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**Unscheduled Events, Stock Returns, and Market Efficiency: A COVID-19 Case
Study of Industry Leaders**

An Honors Thesis submitted in partial fulfillment of the requirements for Honors in the
Economics Department

By

Nathan Durham

Under the mentorship of Dr. Nicholas Mangee

Abstract

This thesis explores the effects of unscheduled events on stock market returns due to increased uncertainty. A case study is done on the Coronavirus pandemic for the dates of March 9th, 2020, through March 23rd, 2020. The findings allow for short-run and long-run narratives where long-run returns, and short-run volatility explain how the role of psychology and different forecasting strategies are used to differentiate industry outcomes and technology sector returns.

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I. Introduction

The coronavirus pandemic (COVID-19) turned the world on its head. It was a crisis event that no one saw coming. The pandemic gave every household and business a new set of challenges to face. With social interaction plunging and economic activity hitting a standstill, the way in which the world operated was thrown completely out of rhythm. For the stock market, there were not many events COVID-19 could be compared to historically in terms of its magnitude or impact. In fact, according to Baker *et al* (2020) the stock market reaction to COVID-19 is completely unprecedented when comparing it to past pandemics. This is because stock prices are affected by two types of events: scheduled and unscheduled.

Scheduled events follow a routine calendar release, such as government agency reports, while unscheduled events do not follow a periodic release. When nonroutine events (pandemics, wars, recessions, presidential elections) occur, uncertainty increases driving a wedge between short run and long run forecasts and between differential industry effects. COVID-19 marks one of the most dramatic unscheduled events in the stock market's history, especially during the month of March 2020 when the pandemic became a reality in the US. This thesis will explore a case study on stock returns during COVID-19 for industry leaders across the consumer goods, financial services, and technology industries to understand whether and how unscheduled events have differential impacts on market outcomes. By using textual analysis of financial news to identify unscheduled events, the analysis, indeed, finds that market efficiency and the

role of psychology are different for technology industry stock returns compared to the other industries.

By understanding how stock prices respond to unscheduled events, investors and researchers are better equipped to understand the role of uncertainty in the market. Since unscheduled events are not all the same in magnitude and scope, it can be hard to judge stock valuations because older information is based on previous economic conditions and the impacts of unscheduled events are unforeseeable. This makes the mechanical method – basing forecasts on past relationships in the data – for evaluating a stock difficult. Risk will always be present in the stock market but being able to better understand the role of uncertainty can help both investors and economists alike make sense of how stock market outcomes unfold over time. The results of this thesis could further strengthen the view of Frank Knight (1921) on “immeasurable risk” in the stock market, dubbed Knightian Uncertainty. Knight separates the ideas of risk and true uncertainty. According to Knight, risk is measurable whereas true uncertainty is not. Since risk is measurable, its expected negative outcomes can be represented with a probability. Uncertainty, on the other hand, is handled solely by judgement and that is where the profit lies according to Knight (1921).

This thesis investigates whether unscheduled events cause returns in the technology industry to behave differently than those in the financial services or consumer goods industries. The increased uncertainty from COVID-19 causes different effects due to short-run versus long-run considerations. It is hypothesized that the technology industry is more efficient at aggregating prices in the short run, but investors are more focused on long-run returns. Consequently, returns in the technology industry should be greater (or

less negative) than the other two industries if long run forecasting dominates.

Alternatively, greater short run efficiency of the technology industry implies psychology holds more of an influence in the day-to-day movement in stock prices. The technology industry can attribute those results to two reasons. The first is that there is a greater rate of innovation in the technology industry due to firms constantly producing new and more efficient ideas. The second reason is that the pandemic did not create the same structural restrictions for the technology industry that were created for the consumer goods and financial services industries.

Specifically, I investigate a ten-day timeframe in March 2020 and find that the financial services and consumer goods industries experienced greater negative returns when compared to the technology industry. Moreover, psychology plays a larger role in setting technology industry prices.

To test the hypothesis, a case study across the consumer goods, financial services, and technology industries during the COVID-19 pandemic was conducted with a sample period March 9th, 2020, through March 23rd, 2020. The top three firms in terms of holdings were used as the industry leaders. In the consumer goods industry, the top three firms are Amazon (AMZN), The Home Depot Inc (HD), and McDonald's Corporation (MCD). Moving into the financial service industry, the top three firms are Berkshire Hathaway Inc Class B (BRK.B), JPMorgan Chase & Co (JPM), and Bank of America Corp (BAC). Finally, the technology's top three firms are Apple (AAPL), Microsoft Corp (MSFT), and NVIDIA Corp (NVDA). To track the frequency and impact of firm-specific unscheduled events – such as management shakeups and new hirings – this analysis uses a dataset from *Ravenpack News Analytics* identifying all events across the *Dow Jones*

Newsfeed, *Wall Street Journal*, *Barron's*, and *MarketWatch* for all publicly traded companies in the United States. By aggregating the data, both industry and firm level return trends were found.

The analysis provides evidence that a dramatic number of unscheduled events can lead to more negative returns, however, more normal ranges of unscheduled events have mixed effects on returns. By digging deeper into these mixed results across industries it was found that the financial services and consumer goods industries did experience greater negative returns than the technology industry whose returns seemed more long-run focused. Moreover, when it came to day-to-day price movements, the consumer goods industry experienced the least amount of volatility showing a more direct relationship with the effects of COVID-19. This implies that investors in the technology industry were more focused on making longer-run capital gains. In support of my second hypothesis, psychology played a greater role in enhancing technology industry efficiency when unscheduled events were reported in the news.

Additional textual analysis was also applied to the hypotheses in the form of combing *Bloomberg Wraps* for the sample period. It was evident in examining the wraps that stock market uncertainty was flowing at a high level during the sample period. A prime example would be David Spika, president of GuideStone Capital Management, who said “We have no idea how to model it, we have no idea what to expect from it.” When a prominent industry figure tells the public that there is no discernable way to model this pandemic as more unscheduled events unfold, the role of uncertainty increases leading to a greater diversity of views. In turn, industries will reflect differential effects due to short-

versus long-run forecasting horizons and psychological factors will be needed to make sense of unforeseeable impacts.

While the country's social interactions were nonexistent and economic activity came to a halt, the stock market found itself doing better than the rest of the country. During the initial shutdown in March 2020, the stock market was hit hard, but over the course of the pandemic it rebounded and pushed onward despite many figures feeling that a price bubble had been created. Originally, many looked at the stock market as an indicator of the economy, but the pandemic has suggested that the two entities appear disconnected. By contrast, the analysis and results from this thesis suggest financial markets and the real sector are indeed connected. Rising prices were due to longer-run forecasts of technology firms, such as Apple and Microsoft, which are some of the largest in the world. This helps explain why the technology firms, and their earnings results, were trending up while the consumer goods and financial services industries laid in ruin. However, while the stock market moved in an upward trajectory, the economy was still damaged from COVID-19.

This thesis is organized as follows. Section 2 provides a literature review. Section 3 presents the main hypotheses. Section 4 describes the dataset and methodology while Section 5 reports the results. Section 6 concludes the thesis with nods to future research.

II. Literature Review

Market efficiency is a key component in understanding how excess returns are generated in the stock market. The Efficient Market Hypothesis (EMH) was pioneered in 1970 when Eugene Fama published his theory and work on whether stock returns

behavior displayed discernible patterns. EMH argues that asset prices fully reflect all relevant information at every point in time and therefore investors cannot consistently outperform the market. Furthermore, persistent market anomalies should be nonexistent under this theory because they would immediately be arbitrated away. Since past price movements would already be fully reflected in current prices, investors would not be able to use technical analysis to consistently outperform the market. Under this theory, any excess returns would be random. However, classical approaches motivated by Fama assume that tests of EMH involve fixed informational factors, usually based on conventional data releases that assume investors use probabilities to forecast outcomes, and that psychological factors do not matter.

However, EMH cannot explain excess volatility first found by Shiller (1981). Shiller (1981, 2003) argued that behavioral finance, i.e., psychological factors, should be considered when trying to explain the excess volatility. Excess volatility due to pure psychology, however, implies that stock markets are casinos and are driven by irrationality and misallocate capital. Thus, financial markets are not functioning properly implying a greater role for state intervention. Rather, there is good reason to believe psychology plays a natural cognitive role when unscheduled events, and structural change, take place.

In Barro (2006), disaster probabilities were calculated and used to further the argument that the potential for rare disasters is the cause of asset pricing anomalies and time-varying risk. Barro understood that unscheduled events are important for investors and that as the probability of an economic disaster changes, the standard deviation of excess returns does not change one for one with the risk premium. Being able to assess

the probability of an economic disaster would be vital to investors trying to gauge the market and decide if they should enter, stay, or leave. But this probability-based approach is only valid when true uncertainty is absent in the stock market.

A growing idea based on Imperfect Knowledge and Knightian Uncertainty Economics developed by Frydman and Goldberg (2011) and Frydman *et al.* (2015) is that true uncertainty is ubiquitous in stock, and other asset, markets. This literature assumes that rational forecasting is tied to both fundamental and psychological factors and rejects the REH assumption that the future unfolds in a determinant way and affirm that Knightian uncertainty is an important factor in real world markets (Frydman et al, 2015). Consequently, under these approaches, investors cannot use past relationships to forecast future returns due to unscheduled events and unforeseeable change caused by Knightian Uncertainty. Knightian Uncertainty works to weaken investors' predictive models. Uncertainty forces investors to come up with diverse forecasting strategies which complicates uniformly applying views across different industries with different forecasting horizons for cash flows. However, that does not stop different sets of forecasting strategies from being invented and implemented which may assist industry level forecasting.

Industry specific forecasts are ways to apply a certain view to all the firms in that industry. Indeed, Friberg and Seiler (2017) find that industry forecast face not only conventional risk but also ambiguity. The authors separate the ideas of ambiguity and risk by defining the former as market uncertainties with unknown probabilities and the latter as measurable uncertainties with known probabilities. They claim to have found that

ambiguity is high in technology industries while risk is higher in competitive industries like consumer goods industries (Friberg and Seiler, 2017).

Mangee (2021) extends this literature using textual analysis to strengthen the ideas of Knightian uncertainty and how the associated instability influences stock market relationships. Big data textual analysis of financial news reveals the inextricable connection between unscheduled events, psychology, and time-varying forecasting diversity in the stock market. This thesis will build on the textual analysis of both Friberg and Seiler (2017) and Mangee (2021) investigating these dynamics on industry level returns during the COVID-19 pandemic.

III. Hypothesis

This thesis hypothesizes that returns across all three industries will be greater (greater in absolute value, but negative in sign) when more unscheduled events occur. That is, there will be a negative correlation between number of unscheduled events and returns for all three industries. Additionally, the analysis hypothesizes that the financial services and consumer goods stocks experienced more negative returns than the technology industry during the time of March 9th, 2020, through March 23rd, 2020. It is predicted that the technology industry will experience less negative returns because investors take a longer-run approach during the time examined and therefore the industry is more resilient to real economy shocks in the short-run. The technology industry also experiences quick-paced innovation. Due to the innovative nature of the companies in the technology industry, they can adapt to situations more efficiently which, again, allows the industry to show resilience when faced with bouts of adversity.

The forecasting horizon for each of the industries is different as well. The consumer goods and financial services industries have forecasting views that mainly operate in the short run. Their good and services are reliant on social interaction which plummeted due to COVID-19. Short run changes in COVID-19 news will weigh heavily into investor sentiment regarding these two industries since they are more based in the real economy. The technology industry will have forecasting views that are more long-run focused. Since firms in the technology industry have a better ability to adapt to an environment with little to no social interactions, investors can forecast over longer-run horizons. Therefore, uncertainty caused by COVID-19 is hypothesized to have less of a negative impact on the technology industry.

IV. Dataset and Methodology

The data employed throughout this thesis comes from the *RavenPack* news analytics platform. *Ravenpack* tracks all identified firm events (scheduled and unscheduled) and provides explanatory and predictive analytics from *Dow Jones Newsfeed*, *Wall Street Journal*, *Barraon's*, and *MarketWatch* articles published over the past two decades. The dataset is abundant with structured information and includes thousands of event classifications. The primary data source is based on millions of corporate-specific events, identified by the previously mentioned outlets, that impact a firm's share price. *Ravenpack* automatically tracks such events and any relevant information on tens of thousands of companies while also generating metrics for event classification almost immediately after the news comes out.

Using *Ravenpack* to gather event data on the largest firms in each of the three industries being examined in this study was crucial in delivering the narratives

surrounding each industry. Firm level data was aggregated into industry level data to create a clear comparison between the industries. Industry event and return statistics were calculated and are represented in **Table 1** and **Table 2**. Analyzing stock price changes and comparing the sentiment surrounding unscheduled events between the industries allows the hypothesis to develop differing narratives in the short run and long run which is represented in **Table 3** and **Table 4**. Combining the short run and long run narratives with the industry event and returns statistics allows for the emergence of industry specific forecasting strategies used during the ten-day timeframe examined in March 2020.

The differences in forecasting strategies further the idea that psychology plays a rational role used by investors when developing forecasting strategies under increased uncertainty. Importantly, the textual data allows for unscheduled events to matter in different ways over time. Therefore, investors can alter their forecasting strategies based on new information. How the new information is received affects the psychology of investors and pushes them toward a forecasting strategy that is more aligned with the overall mood for firms particular to an industry.

Textual analysis was also used by delving into *Bloomberg* wraps for the period. The wraps were combed through to try and grasp how the language used in them affected investor sentiment in the technology industry. The wraps were also used to gather quotes, ideas, and feelings expressed at the time that can be used to paint the overall sentiment around the stock market and investor narratives. Real emotionally charged language that was used to describe the environment during the period was found within the wraps.

V. Results

The results showcased in **Table 1** and **Table 2** provided mixed results when trying to determine if more unscheduled events decrease returns. **Table 1** details the average prices and capital gains yield for each firm and each industry while **Table 2** gives the number of scheduled and unscheduled events for each firm and industry. The Financial Services industry leads the pack with a total of 498 unscheduled events and had the most negative overall return at -53.69% for the period. That result supports the claim that more unscheduled events cause a decrease in returns. However, when comparing the Consumer Goods and Technology industries, we find that the Technology industry had more unscheduled events but experienced a less negative return than the Consumer Goods industry. Which does not support the previous results and claim. Therefore, while there is marginal support at the extremes, there is inconclusive evidence that more unscheduled events decrease returns across the industries.

In terms of overall returns, the financial services and consumer goods industries' stocks had greater negative returns than the Technology industry. I believe there are two factors working to influence that outcome. The first being that with the world economies and social aspects shutting down due to COVID-19, technology stocks were looked upon more favorably since people were becoming increasingly reliant on them. With more people diving into technology or increasing their usage rate, the tech companies fared better than other industries because of the technology industry's ability to have products that can be used almost anywhere anytime. The second reason I would like to posit is that investors in the technology industry hold a longer-run view than those in the consumer goods and financial services industries. While the stock market was whipsawing and trading activity was higher than the norm, the *Bloomberg Wrap* from November 19th,

2020, showed how investors were locked into a conflict of short run versus long run horizons when trying to create forecasts for the market and industries.

Table 1

Consumer Goods	Home Depot	Amazon	Mcdonalds	Average	Total
Average Open Price	\$183.66	\$1,796.42	\$163.54	-	-
Average Close Price	\$183.20	\$1,811.98	\$162.84	-	-
Average High Price	\$190.44	\$1,860.00	\$170.20	-	-
Average Low Price	\$172.98	\$1,751.11	\$155.89	-	-
Average	\$182.57	\$1,804.88	\$163.12	-	-
Cap Gains Yield For Whole Period	-24.07%	7.27%	-26.95%	- 14.58%	-43.75%
Cap Gains Yield on March 16th	-9.35%	2.90%	-5.15%	-3.87%	-11.60%

Financial Services	Berkshire Hathaway	JPMorgan	Bank of America	Average	Total
Average Open Price	\$182.70	\$90.29	\$21.23	-	-
Average Close Price	\$182.50	\$90.54	\$ 21.37	-	-
Average High Price	\$187.39	\$95.00	\$22.25	-	-
Average Low Price	\$176.73	\$86.39	\$20.45	-	-
Average	\$182.33	\$90.56	\$21.33	-	-
Cap Gains Yield For Whole Period	-16.86%	-18.16%	-18.67%	- 17.90%	-53.69%
Cap Gains Yield on March 16th	2.17%	3.71%	2.97%	2.95%	8.85%

Technology	Apple	Microsoft	NVIDIA	Average	Total
Average Open Price	\$63.43	\$145.72	\$55.64	-	-
Average Close Price	\$63.48	\$146.04	\$55.87	-	-
Average High Price	\$65.81	\$152.05	\$58.52	-	-
Average Low Price	\$61.45	\$140.49	\$52.84	-	-
Average	\$63.54	\$146.08	\$55.71	-	-
Cap Gains Yield For Whole Period	-14.94%	-9.95%	-11.34%	- 12.07%	-36.22%
Cap Gains Yield on March 16th	0.10%	-3.27%	-7.53%	-3.57%	-10.71%

Table 2

Consumer Goods	Home Depot	Amazon	Mcdonalds	Average	Total
Unscheduled Events	15.00	19.00	27.00	20.33	61.00
Scheduled Events	0.00	1.00	0.00	0.33	1.00
Average	7.50	10.00	13.50	-	-
Total	15.00	20.00	27.00	-	62.00

Financial Services	Berkshire Hathaway	JPMorgan	Bank of America	Average	Total
Unscheduled Events	6.00	443.00	49.00	166.00	498.00
Scheduled Events	3.00	7.00	2.00	4.00	12.00
Average	4.50	225.00	25.50	-	-
Total	9.00	450.00	51.00	-	510.00

Technology	Apple	Microsoft	NVIDIA	Average	Total
Unscheduled Events	54.00	19.00	14.00	29.00	87.00
Scheduled Events	9.00	1.00	0.00	3.33	10.00
Average	31.50	10.00	7.00	-	-
Total	63.00	20.00	14.00	-	97.00

“There’s the push-pull of short-term versus long-term and that’s what investors are looking at right now,” said Chris Gaffney, president of world markets at TIAA Bank.

[11/19/20]

The quote by Chris Gaffney further exemplifies the diversity in forecasting views exhibited by investors because of COVID-19. There are some forecasting strategies that are focusing on a post-pandemic world while other forecasting strategies are living in the present COVID-19 controlled world. Since the technology industry can plough through many of the issues caused by COVID-19, forecasting strategies surrounding this industry are able to focus more on what the world is going to look like after the pandemic. On the other hand, industries like consumer goods and financial services have a greater reliance

on the real economy which forces forecasting strategies for these industries to live in the short run.

The tables also indicate that the technology industry may have an overall greater level of industry efficiency than the other two industries. **Table 3** gives the breakdown of how much an unscheduled event affected stock prices during the period. The Consumer Goods industry had a change of approximately -2.22% per unscheduled event, the Financial Services industry had a change of approximately -3.23% per unscheduled event, and the Technology industry had a change of approximately -1.61% per unscheduled event. By having the lowest change in stock price per unscheduled event, the technology industry was the most efficient about factoring in short-run uncertainty into its pricing. If an unscheduled event were to happen, the consumer goods and financial services stocks would be more affected than the technology industry's stocks because the technology industry more accurately reflects market conditions and consumer aversion to market uncertainty. Therefore, the level of market efficiency in the technology industry may be greater and geared toward the long run compared to the consumer goods and financial services industries.

Based on the results drawn from these tables, evidence is provided to support the view that the financial services and consumer goods industries were more negatively impacted by COVID-19 than the technology industry. The technology industry had the least negative returns for the whole period and showed to be least affected when an unscheduled event occurred. Thus, the technology industry displayed a greater overall level of market efficiency toward long-run returns. Investors in this industry are more willing to hold through volatile periods in hopes of realizing a greater (or less negative)

return. A longer-run viewpoint of the consumer good and financial services industries implies investors in those two industries will alter their short-term position when uncertainty trends upward in the market.

Table 3

Change in Stock Price Per Unscheduled Event For The Whole Period		Average
Home Depot	-1.60%	-
Amazon	0.38%	-
Mcdonalds	-1.00%	-
Consumer Goods Total	-2.22%	-0.74%
Berkshire Hathaway	-2.81%	-
JPMorgan	-0.04%	-
Bank of America	-0.38%	-
Financial Services Total	-3.23%	-1.08%
Removing JPMorgan	-3.19%	-1.60%
Apple	-0.28%	-
Microsoft	-0.52%	-
NVIDIA	-0.81%	-
Technology Total	-1.61%	-0.54%

During the time frame examined, JPMorgan had a substantially greater number of unscheduled events than the other two firms in the industry. To ensure the data was not skewed by a firm dominating the number of unscheduled events in the industry, I created a secondary dataset excluding JPMorgan's data to get results that were free of their influence. Those results did not produce anything of significant difference in the data. The new results just verified what the original results were already showing.

Table 4 compares each industry's average event sentiment score (ESS) with the corresponding standard deviation of return for that industry. Essentially, this table is the

visual of the short-run story that took place over the examination period. The consumer goods industry featured the highest ESS and lowest standard deviation. Therefore, in the short-run, pessimistic psychology had less of an impact in the consumer goods industry than in the other two industries. Both the financial services industry and the technology industry have a lower ESS and higher standard deviation. The volatile state of the market played into the psychology of investors in those two industries making their short run price fluctuations more volatile. The technology industry faced the most pessimism when faced with an unscheduled event. This gave way to more short-run volatility in the industry. However, since the investors in the technology industry took a longer-run approach to their forecasting strategies, they were able to experience the least negative returns.

Table 4

	Average ESS	STDEV of Returns
Consumer Goods	53.89	7.42%
Financial Services	50.02	8.93%
Technology	40.69	8.40%

On the other hand, the consumer goods industry had the highest ESS and lowest standard deviations of returns while holding the middle position in overall returns for the period. Investors in this industry were relatively the most optimistic in terms of event sentiment and therefore experienced the least amount of short-run volatility out of the three industries. However, investors in this industry were not looking as favorably

towards the long run as in the technology industry. As a result, they had more negative returns than the technology industry. The result is unsurprising given the context of the pandemic. With people having to cut back their working hours or stop working completely, a drop in the demand for consumer goods was inevitable as people used the money they were able to make for necessities.

The financial services industry faced the largest standard deviation of returns and the most negative return for the whole period but also held the middle position in the average ESS rankings. While investors in this industry were about split evenly on pessimism and optimism for their event sentiment, the industry was plagued with the highest amount of short-run volatility. I believe the instability in this industry during COVID-19 can be compared to other crisis events like The Great Depression and The Great Recession when banks and other financial companies around the United States collapsed. Based on those past crisis events, investors were unsure whether they could trust the industry to pull through or if it would suffer a fate to a similar degree of a previous crisis event. The lack of confidence led to an unfavorable long-run view causing this industry to suffer the most in the long-run.

VI. Conclusion

COVID-19 was a crisis event with little to no relatives for comparison. The way in which the world operated essentially changed overnight. This pandemic was a large-scale unscheduled event that has an effect still felt to this day in the stock market. Uncertainty is still a large factor in today's market. This thesis aimed to find a correlation between the number of unscheduled events and industry stock return. However, the results indicate that the two factors are connected but are not uniformly correlated. In the short-run, the

emotions and thoughts surrounding the state of the stock market make the volatility of returns differ from returns based on long-run forecasts. Also, in the short-run, investors in the consumer goods industry were the most optimistic about unscheduled events with an average ESS of 53.89, while the technology industry had the lowest average ESS of 40.69. A future study may examine why the consumer goods industry had optimism while the industry's stocks continued to suffer. However, when investors peered to the future, their forecasting strategies were altered. The setting of the pandemic allowed the technology industry to gain long-run favorability while the consumer goods and financial services industries fell to skepticism.

The *Bloomberg Wraps* also revealed that stock market and industry figureheads were feeding into the uncertainty. The language used and details provided in the wraps served to make investors uncertain about the state of the stock market and where it was headed. With commercial investors and market leaders all featuring growing uncertainty, it was creating an extremely volatile market. This led to big losses across the board, however, certain industries fared better than others due to the differences in long run and short run forecasting strategies employed. A further study might include more industries and create a model examining the factors that influence each industry's stock price. That would extend the results found in this thesis while also verifying what factors are of more importance to each industry.

As the world still recovers from the effects of COVID-19, uncertainty still holds a firm grip around the stock market. The results of this thesis revealed the different forecasting views investors are using to navigate the volatile terrain. As society creeps toward a post-pandemic world, those forecasting strategies become liable to change as

investors take new information into account and adjust their expectations accordingly. Investors will be better prepared for any future crisis event by using the experience gained from COVID-19 to help guide them when faced with major unscheduled events and a highly volatile market.

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