis and Results.”

<sup>9</sup> For the purpose of this study any indication of statistical significance is particularly valuable because the number of ‘announcement days’ is materially smaller than ‘normal’ days, which makes the t-test more challenging.

<sup>10</sup> Snedecor and Cochran, 1983.

we intended to evaluate whether there were any differences during announcement periods vis a vis normal periods that were statistically significant at any meaningful alpha level.<sup>11</sup>

Finally, we looked at market momentum and any differences during normal time versus the announcement period that goes seven days before the announcement and seven days post announcement. Market momentum refers to the rate of change in an asset's price over a certain period of time. It is an important indicator of market sentiment as it measures the strength and direction of the market trend. Market momentum is typically measured using technical analysis tools such as the Moving Average Convergence Divergence (MACD) and Relative Strength Index (RSI). The MACD measures the difference between two moving averages, while the RSI compares the magnitude of recent gains to recent losses. By analyzing market momentum, investors can gain valuable insights into the market's direction and make more informed investment decisions. Market momentum is computed by subtracting asset's closing price from its current price. The closing price of the asset is taken from a certain number of past days (usually  $n$  days). The formula for market momentum is as follows:  $\text{Market momentum} = (\text{current price}) - (\text{closing price of past } n \text{ days})$ . Investors can gain valuable insights into the market's direction by analyzing market momentum and making more informed decisions about buying or selling stocks. Market momentum is one of the technical indicators used in technical analysis, which is a method for evaluating securities based on statistical analysis of past price movements. For this study, we used a lag of 10 days to calculate market momentum. One aspect that we intended to investigate, was to see if higher volatility before the announcement could be used in any way as a predictor of whether the FOMC decision would represent a surprise and therefore provide guidance to market participants.

#### 4. Analysis and Results

##### Daily Returns

On average the periods during the FOMC announcement consistently showed a lower average daily return. For the purpose of our study, as illustrated also in the previous section, these periods capture the days both before the announcements and after announcements. Remarkably, for certain of these specific periods, the differences in performance with "normal" periods" (periods other than those in proximity of the FOMC announcements) are indeed statistically significant. The table below illustrates the differences in the average daily return, considering periods that go from several days pre-announcement to several days post-announcement:

In the table above, although the differences in the daily average returns appear to be sizeable (this is an average daily return), the difference is statistically significant at the 10% level only when we consider seven days before and after the announcement.

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<sup>11</sup> See results in the Analysis and Results section below.

**Table 1**  
**Average Daily Return – Pre and Post Announcement**

	7 days before and after	6 days before and after	5 days before and after	4 days before and after	3 days before and after
Return % during Announcement	0.01*	0.01	0.01	-0.0002	0.01
Return % during Normal Periods	0.05*	0.04	0.04	0.04	0.03

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

When we looked at the periods just preceding the FOMC announcements, we noticed that the situation was reversed, meaning that the average of the daily returns tended to be greater for the “announcement periods” than for “normal periods.” This could suggest a level of overconfidence bias among market participants since more ‘bullishness’ prior to the release of the FOMC decision can mean that the buyers think they can correctly anticipate what the decision will be and its implications for market returns. This seems especially valid when compared with the post-announcement results where there is a new reversal of the data; indeed, post-announcement results indicate a lower average return when compared to the average return of normal periods. The table below showcases the differences that comprise only the days leading to the FOMC announcement; although some differences appear to be material percentage-wise, none of the differences were statistically significant.<sup>12</sup>

**Table 2**  
**Average Daily Return – Pre-Announcement**

	7 days Prior	6 days Prior	5 days Prior	4 days prior	3 days prior
Return % during Announcement	0.04	0.04	0.06	0.05	0.08
Return % during Normal Periods	0.03	0.03	0.02	0.03	0.02

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

The analysis of the day’s post announcements was especially of interest for our study because on many occasions the differences were statistically significant even at the 5% level, as illustrated by the table below:

<sup>12</sup> This can be partially due to the fact that the differences in observations in this case was particularly large because the number of days just prior to the announcement was on average only approximately 15% of the normal daily periods.

**Table 3**  
**Average Daily Return - Post Announcement**

	7 days Post	6 days Post	5 days Post	4 days Post	3 days post
Return % during Announcement	-0.02**	-0.03**	-0.03**	-0.04*	-0.05*
Return % during Normal Periods	0.05**	0.04**	0.04**	0.04*	0.04*

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

When comparing the times series that include solely surprises vs. anticipated FOMC decisions, it appears that a large portion of the anomalies illustrated above might be due to the surprises. However, since such surprises happen recurrently and with enough frequency, a rational investor could determine that it does not have the ability to predict with reasonable probability whether there will be a surprise or not. The table below illustrates the average daily returns for surprises for periods that comprise both several days prior the announcement and post-announcement:

**Table 4**  
**Average Daily Return (Surprises Only) - Pre and Post Announcement**

	7 days before and after	6 days before and after	5 days before and after	4 days before and after	3 days before and after
Return % during Announcement	-0.003	-0.01	-0.03*	-0.06**	-0.03
Return % during Normal Periods	0.04	0.04	0.04*	0.04**	0.04

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

For the periods that led to the FOMC decisions, which turned out to be surprise, we noticed that similarly to Table 2 above, none of the differences were statistically significant, and also the differences were very similar to the differences for all periods:

**Table 5**  
**Average Daily Return (Surprises Only) - Pre-Announcement**

	7 days Prior	6 days Prior	5 days Prior	4 days prior	3 days prior
Return % during Announcement	0.04	0.04	0.03	0.01	0.08
Return % during Normal Periods	0.03	0.03	0.03	0.03	0.03

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

The differences for post-announcement periods for surprises only are illustrated in the table below, where the differences are indeed statistically significant, and larger than in Table 3:

**Table 6**  
**Average Daily Return (Surprises Only) - Post-Announcement**

	7 days Post	6 days Post	5 days Post	4 days Post	3 days post
Return % during Announcement	-0.05*	-0.06*	-0.09**	-0.09**	-0.13**
Return % during Normal Periods	0.04*	0.04*	0.04**	0.04**	0.04**

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

### Daily Volatility

On average, when compared with normal periods, the announcement periods recorded a higher average daily volatility. This indicates higher risk during those periods due to the uncertainty of the outcome of the FOMC decisions. The statistical significance of the differences between normal periods and announcement periods were tested through the use of the F-test as indicated in the data and methodology section of this paper. The announcement periods include both the days leading to the decision as well the days after the decisions. The result of our analysis is illustrated in the table below:

**Table 7**  
**Daily Average Volatility - Pre and Post Announcement**

	7 days before and after	6 days before and after	5 days before and after	4 days before and after	3 days before and after
Average Daily Standard Deviation % during Announcement	1.30**	1.30*	1.31**	1.36***	1.38***
Average Daily Standard Deviation % during Normal Periods	1.22**	1.23*	1.23**	1.22***	1.23***

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

Since higher volatility during announcements periods as illustrated in the table above lowers the Sharpe ratio, it seems reasonable that such an anomaly should be corrected by investors anticipating this type of market behavior. A lower return (see Table 1) combined with higher standard deviation translated into a significantly lower Sharpe ratio for the periods in conjunction with the FOMC decisions of 0.12 compared to a Sharpe ratio of 0.65 for normal periods.

For the pre-announcement periods only, the results are similar, where most of the differences in volatility were statically significant. This confirms that volatility surges during the days leading to the FOMC's announcements. This is in line with the notion that the increased uncertainty translates into a more jittery market.

**Table 8**  
**Daily Average Volatility - Pre-Announcement**

	7 days before and after	6 days before and after	5 days before and after	4 days before and after	3 days before and after
Average Daily Standard Deviation % during Announcement	1.33**	1.32*	1.34*	1.39**	1.42***
Average Daily Standard Deviation % during Normal Periods	1.23**	1.24*	1.24*	1.24**	1.24***

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

However, by looking in isolation at the post announcements periods, somewhat surprisingly, we did not observe any material differences in volatility between announcement periods vs normal periods. In this case none of the results were statistically significant, while only for the period of 'three days after the announcement' the difference was to some extent meaningful.

**Table 9**  
**Daily Average Volatility - Post-Announcement**

	7 days after	6 days after	5 days after	4 days after	3 days after
Average Daily Standard Deviation % during Announcement	1.26	1.27	1.26	1.29	1.34
Average Daily Standard Deviation % during Normal Periods	1.26	1.25	1.26	1.25	1.25

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

The results of the table above indicate that overall, the market resumed normal level of volatility in the days following the announcements; thus, investment strategies that attempted to exploit sudden spikes in volatility solely post announcement, such as straddles and strangles, most likely would have remained unprofitable, unless they paid attention to the likelihood of a surprise announcement. Thus, based on the aforementioned findings on volatilities during different periods,

it appears that similarly, to the analysis of the daily return, this is due primarily to the periods that recorded “surprises” in the FOMC decisions. Yet once again,

In addition to the increase in volatility during the announcement periods, it is also of particular interest, (and perhaps one of the most surprising results of our study), the fact that the standard deviation of the returns for the days leading to the FOMC announcement was higher on average when the decision turned out indeed to be a surprise rather than not. That is to say that a higher daily volatility could have alerted investors that a surprise was ‘in the cards,’ with all the consequences that a surprise can have for the expected average return and volatility as illustrated in above in this section. The results in the table below illustrate that the difference in market volatility between pre-announcement surprise periods and pre-announcement non surprise periods were indeed statistically significant at the 0.01 level.

**Table 10**  
**Daily Average Volatility (Surprise vs. No Surprise)- Pre-Announcement**

	7 days before	6 days before	5 days before	4 days before	3 days before
Average Daily Volatility % for Surprises	1.52***	1.51***	1.53***	1.59***	1.68***
Average Daily Volatility % for no Surprises	1.15***	1.14***	1.15***	1.19***	1.16***

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

In the result of the table above, the 7<sup>th</sup> day is the day of the announcement, so we could speculate that the last of the period could be particularly volatile and skew the results. However, when we exclude it from the calculation and account only for seven days leading to the announcements and excluding the announcement day, the results remain robust and statistically significant as indicated in the table below:

**Table 11**  
**Daily Average Volatility (Surprise vs. No Surprise)- Pre-Announcement**

	7 days before	6 days before	5 days before	4 days before	3 days before
Average Daily Volatility % for Surprises	1.36***	1.38***	1.35***	1.34**	1.37*
Average Daily Volatility % for no Surprises	1.12***	1.13***	1.11***	1.12**	1.16*

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

## Volume

When analyzing volume, we observed that volume is significantly higher during the announcement periods than during normal periods, whether a surprise was recorded or not. Higher volume coupled with lower return (declining prices) and higher volatility suggests significant selling pressure. If this happens systematically for the announcement periods, it would be reasonable to expect that market participants should adjust their behavior, at least marginally, over time. For all announcements, the seven days prior and seven post FOMC decision, there was a clear indication that volume was greater during the announcement period and the difference was statistically significant as illustrated by the table below:

**Table 12**  
**Daily Average Volume**

	Average daily Volume - Announcement Periods	Average daily Volume - Normal Periods	df	P value
7 Days prior and 7 Days after	98,317,702	104,491,096	6,288	0.0021***

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

With regards to volume, a startling outcome that recalls the results related to volatility is that the average volume tends to be substantially higher for the seven days leading to a surprise announcement (approximately 15 million shares), compared to the volume of the seven days prior to an outcome that is correctly anticipated by the market (near 10 million shares). This suggests that the jitteriness of the market is also reflected into a substantially higher volume, which in turns anticipates an FOMC decision surprise.

**Table 13**  
**Daily Average Volume**

	Average daily Volume - Leading to No Surprise Announcement	Average daily Volume - Leading to Surprise Announcement	df	P value
7 Days prior	99,988,872	114,973,837	1,709	0.0021***

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

We observed that when the FOMC's decision did not represent a surprise, the average volume leading to the announcement did not materially differ from the average volume of normal periods and the difference was not statistically significant. The average volume of the days leading for surprise announcements certainly

differed from the average volume of the average volume of normal periods and the difference was statistically significant.

### Market Momentum

With respect to market momentum, on average the periods of the FOMC announcement show a lower momentum, 0.03, vs. 0.08. The difference was statistically significant at the 1% level. This is true for all periods (with and without surprises). This indicates that investors are less likely to buy during the announcement periods than in normal periods. This resonates well with the fact that on average returns tended to fall during the announcement periods. Again, the systematic recurrence of lower market momentum during the last 20 years, especially in conjunction with higher volatility, lower return and lower volume is somewhat puzzling since market participants could adapt to this market behavior, so it should be corrected over time, or at least less noticeable. Another explanation can be that smart money drives the emotions of the market in order to take advantage of the outcome which is partially driven by the emotions of other market participants.

**Table 14**  
**Market Momentum**

	Market momentum -announcement periods	Market momentum - normal periods	df	P value
7 days prior and 7 days after	0.03	0.80	6,279	0.00001***

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

When we compared the momentum for the seven days prior to the announcements of the surprise decisions vs the no surprise, we discovered that the difference was of opposite sign, that is, with for no surprise the momentum was positive while for surprises, the momentum was actually negative.

**Table 15**  
**Market Momentum**

	Market Momentum - Announcement Periods No Surprise	Market Momentum - Announcement Periods Surprise	df	P value
7 days Prior	0.73	-0.14	1,709	0.0092***

\*\*\* Statistically significant at the 1% level; \*\*statistically significant at the 5% level; \* Statistically significant at the 10% level.

Once more, our study shows that the momentum generally predicts whether the FOMC decision will be a surprise before the announcement actually takes place. Weather market participants can truly profit from such knowledge of course remains doubtful given the direction of the surprise will remain unpredictable.

## 5. Conclusion

This study has investigated the impact of FOMC decisions on the S&P 500 index and the SPY ETF, a tradable proxy for the index. Our findings suggest that FOMC decisions have a significant impact on the stock market, with both the S&P 500 index, or the SPY ETF as a proxy, experiencing a decline in daily returns and an increase in daily volatility on average during the announcement periods. We also observed that lower volumes and lower momentum are present during the announcement periods when compared with normal periods. These findings are consistent with previous research that has shown that FOMC decisions are a source of uncertainty and risk for investors.

While surprises account for a meaningful portion of the market reaction to FOMC announcements, we also found that some of the observed traits persist even when the market correctly predicts the FOMC decisions. This suggests that there may be other factors at play, such as investor sentiment or herding behavior. With respect specifically to FOMC decisions that surprised the market, we observed that the days leading to the FOMC meeting recorded higher market volatility. This seems to represent an anomaly since the higher-than-average volatility could be seen as a signal to market participants that the FOMC decision is likely to be a surprise. Although we should expect this breakdown in market performance to be arbitrated away, this would most likely require taking a short position or writing call options, which, of course, can entail considerable risk. Interestingly, the higher-than-normal volatility preceding surprise announcements is accompanied by two other anomalies: higher volume and lower momentum. Volume is significantly higher for surprise announcements than for non-surprise announcements, and momentum is significantly negative for surprise announcements but not for non-surprise announcements.

We believe our results have important implications for investors and policymakers. For investors, our findings suggest that they should be cautious when trading during FOMC announcement periods. The market is more likely to experience volatility and lower returns during these periods, as investors react to the news and try to adjust their positions. Investors may want to consider reducing their exposure to the market during these times, or hedging their positions using options or other derivatives to protect themselves from downside risk. For policymakers, the results of our analysis suggest that they should be aware of the potential impact of their decisions on the stock market. FOMC decisions are a major source of uncertainty and risk for investors, and policymakers should carefully consider the market's expectations and communicate their decisions in a clear and concise manner in order to minimize volatility.

In addition to the above, we postulate that investors may be able to exploit the market inefficiencies that we observed. For example, investors could potentially profit by selling (shorting) the index before the announcement period and going long the index (closing the short position) after the announcement period, when the market is more likely to resume normal levels of volatility and higher daily returns. Additionally, and more importantly, when higher levels of volatility and volume are observed during the days leading to the announcement date, the speculator could anticipate the possibility of surprise and exploit the additional expected volatility by adopting a straddle or strangle options strategy. However, it is important to note that these strategies would involve taking on additional risk, as there is no guarantee that the market will react in the expected way since our study identified the average results over a long period of time.

Further research, which we are keen in pursuing could explore areas such as market reaction to FOMC announcements for other central banks, the evolutionary aspects of the market reaction to FOMC announcements, per the adaptive market hypothesis and the market reaction to FOMC announcements for other indexes. Market reaction to FOMC announcements for other central banks would involve comparing the market reaction to FOMC announcements to the market reaction to announcements from other central banks, such as the ECB or the Bank of England. This would allow us to identify any differences in the market's response to different central banks, and to measure the implications for market efficiency. We could also measure any spillover effect of one central bank to foreign markets. The adaptive market hypothesis posits that the market evolves over time in response to new information and changing conditions. This research question would explore how the market's reaction to FOMC announcements has evolved over time. This would require a longer time span of data, but it would provide valuable insights into the market's learning and adaptation process and identify whether the anomalies that we identified in this paper are likely to fade over time and to what extent. Finally, with respect to market reaction to FOMC announcements for other indexes, this research question would explore the market reaction to FOMC announcements for other indexes, such as the Dow Jones Industrial Average and the NASDAQ 100. This would allow us to identify any differences in the market's response to FOMC announcements for different indexes. It would also let us to assess the generality of the findings from previous research on the market reaction to FOMC announcements for the S&P 500 index.

Overall, we believe our study has provided valuable insights into the impact of FOMC decisions on the stock market. FOMC decisions are a significant source of uncertainty and risk for investors, and that investors should be cautious when trading during FOMC announcement periods. Nonetheless, a great deal of further work can be done to test other hypotheses as well as considering different time periods, and / or the decisions of other central banks around the world as well as the interconnectedness of such decisions among different markets.

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