2020

Noise Traders, Fintech, and Equity Market Volatility

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

Parker College of Business

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Under the advice of Dr. Axel Grossmann

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Abstract

The literature provides ample evidence that the last decades have seen an increase in noise trader activities, in part driven by the development of fintech. This paper strives to educate readers on the term noise traders as well as fintech. Moreover, it argues that the evolvement of noise trader activities accompanied with fintech has increased equity market volatility over time. The study finds that equity market volatility has indeed increased over time and is not driven by periods of crisis. Furthermore, this increase in volatility is more severe for small stocks versus large stocks, which is in line with the stated hypothesis that low volume stocks (small stocks) are more impacted by noise trades. Additionally, the study finds higher volatility for daily returns versus volatility based on weekly or monthly returns, which supports the notion that noise traders move more quickly in and out of equity markets. Finally, sectors which are potentially more impacted by noise trader activities, due to their growth and media coverage, also demonstrate higher volatility.

Introduction

Throughout the Covid-19 pandemic, equity markets in the United States have seen unprecedented levels of volatility. From its high in February, the S&P 500 dropped over 30% in a single month only to rebound later in the year to all-time highs. With such extreme movements within the market, it is important for an investor to understand what factors are at play creating the volatility. While the pandemic has been the largest catalyst of market movements, upon analyzing market trends, there are two potential underlying factors that may have exacerbated volatility. These two potential driving factors of volatility are noise traders and fintech. Noise traders are irrational individuals who trade on incomplete or false information. This leads to equity prices diverging from a fundamental value because of noise traders investing based on false information (De Long, Shleifer, Summers, and Waldmann, 1990). The impacts of noise traders on equity markets may have been enhanced by recent developments related to fintech, specifically zero commission trading and fractional shares, which allows any market participant to buy and sell shares without having to pay transaction costs for their trades.

The purpose of this paper is twofold: First, we aim to explain and educate the reader about noise traders as well as fintech. By understanding the potential impact of noise traders and fintech on equity markets, investors may be better prepared to navigate current market conditions by evaluating risk levels. Second, we investigate the potential impact of noise traders on the volatility of equity markets. If noise traders are indeed irrational, they are assumed to cause more volatility. Moreover, noise traders are assumed to seek short-term profit; hence, moving in and out of the market more quickly.

Thus, one would expect that they have a higher impact on the short-term volatility of daily returns compared to the volatility of weekly or monthly returns. Furthermore, noise traders may have a larger impact on stocks with smaller trading volume (usually small stocks) versus stocks with higher volume (typically larger stocks). Additionally, the advancements in fintech may have increased noise trading activities; thus, one would expect an increase in volatility over time, and a greater impact over time on small stocks versus large stocks. Finally, different sectors might be more impacted by noise trading compared to other sectors. Noise traders might be more active in the IT sector, where they may be less active in a sector such as utilities.

What is Noise Trading?

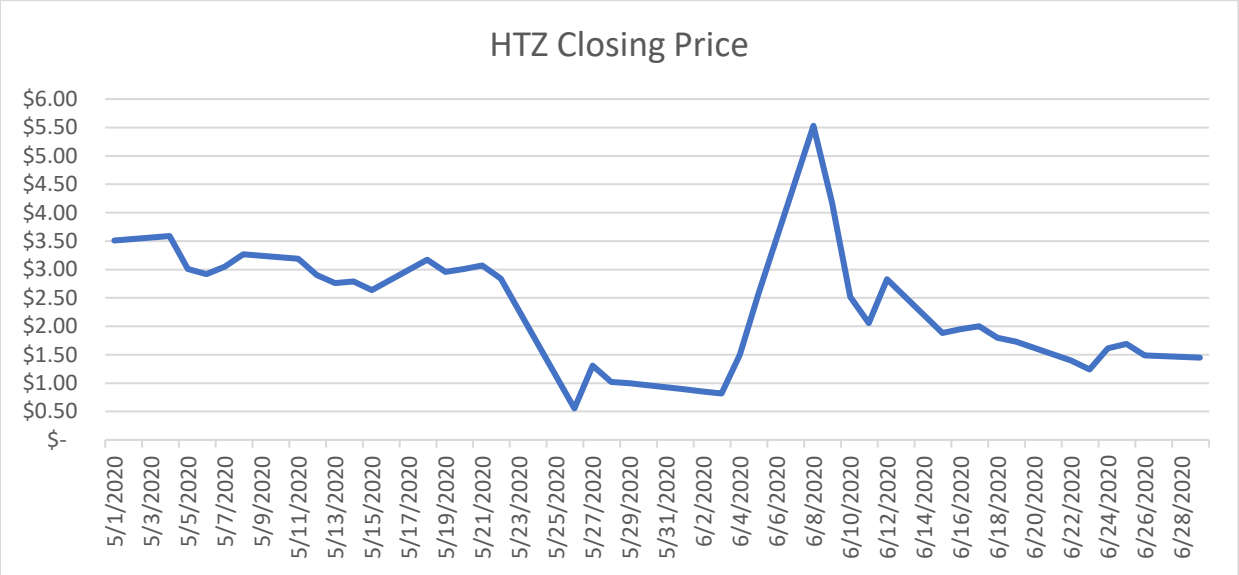
The term noise was first introduced by Black (1986) in his paper 'Noise' to describe small events that cause a disproportionate impact relative to their size. A noise trader, as defined by De Long et al. (1990), is an irrational individual who trades on incomplete or false information. This is opposite to the rational investor, who is an individual that reasonably calculates the costs and benefits of every action before making an investment decision. The rational investor is used as the basis for many economic theories and financial models. Noise traders were further defined by Shliefer and Summers (1990) as individuals who chase trends and rumors rather than investing based off a company's fundamentals or solid technical analysis. This formal definition of noise then evolved to describe individuals who speculate based on these events. While noise traders have only had a formal definition for a relatively short period of time, these types of traders have always existed, but in the age of media and internet as well as lower transaction costs, the amount of noise traders have increased. This is might be

partially due to the amount of information that investors are provided. For example, a quick web search of the phrase “Disney Stock” yields hundreds of millions of results. This volume of information creates concerns of an information overload, as even a rational investor may be misled by inaccurate or erroneous information.

With more noise comes increased risk associated with these speculators. In his study on noise trader risk within financial markets, De Long et al. (1990) states that: “The unpredictability of noise traders' beliefs creates a risk in the price of the asset that deters rational arbitrageurs from aggressively betting against them. As a result, prices can diverge significantly from fundamental values even in the absence of fundamental risk. Moreover, bearing a disproportionate amount of risk that they themselves create enables noise traders to earn a higher expected return than rational investors do.” This shows that noise investors are the opposite of rational investors, as they seek to gain excess returns during a short-time horizon.

Noise trading alone presents an increase in risk, but as of late patterns of herd behavior have been present amongst noise traders. Herd behavior is when individuals within a group begin to act collectively as a whole without centralized direction. This has created tailwinds for noise investors who have created enough demand to drive stock prices higher, diverging from a fundamental value. As De Long et al, (1990) state, “prices can diverge significantly from fundamental values.” Internet chat forums have even been created for noise investors claiming noise as due diligence on companies. Figure 1 shows an example in Hertz (HTZ) of a company’s stock price that has potentially been impacted by noise traders.

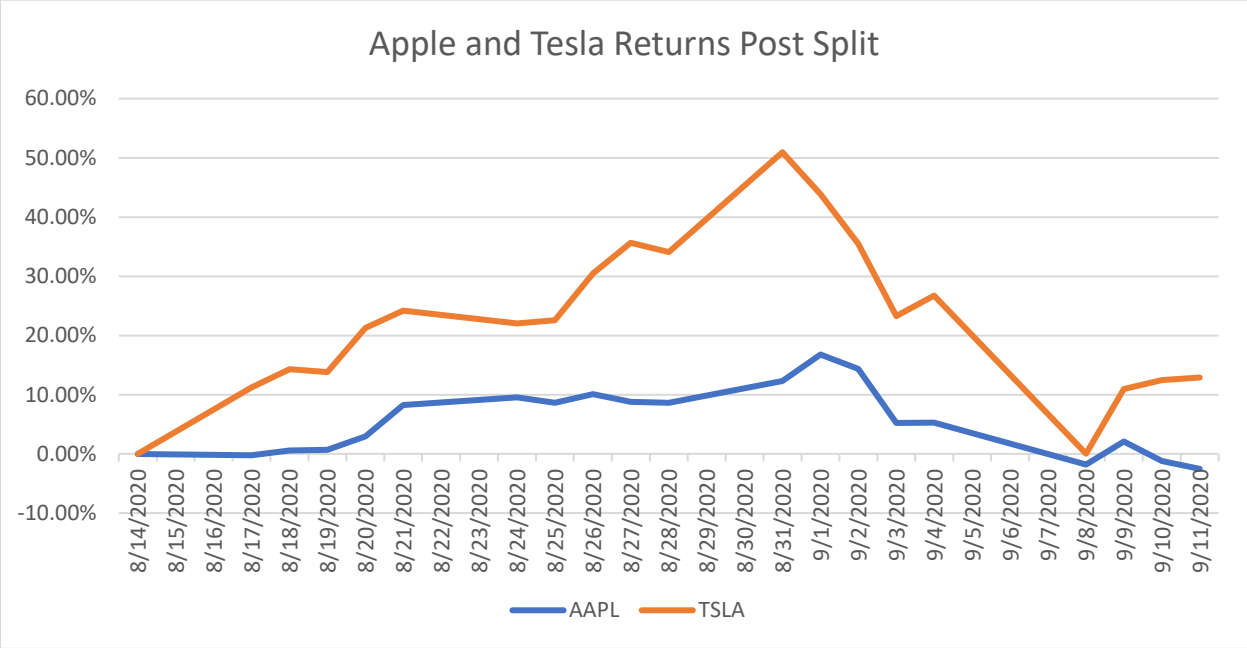
Figure 1: Hertz Closing Price



Hertz filed for bankruptcy on May 22, and within a month the stock jumped over 400% from its low on May 26. This was potentially a result of noise investors making bets that the distressed company would be given bankruptcy assistance from the US Government. Fundamentally, the company did not warrant the jump in share price as they produced negative earnings and generated a negative free cash flow over the previous four years which led to Hertz's bankruptcy filing. Despite the poor historical performance, enough noise investors bought into the company that it created enough demand to drive the share price higher. Once the complete information came that Hertz would not receive the level of federal assistance to warrant that large of a recovery, the noise traders fled with their profits. Figure 1 also shows the short time horizon of noise traders. As mentioned above, noise traders seek above average returns in a short period of time, and with the case of Hertz, this period was a matter of weeks.

Another example of noise trading is the hype generated around stock splits. A stock split is when a company reduces its share price while simultaneously increasing the number of shares outstanding to have a lower price per share. This is done to allow investors with less funds to buy into a company. Desai, Nimalendran, and Venkataraman (1998) write in their research that a stock split is an event that both creates noise and invites noise traders in with a lower price per share, and they conclude in their research that there is a significant increase in volatility following a split. While there are changes associated with a stock split, there are no changes to the company's market capitalization. Often the result of a stock split leads to increased demand for the stock driving the price higher, but there are no fundamental changes to warrant this increase in price. This artificially created demand enables noise traders to push prices higher by increasing the demand for a stock. Recent stock splits by both Apple and Tesla saw increased demand at the time of the split, only to have the price fall back once the demand subsided. The prices rose over 10% following the late August stock splits before retracing all of the gains in the days after.

Figure 2: Apple and Tesla Post Stock Split



These are just a few examples of how noise investors can create price movement within stocks. Often the swings will not be this extreme, but noise investors continue to create non-fundamental demand for companies which adds additional risk for the rational investor to consider when investing.

What Is Fintech?

Fintech, formally known as financial technology, is the innovation and incorporation of technology within the financial sector. It is the marriage of both finance and information technology to solve problems within the financial sector such as high costs, limitative regulation, and access for individuals. This technology is often disruptive in nature, as the financial sector has been dominated by a consistent number of players. Since the emergence of the internet in the early 2000's, new technological innovations have continued to transform the financial sector. In his research on fintech, Philippon (2016) states that "Such innovations can disrupt existing industry structures

and blur industry boundaries, facilitate strategic disintermediation, revolutionize how existing firms create and deliver products and services, provide new gateways for entrepreneurship, democratize access to financial services." For the purpose of this paper, the focus will remain on the impact of fintech on investing, but it is important to note that fintech has impacted all aspects of the financial sector from capital markets and insurance to retail banking.

Two of the most impactful fintech innovations on investing have been the rise of zero commission brokerages as well as the ability to invest in fractional shares of companies. The main goal of these innovations is to democratize the financial markets by providing easy access for all individuals to participate in investments. Zero commission brokers, such as Robinhood, have disrupted the fee structure of all discount brokers, forcing competitors such as TD Ameritrade and Charles Schwab to cut trade commissions to zero to remain competitive. This allows investors to participate in trading and investing without the hurdle of paying a fee per trade. The innovation of fractional shares also lowers barriers to entry by allowing individuals to invest in companies at a cost level they deem reasonable. Fractional shares enable an investor to do this by allowing them to purchase a fraction of a share. For example, stocks such as Amazon and Alphabet trade at over $1,000 per share making it difficult for many retail investors to buy shares of these companies. With fractional shares this is no longer the case because an individual can invest any amount they would like into the company.

While these innovations accomplish their goal of providing access to the markets for all, they have inherently increased risk within the market by adding to the number of

unexperienced and uneducated investors. In an interview with Bloomberg, head of execution at Citadel Joe Mecane stated that “historically, retail investors have accounted for 10-15% of market activity, but they now make up roughly 20-25% of daily market volume.” This increase in market participation by retail investors directly relates to some of the market volatility in current market conditions, which can be traced back to the accessibility of investing and trading due to fintech innovations.

Hypothesis

Multiple hypotheses are formulated to examine how noise trading and fintech might have impacted volatility of equity markets.

The rise of fintech, which has allowed for zero transaction costs, has made it easier and rather costless for noise traders to execute orders. Thus, if noise traders are indeed more irrational, one may expect there has been an increase in market volatility since the emergence of fintech in the early 2000’s.

Hypothesis I:

Equity market volatility has increased over the last decades and especially after 2000.

Further, we argue that the trading activities of noise traders impact stocks with lower trading volume relatively more compared to stocks with a high trading volume. Since small stocks usually experience less trading volume than stocks of large well-known companies, one may expect the volatility of small stocks to be higher.

Hypothesis II:

Smaller stocks show more volatility compared to larger stocks (S&P 500).

Noise traders are known for having a rather short-term investment horizon and move in and out of the market quickly. Thus, we may expect that noise traders impact short-term volatility more than long-term volatility.

Hypothesis III:

Volatility increased more based on daily returns compared to weekly or monthly returns.

Finally, certain sectors may be more impacted by noise traders than others. Thus, by comparing the returns and volatility of sectors that are more likely to be impacted by noise to those which are less likely, one can find potential signs of noise trading. If noise traders do indeed trade more on noise than on fundamentals, one may expect that sectors with high growth and news coverage, such as the technology sector, are more impacted by noise trader activities.

Hypothesis IV:

Certain sectors are more prone to noise trading; hence, they demonstrate higher levels of volatility.

Data and Methodology

To analyze market volatility, historical data is collected for the S&P 500, Russell 2000, and Wilshire 5000. The S&P 500 has been selected to represent large stocks within the US market, and the Russell 2000 has been selected to represent small stocks within the US. These two indices are selected to examine differences in volatility of large and small stocks as potential evidence of noise trading. The Wilshire 5000 is selected as it represents all stocks within the US. For these indices, closing prices are collected for the past 40 years on daily, weekly, and monthly intervals. Upon collecting

this data, volatility is calculated by using the standard deviation of the returns. This was in turn calculated with a 20-, 20-, and 40- year time horizon to compare historical trends in volatility. The first 20-year period is from January 1980 to December of 1999. The following 20-year period is from January 2000 to September 2020, and the 40-year period includes the entire period from 1980 to present. Furthermore, volatility is calculated considering only recessionary periods. In addition to calculating volatility, a modified Sharpe ratio assuming a risk-free rate of zero is calculated for all periods to show the risk-adjusted return for each index during the periods to examine how noise traders might have been compensated for excess risk. With recessionary times providing additional volatility, all volatilities are calculated for the same periods but with recession periods removed. The recession dates used are specified by the National Bureau of Economic Research as follows: Dotcom Financial Crisis March 2001 – November 2001, Global Financial Crisis December 2007 – June 2009, and the Covid-19 Recession February 2020 to October 2020.

After looking at market volatility, data is collected from SPDR sector funds from all GICS sectors excluding Real Estate and Communication Services as they are restructured in 2015 and 2018, respectively. Data is collected on a weekly basis going back to the inception of the SPDR sector funds in December of 1998. This data is then subjected to the volatility tests above, calculating standard deviations of returns and modified Sharpe ratios.

Results

If there is increased volatility due to noise traders and fintech, then volatility should be increasing over time. Fintech first began to increase in popularity in the early 2000's. Table 1 shows the standard deviation of daily returns for the S&P 500 including times of crisis and recession, the Russell 2000 and the Wilshire 5000 for the period from January 1980 to December 1999, as well as the period from January 2000 to September 2020, and a final column with the standard deviation from the entire period. In line with hypothesis I, we find that there has been an increase in the volatility of daily returns for the later period from 2000 to 2020 compared to the entire period from 1980 to 2020. Further, the results show in general that the small cap stock index (Russell 2000) has higher volatility than the entire US market (Wilshire 5000) or the S&P 500, which is in line with our second hypothesis stating that the increase in volatility is larger for the small-cap index compared to the other two indices. This is also in line with our hypothesis that noise traders impact smaller stocks with lower trading volume more so than large stocks. Upon analyzing the Sharpe Ratios for the periods, there are lower Sharpe Ratios for the period 2000 – 2020 compared to 1980 – 2000. This shows that market participants have not been compensated for higher volatility over time. One may argue that the increase in volatility over time may have been driven by the crisis and recessions in the period from 2000 to 2020. Table 2 shows the results excluding the DotCom Financial Crisis (March 2001 – November 2001), the Global Financial Crisis (December 2007 – June 2009), and the Covid-19 Recession (February 2020 – October 2020). Table 2 demonstrates that the results are robust with respect to the exclusion of the crisis periods.

Table 1: Volatility of Daily Returns and Sharpe Ratios Including Recession

	S&P 500	Russell 2000	Wilshire 5000
Standard Deviation 1980 - 2000	1.00%	0.95%	0.87%
Standard Deviation 2000 - 2020	1.25%	1.55%	1.26%
Standard Deviation since 1980	1.13%	1.34%	1.13%
Sharpe Ratio 1980 – 2000	5.34%	4.04%	6.70%
Sharpe Ratio 2000 – 2020	1.95%	2.14%	2.07%
Sharpe Ratio since 1980	3.46%	2.63%	3.37%

Table 2: Volatility of Daily Returns and Sharpe Ratios Excluding Recession

	S&P 500	Russell 2000	Wilshire 5000
Standard Deviation 1980 - 2000	1.00%	0.95%	0.87%
Standard Deviation 2000 - 2020	0.98%	1.25%	0.99%
Standard Deviation since 1980	0.99%	1.13%	0.94%
Sharpe Ratio 1980 – 2000	5.34%	4.04%	6.70%
Sharpe Ratio 2000 – 2020	3.85%	3.61%	3.94%
Sharpe Ratio since 1980	4.68%	3.74%	4.99%

Upon finding that there has been an increase in volatility over the past 40 years, the next step is to analyze how noise trading and fintech might have impacted volatility. If noise traders have short-time horizons, which has been stated in prior research by De Long et al., (1990) then there should be a larger increase in the volatility of daily returns versus volatility based on weekly or monthly returns. Tables 3 and 4 below compare the volatility measure based on daily, weekly, and monthly returns over the past 40- year and 20-year time periods.

Table 3: Daily, Weekly and Monthly volatility from 1980 to 2020

	S&P 500	Russell 2000	Wilshire 5000
Daily	1.13%	1.34%	1.13%
Weekly	2.30%	2.87%	2.34%
Monthly	4.34%	5.61%	4.71%

Table 4: Daily, Weekly and Monthly Volatility from 2000 to 2020

	S&P 500	Russell 2000	Wilshire 5000
Daily	1.25%	1.55%	1.26%
Weekly	2.47%	3.17%	2.53%
Monthly	4.35%	5.71%	4.48%

Table 5 presents the percent increase of the different volatilities as well as the different indexes. Upon comparing the two, there is a substantially higher percent increase in volatility based on daily returns relative to volatility based on both weekly and monthly returns. Thus, the result confirms Hypothesis III. Moreover, Table 5 provides additional evidence for Hypotheses I and II, as it demonstrates that volatility has increased over time with a more severe increase in volatility for small stocks.

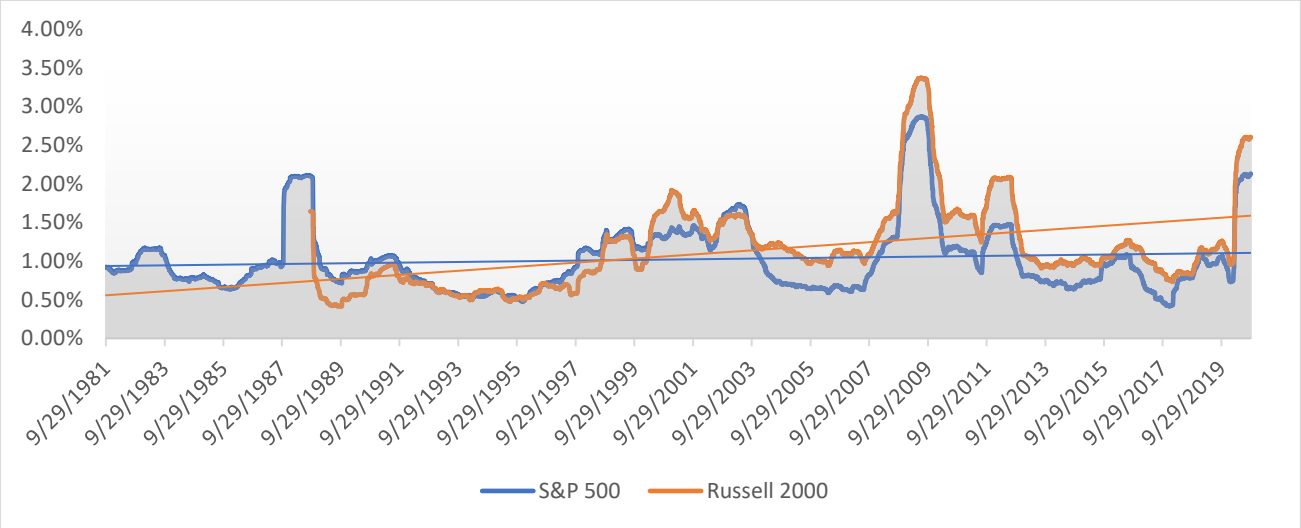
Table 5: Percent Change of Volatility Between Periods per Index

	S&P 500	Russell 2000	Wilshire 5000
Daily	10.36%	15.20%	11.19%
Weekly	7.49%	10.15%	8.17%
Monthly	0.27%	1.75%	-4.87%

The higher increase in daily volatility across all indices points to noise traders as a potential factor for the increase in volatility, as they have shorter time horizons. Noise traders are enabled by zero commission trading, allowing them to enter and exit positions without cost. This allows them to focus on short-time horizons without risk of trading costs. It is of interest to note that the monthly returns see little to no change in volatility across the S&P 500 and the Russell 2000, leading one to believe that the duration of investments for noise traders is less than one month.

Figure 3 below shows annualized volatility and, as seen in the trend lines markets are becoming more volatile with small cap stocks (Russell 2000) increasing at a much quicker pace than large cap stocks (S&P 500).

Figure 3 Rolling Annual Daily Volatility



The finding that small cap stocks are becoming increasingly more volatile than their large cap counterparts, as shown in Tables 1 and 3, might be explained by noise traders having a disproportionate effect on stock prices of smaller less-liquid companies which often have lower trading volume. With lower trading volume, a stock's price may be impacted more so by noise traders than a large cap counterpart.

In general, the presented findings above support the hypotheses that noise traders, enabled by fintech, have potentially impacted market swings. Given the above findings that noise trading and fintech have created more volatility over time and the current Covid-19 crisis has caused unprecedented market conditions, one may expect that the current crisis has caused more volatility compared to prior crises and recessions. Table 6 below compares the current recession to previous recessions. The findings below show that the Covid-19 Crisis has the highest volatility of daily returns

when compared to the Dotcom Crisis and the Global Financial Crisis. Also, the Russell 2000 shows more a higher volatility of daily returns than the S&P 500 and Wilshire 5000. This supports both Hypotheses 1 and 2.

Table 6: Comparison of Daily Volatility and Sharpe Ratios for Recessionary Periods

	S&P 500	Russell 2000	Wilshire 5000
Standard Deviation Dotcom Crisis	1.39%	1.46%	1.41%
Standard Deviation Financial Crisis	2.41%	2.86%	2.40%
Standard Deviation Covid-19	2.68%	3.29%	2.71%
Sharpe Ratio Dotcom Crisis	-2.53%	-0.34%	-2.36%
Sharpe Ratio Financial Crisis	-3.78%	-2.20%	-3.62%
Sharpe Ratio Covid-19	1.10%	-0.58%	1.25%

After examining market volatility across time, different stock indexes, and volatility measures, it might be of value to analyze how volatility has changed for different sectors. As stated in the hypotheses section, noise trading might impact specific sectors differently. By calculating weekly returns for every GICS Sector represented by SPDR sector ETFs, one can compare volatility within each sector. Figure 4 shows the volatility of weekly returns since the inception of the SPDR ETFs in December of 1998. The volatility is presented for the entire period as well as the period before and after the global financial crisis. The data excludes the Real Estate and Communication Services sector as they were re-classified in 2015 and 2018.

Figure 4: Sector Volatility Before and After the Global Financial Crisis

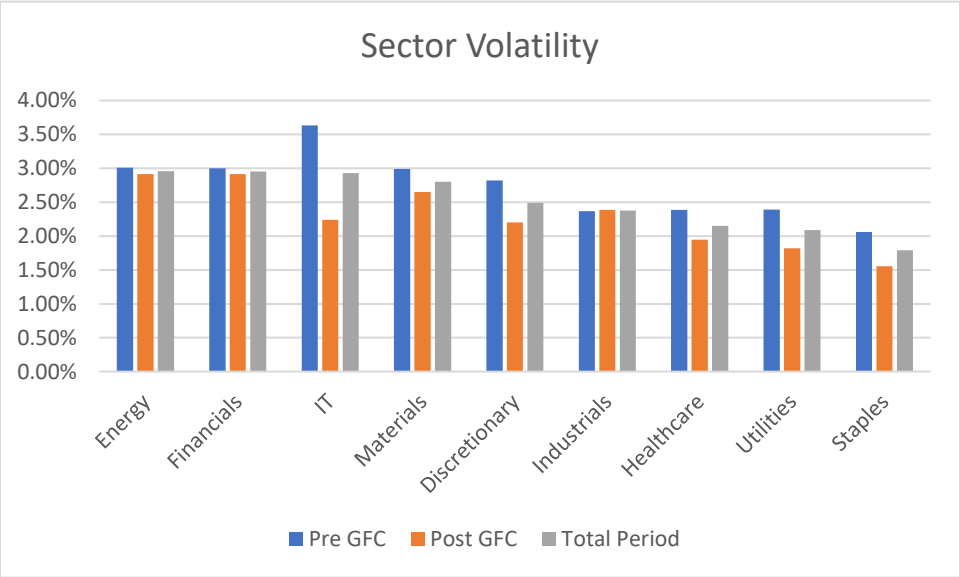


Figure 4 shows that the Financial, Energy, and Information Technology sectors have been most volatile since the late 1990's. The least volatile sectors have been Utilities, Healthcare, and Consumer Staples. This may confirm hypothesis IV, that noise traders are more active in sectors that experience growth and media coverage compared to more conservative sectors, such as utilities. However, Figure 4 also shows that volatility has been lower during the post global financial crisis period, compared to the pre global financial crisis period, for most sectors. This finding is rather unexpected, as one would have expected to see more volatility in the more recent period. However, we want to point out that the sector ETFs are only covering stocks within the S&P 500, which are large stocks and, hence, according to our previous findings less prone to noise trader activities. Consequently, the higher volatility might have been more driven by the Dotcom bubble and the Global Financial crisis rather than noise traders. We

leave a further investigation of the impact of noise traders on different sectors to future research.

Conclusion

The last two decades have seen an increase in noise trader activities amplified by the rise of fintech, which was accompanied by lower trading fees and ultimately zero commission as well as trading of fractional shares. In addition, fintech allows for the execution of simple trading algorithm. Since noise traders are described as irrational and trading based on incomplete information, this paper argues that fintech developments have increased noise trader activities and, hence, magnified volatility in certain equity markets. To this end, the paper finds that equity markets have indeed experienced an increase in volatility over the last decades. Moreover, this enhanced volatility is more pronounced for stocks with low market capitalization (small stocks) compared to stocks with large market capitalization (large stocks). It is argued that large stocks have a higher trading volume; hence, are less prone to noise trader activities. Additionally, the study finds that the volatility based on daily returns is higher compared to volatilities measures based on weekly or monthly returns. This might be explained by noise traders moving quickly in and out of the market; hence, leaving more of an impact on daily returns compared to monthly returns. Finally, the study demonstrates that certain sectors have experienced more volatility than others. This might be explained by noise traders focusing more on stocks with growth and high media coverage. The main result of increased equity market volatility in the most recent decades is not driven by periods of crisis and recession. In general, the results point in the direction of noise trader activities having a greater impact on equity market volatility in recent decades,

which holds especially true for small stocks and stocks with more media coverage, such as stocks in the IT or financial sector.

Sources

Black, F. (1986). Noise. *Journal of Finance, 41*(3), 529-543. Retrieved September 14, 2020, from https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1540-6261.1986.tb04513.x

De Long, J. Bradford, Andrei Shleifer, Lawrence H. Summers, and Robert J. Waldmann. "Noise Trader Risk in Financial Markets." *Journal of Political Economy* 98, no. 4 (1990): 703-38.

Desai, A. S., Nimalendran, M., & Venkataraman, S. (1998). Changes In Trading Activity Following Stock Splits And Their Effect On Volatility And The Adverse-Information Component Of The Bid-Ask Spread [Abstract]. *Journal of Financial Research, 21*(2), 159-183.

Mecane, Joseph. Bloomberg Markets: Americas. Bloomberg. New York. 19 Jul. 2020.

Philippon, Thomas. "The FinTech Opportunity." *National Bureau of Economic Research Working Paper Series,* No. 22476, Aug. 2016

Radin, C. (2020, August 06). US Business Cycle Expansions and Contractions. Retrieved October 10, 2020, from https://www.nber.org/research/data/us-business-cycle-expansions-and-contractions

Shleifer, A., & Summers, L. H. (1990). The Noise Trader Approach to Finance. *Journal of Economic Perspectives, 4*(2), 19-33. doi:10.1257/jep.4.2.19