TIME-VARYING EFFECT OF SHORT SELLING ON MARKET VOLATILITY DURING CRISIS: EVIDENCE FROM COVID-19 AND WAR IN UKRAINE

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ABSTRACT

In this paper, we empirically investigate the effect of short selling on market volatility during exogenously-induced uncertainties. Using the Covid-19 pandemic and the onset of the Russian-Ukraine Conflicts periods as event study, we employ the asymmetric EGARCH model. We show high persistence and asymmetric effects of market volatility during the pre-covid outbreak and post-covid outbreak periods. We find evidence that short selling increases market volatility during the pre-covid outbreak period while the period of the Russian-Ukraine conflict is characterized by reduced volatility. We find no evidence of short selling effect on market volatility during the post-covid outbreak period. Our findings provide significant implications for short-selling strategies during crisis periods.

KEY WORDS

short-selling, market volatility, COVID-19, Russian-Ukraine conflict

JEL CODES

C22, G11, G12, G14

1 INTRODUCTION

The years 2020 to 2022 represent an exogenous shock to the financial markets and global economy. The outbreak of the novel coronavirus (Covid-19) in 2020 led to an unprecedented impact on the global financial markets (Ding et al., 2021). The recovery from the pandemic has been impeded by another crisis; the Russian invasion of Ukraine which began in February 2022. These crises have generated high uncertainties in the financial markets. The outbreak of Covid-19 led to market declines and increased market risks (Zhang et al., 2020). While the effect of Covid-19 on the financial markets (see Zhang et al., 2020; Ding et al., 2021; Guo et al., 2021; Liu et al., 2022) and the impact of the Russian-Ukraine on the financial market (see

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Umar et al., 2022b; Boungou and Yatié, 2022) is well documented in existing literature, little is known about the behaviour of short sellers during these turbulent times. Given the significant role short sellers play in securities trading and their impact during bearish markets, it is vital to analyse how they contribute to risk in financial markets during these periods.

This paper aims to investigate the effect of short selling on volatility in the U.S. stock market during the Covid-19 outbreak and the onset of the Russian-Ukraine conflict. On the Covid-19 outbreak, few studies have examined its impact on market volatility (see Albulescu, 2021; Baker et al., 2020; Zaremba et al., 2020) but little evidence is provided on the impact of short sellers on volatility. In the literature, our paper is close to the recent study of Lin et al. (2022) which examines the effect of margin trading and short selling on stock return volatility. They show no evidence that short selling destabilizes the stock market and observe that intensified short selling effectively reduces return volatility when infection risk is high. While Lin et al. (2022) investigate the Chinese stock market, our paper focuses on the US stock market and extends the data to cover the recovery period of Covid-19 and the onset of the Russian-Ukraine conflict.

Our paper contributes to the emerging literature to investigate the impact of the covid-19 outbreak and the Russian-Ukraine conflict on the financial market and focus on the effect of short selling on volatility. Using the asymmetric EGARCH model proposed by Nelson (1991), we show that there is high volatility persistence and asymmetric effects during the pre-covid outbreak and post-covid outbreak periods in market volatility. We show that the pre-covid outbreak is associated with bullish market conditions and short selling during the period increases the market volatility. We explain these results as investors can process available information better to identify overvalued stocks and apply them in their trading strategies under bullish market conditions. Our analysis of short selling during the post-covid outbreak period shows that there is no significant effect on market volatility. We argue that the uncertainties in the financial markets were short-term and caused by speculations of market players. Short-selling activities during the period of the Russian-Ukraine conflict reduce market volatility. The period is characterized by high inflation and interest rate hikes which makes the debt market more attractive to stocks. Investors are likely to reduce their stock portfolio, and this can lead to price falls. Short sellers can take advantage to increase short positions to hedge against their risk exposures.

The remainder of this paper is organized as follows. In section 2 we provide a review of existing literature. Section 3 introduces the data and methodology. In section 4, we present the empirical results of the analysis while section 5 concludes the study.

2 LITERATURE REVIEW

Volatility in the financial market indicates the price fluctuations of securities. It is used as a proxy for risk measurement and an important variable for investment and asset pricing (Zhang et al., 2020). The vast literature has examined the impact of exogenous factors on market volatility. Albulescu (2021) investigate the impact of the coronavirus pandemic uncertainty on the U.S. financial market volatility. He argued that both new infections and the fatality ratio recorded positively influenced the US financial market.

Zaremba et al. (2020) examine stock data on a global level (from 67 countries) during the Covid-19 period using data from January to April 2020 and provide evidence that stringent policy responses led to a significant increase in market volatility. Bakas and Triantafyllou (2020) show a strong negative effect of covid-19 on commodity volatility using quarterly data from the S&P GSCI broad commodity index from 1996 Q1 to 2020 Q1.

Market regulators always target short-selling activities to introduce bans during turbulent

periods to stabilise the markets. While bans were introduced in some European countries during Covid-19, no bans were introduced in the U.S. market. Bessler and Vendrasco (2022) argue that bans introduced on short selling failed to boost stock prices, reduce volatility and preserve liquidity when they studied 12 European countries (6 countries with bans on short selling) from 2nd January 2020 to 30th June 2020. They further recommend regulators should abstain from imposing short-selling bans. The emerging literature on the effect of Covid-19 on the financial markets has mainly employed data that covers the onset of the outbreak in 2020. Prior to the Russian invasion of Ukraine, the global economy was on a recovery trend from the Covid outbreak. It is vital to analyse the effect of the covid outbreak with available data to capture the recovery period.

The literature on the ongoing Russia-Ukraine conflict is expanding and early studies have provided evidence of adverse effects on the financial markets. The conflict poses geopolitical-induced uncertainty in the global economy and financial markets. This leads to many economists predicting a recession in most developed economies and high speculative market activities. Boungou and Yatié (2022) show that the war has negatively impacted the world's stock indices and this effect was more significant after the invasion of Ukraine when they study indices from 94 countries from 22nd January 2022 to 24th March 2022. Boubaker et al. (2022) provide evidence that the invasion generated negative cumulative abnormal returns for global stock market indices but with heterogenous effects when they examine all countries in the Morgan Stanley Capital Investment (MSCI) market. Chortane and Pandey (2022) examine the impact of the Russia-Ukraine war on the value of global currencies against the US dollar (USD) and show that the war adversely affected global currencies, however on the regional level, European currencies depreciated against the USD while Pacific currencies appreciated significantly.

Engelberg et al. (2012) argue short sellers trading advantage emerges from their ability to analyze publicly available information. The information provides valuable opportunities that influence trading strategies used by short sellers who are considered to be skilled processors of information. The two crises create a pessimistic view in investors on the performance of the financial markets and influences them to take short positions to either hedge against risk or profit from expected market declines. Greppmair et al. (2022) study how informed market participants incorporate fiscal space into their trading decisions in the European market during Covid-19. They suggest that after the outbreak of Covid-19, short sellers correctly anticipated the underperformance of illiquid firms in countries with low credit ratings. They highlight the skills of short sellers as they were adept to process complex information on the unprecedented effects of the pandemic by linking the economic consequences to the financial markets. On the Russian-Ukraine conflict, Umar et al. (2022a) analyse how short stocks respond to military conflicts and employ sectoral shorted equity indices from 2nd February 2022 to 5th July 2022. They show strong and high co-movement between the shorted shocks and geopolitical risk and provide evidence that hedging strategies with shorted shocks would be beneficial. This study contributes to the literature and focuses on how short-selling activities affect risk during unprecedented market uncertainties caused by exogenous factors.

3 METHODOLOGY AND DATA

3.1 Data

Our data sample comprises two sets – the daily NYSE CI (New York Stock Exchange Composite Index) and short selling between 1st January 2019 and 31st October 2022. The daily NYSE CI index is obtained from Yahoo Finance[1] and consists of 965 observations. We use the daily log return of the NYSE CI. The NYSE CI is used to represent the stock market

[1] https://finance.yahoo.com/quote/%5ENYA/history?p=%5ENYA

in the U.S. and it consists of all common stock listed on the New York Stock Exchange which includes, tracking stocks, REITs, ADRs and foreign stocks. The short-selling data is obtained from the Financial Industry Regulatory Authority (FINRA) database[2]. The daily short sale volume data provided by FINRA consist of the date, symbol, short volume, and total volume of all list stocks. We aggregate the short volume and total volume for each stock to obtain the total trading volumes for each daily.

We use 2 important dates of announcement and events to categorise the data into the pre-covid outbreak, post-covid outbreak and the Russian-Ukraine conflict periods. Prior studies have used the event-study method to choose dates covid-19 is publicly announced (see Baker et al., 2020; Kim et al., 2020; Ding et al., 2021). The World Health Organisation (WHO) declared the Covid-19 outbreak a pandemic on 11$^{\text{th}}$ March 2020. Thus, we choose 10$^{\text{th}}$ March 2020 as the cut-off point for the pre-covid period. The Russian invasion of Ukraine began on 24$^{\text{th}}$ February 2022, hence we choose 23$^{\text{rd}}$ February 2022 as the cut-off point for the post-covid outbreak. The pre-covid period consists of data from 01.01.2019 to 10.03.2020; the post-covid period from 11.03.2020 to 23.02.2022 and the Russian-Ukraine conflict from 24.02.2022 to 31.10.2022.

Tab. 3 in the Annex presents the descriptive statistics of the NYSE composite index (NYSE CI) and short volumes for the three periods; pre-covid outbreak, post-covid outbreak and Russian-Ukraine conflict. The NYSE CI returned between 0.0001 and 0.0429 for the pre-covid outbreak; 0.0007 and 0.0956 during the post-covid outbreak; −0.0005 and 0.0329 during the conflict. The post-covid outbreak period is the most volatile. The returns distribution of the index is negatively skewed with high excess kurtosis in all periods except the Russian-Ukraine conflict. This indicates the return series is not normally distributed and confirms the presence of volatility in all periods. The short volumes are at the highest and most volatile during the post-covid outbreak. This is followed by the period of the Russian-Ukraine war. This indicates the level of uncertainties in the financial market during the pandemic. The decline in stock prices and the increase in short-selling activities are captured in Fig. 1 and Fig. 3 in the Annex.

3.2 Methodology

We apply the Exponential GARCH (EGARCH) model proposed by Nelson (1991) to investigate the effect of short selling during crisis periods. The EGARCH model detects the asymmetric (leverage) effect in the volatility.

The conditional variance of EGARCH (1,1) model is specified as follows:

$$\ln(\delta_t^2) = \beta_0 + \beta_1 \left[\frac{|\varepsilon_{t-1}|}{\delta_{t-1}} - \sqrt{\frac{2}{\pi}} \right] + \Upsilon \frac{\varepsilon_{t-1}}{\delta_{t-1}} + \beta_2 \ln(\delta_{t-1}^2), \tag{1}$$

where $\ln(\delta_t^2)$ represents the conditional variance of the NYSE CI, β_0 represents the constant of volatility, $\Upsilon \frac{\varepsilon_{t-1}}{\delta_{t-1}}$ measures the asymmetric effect of the volatility, δ_{t-1}^2 is the variance estimation of the previous period and $\beta_1 \left[\frac{|\varepsilon_{t-1}|}{\delta_{t-1}} - \sqrt{\frac{2}{\pi}} \right]$ captures the impact of changes in news on volatility.

We follow Engelberg et al. (2012) and He et al. (2022) to construct the short ratio as follows:

$$\text{ShortRatio}_t = \frac{\text{ShortVol}_t}{\text{TotalVol}_t}, \tag{2}$$

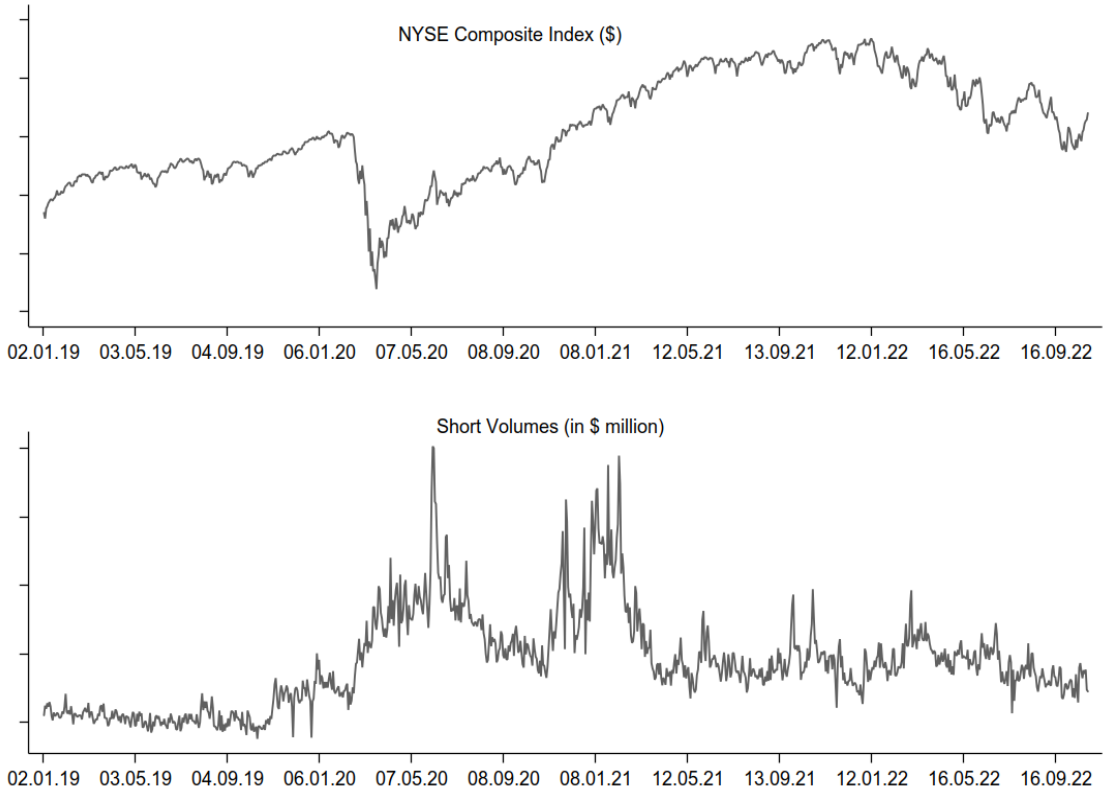
where ShortRatio_t is the aggregate short ratio day t, ShortVol_t is the aggregate short volume on day t and TotalVol_t is the total aggregate total volume on day t.

To investigate the impact of short selling on market volatility, we follow Chen et al. (2011) and introduce short ratio as an additional regressor to equation (1) as

$$\ln(\delta_t^2) = \beta_0 + \beta_1 \left[\frac{|\varepsilon_{t-1}|}{\delta_{t-1}} - \sqrt{\frac{2}{\pi}} \right] + \Upsilon \frac{\varepsilon_{t-1}}{\delta_{t-1}} + \beta_2 \ln(\delta_{t-1}^2) + \lambda \, \text{ShortRatio}_t, \tag{3}$$

where λ is the parameter of the short ratio.

[2] https://www.finra.org/finra-data/browse-catalog/short-sale-volume-data/daily-short-sale-volume-files



Note: All data are sampled from January 2019 to October 2022. The trading prices of the NYSE Composite Index and short volumes are indicated on the y-axis of the first and second graphs. The periods are indicated on the x-axis for both graphs.

Fig. 1: NYSE Composite Index and Short volumes

The EGARCH model follows a Generalized Error Distribution (GED). The distribution of GARCH models is assumed to be normally distributed, however, the assumption does not suit financial time series with excess kurtosis. Nelson (1991) applies the GED to depict the leptokurosis of the time series.

Nelson (1991) expresses the density function of the GED as:

$$f(z) = \frac{\nu \cdot \exp\left[-\frac{1}{2}\left|\frac{Z}{\lambda}\right|^{\nu}\right]}{\lambda \cdot 2^{1+\frac{1}{\nu}} \cdot \Upsilon\left(\frac{1}{\nu}\right)}, \quad -\infty < z < \infty, \tag{4}$$

where Υ is the gamma function, and

$$\lambda = \left[2^{\frac{-2}{\nu}} \cdot \frac{\Upsilon\left(\frac{1}{\nu}\right)}{\Upsilon\left(\frac{3}{\nu}\right)}\right]^{\frac{1}{2}}, \tag{5}$$

ν denotes the shape parameter, z follows a standard normal distribution when $\nu = 2$.

4 RESULTS

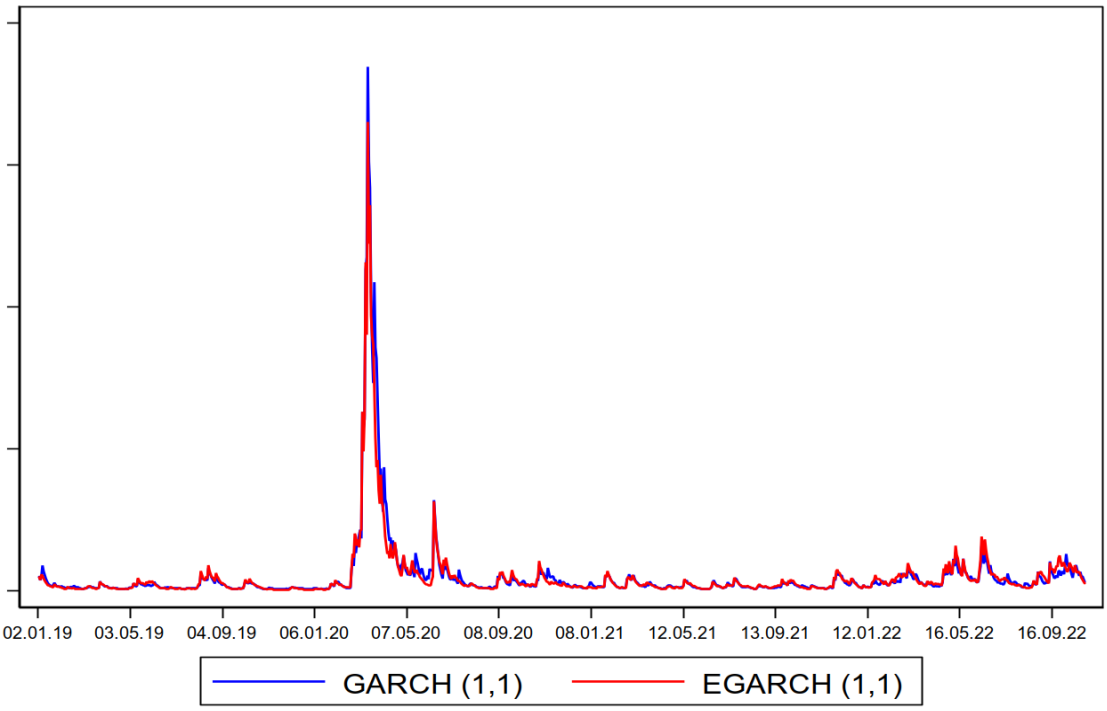
In this section, we provide the results of the empirical analysis. First, we run the EGARCH (1,1) model on the NYSE CI to estimate the market volatility. We provide the analysis in Tab. 1. The ARCH term (β_1) indicates the volatility clustering of the market. The coefficients for all periods are positive. The pre-covid outbreak and post-covid outbreak periods are significant at a 5% and 1% level respectively. This implies that larger shocks to the market returns, regardless of the signs, will increase the volatility to a greater extent than smaller shocks for the periods (Elyasiani and Mansur, 2017). The post-covid outbreak period exhibits the strongest clustering tendency with a coefficient of 0.2597. This is driven by the high level of uncertainties in the financial markets after the declaration of the pandemic.

The GARCH effect (β_2) determines how the past conditional volatilities of the market influence the current conditional volatility. The coefficients β_2 for all periods are positive and significant at a 1% level. This implies the current volatilities for the pre-covid outbreak, post-covid outbreak and the Russian-Ukraine conflict periods are more dependent on the previous volatility of the market. The periods exhibit high volatility persistence ($\beta_1 + \beta_2$) which shows that volatility shocks take a higher time to dissipate.

The asymmetric effect (Υ) is negative for the pre-covid outbreak and post-covid outbreak period and positive for the period of the Russian-Ukraine conflict. The coefficients of the pre-covid and post-covid outbreaks are -0.3065 and -0.1499 respectively and significant at a 1% level. The coefficient of the Russian-Ukraine conflict period is 0.1399 but not significant. The negative coefficients of the asymmetric effect imply that negative shocks increase market volatility more than positive shocks for the pre-covid outbreak and post-covid outbreak periods (Jeribi et al., 2015; Fakhfekh et al., 2016). Fig. 2 shows the high volatility in the market during the post-covid outbreak period.

We present the main analysis of the effect of short selling during the pre-covid outbreak, post-covid outbreak and the Russian-Ukraine conflict in Tab. 2. The U.S. financial market during the pre-covid outbreak (2019) was on a positive trajectory after recovering from the negative performance in 2018. Investors' confidence increased and the markets performed better ending the 2019 calendar year with positive returns on major indices. The results of the pre-covid period in our analysis exhibit significant high volatility persistence and asymmetry in the market. The coefficient of short selling on the market (λ) is positive and significant at a 1% level (2.2464). This implies that short-selling activities increase the market volatility during the pre-covid outbreak. The period is associated with increased market activities and prices. Short sellers and investors identify over-valued stocks and predict future price falls either through their analysis of stock or speculations. These activities lead to high volatility in the market. This finding is consistent with Ho et al. (2022) which indicates that short selling has some incremental positive effects on volatility.

The post-covid outbreak period is characterised by uncertainties in the global market. The announcement by World Health Organization (WHO) led to lockdowns introduced by most governments to limit the spread of the disease. This led to a decline in the financial markets and an increase in short-selling activities. The period exhibits an asymmetric effect of short-selling activities with a coefficient of -0.1677. The coefficient of short selling on the market volatility is 1.0244 but not significant. This indicates short selling does not impact market volatility during the post-covid period. We explain this results that the covid outbreaks resulted in uncertainties in the financial market however since there were no short-selling bans in the U.S., the market recovered. Government measures such as vaccine roll-out were able to control the spread of the disease and restore investors' confidence in the markets. We suggest that the increase in short-selling activities during the period was mainly speculative and had no economic or fundamental basis. However, short sellers may have profited in the short term



Note: Estimated GARCH (1,1) and EGARCH (1,1) conditional volatilities of the NYSE Composite Index. Conditional volatility ranges from 0.000 to 0.008 on the y-axis. Period for sample data indicated on the x-axis.

Fig. 2: Estimated conditional volatility of the NYSE Composite Index

during the onset of the pandemic. This implies investors can increase their short positions in the short term during uncertain periods caused by exogenous factors.

The period of the Russian-Ukraine conflict has impeded the full recovery of the global economy from the Covid-19 pandemic. Russian plays an important role in the supply of natural gas while Ukraine is a key exporter of grains. The conflict has resulted in high energy and food prices across the globe leading to higher inflation and raising the cost of living for many countries. While the U.S. does not directly rely on Russian gas, the significant increase in global energy prices during the conflict is witnessed in the U.S. markets. In an attempt to control the high inflation, the Federal Reserve (FED) of the U.S. has increased the interest rate by 75 basis points on 4 conservative reviews to 3.75–4%[3]. The U.S. stock market is sensitive to the FED rates and the increases have led to the decline of major market indices. The effect of short selling on market volatility during the period is negative and significant at a 5% level. We conclude that short selling during the period of the Russian-Ukraine conflict reduces the market volatility in the U.S. This is attributed to uncertainties in the financial markets from the continuous increase of interest rates. Higher rates imply investors shift their attention to bonds which provide high yields. This can lead to investors increasing their portfolio allocations in bonds and reducing that in stocks. When this happens it can increase the volatility in the stock market and short sellers can use their short positions to hedge against risk.

[3]https://finance.yahoo.com/news/fed-set-to-raise-rates-powell-rate-hike-path-101845316.html?fr=sycsrp_catchall

Tab. 1: EGARCH (1,1) estimates for NYSE CI

	Full Period	Pre-Covid Outbreak	Post-Covid Outbreak	Russian-Ukraine Conflict
β_0	−0.3047***	−0.6027**	−0.3087**	−13.5873**
	(0.0919)	(0.2623)	(0.1476)	(3.8235)
β_1	0.2633***	0.2130**	0.2597***	0.0937
	(0.0400)	(0.0893)	(0.0513)	(0.0874)
β_2	0.9668***	0.9394***	0.9658***	0.8032***
	(0.0098)	(0.0267)	(0.0160)	(0.2128)
Υ	−0.1811***	−0.3065***	−0.1499***	0.1399
	(0.0259)	(0.0450)	(0.0420)	(0.1069)
Log-likelihood	3119.11	1071.76	1550.51	491.8
Obs.	965	299	494	172

Note: *** and ** are significant at 1% and 5% respectively. Robust standard errors are in parentheses. The parameter estimates follow GED.

Tab. 2: Effect of short selling on volatility

	Full Period	Pre-Covid Outbreak	Post-Covid Outbreak	Russian-Ukraine Conflict
β_0	−0.7876***	−0.5676	−0.8724	−4.2254
	(0.2352)	(0.3800)	(0.4790)	(5.0964)
β_1	0.2344***	0.2114**	0.2477***	0.1047
	(0.0418)	(0.0910)	(0.0550)	(0.0892)
β_2	0.9608***	0.9385***	0.9550***	0.7911***
	(0.0111)	(0.0269)	(0.0206)	(0.2177)
Υ	−0.1905***	−0.3081***	−0.1677***	0.1914
	(0.0260)	(0.0465)	(0.0438)	(0.1084)
λ	0.9360***	2.2464***	1.0244	−19.0345**
	(0.3561)	(0.6110)	(0.7486)	(8.0171)
Log-likelihood	3119.34	1071.77	1551.42	495.34
Obs.	965	299	494	172

Note: *** and ** are significant at 1% and 5% respectively. Robust standard errors are in parentheses. The parameter estimates follow GED.

5 DISCUSSION AND CONCLUSIONS

In this study, we analyse the effects of short selling on market volatility in the U.S. stock market during crisis periods. Using daily short selling and the NYSE composite index data, we apply the asymmetric EGARCH (1,1) model. We use two exogenous factors, the Covid-19 pandemic, and the ongoing Russian-Ukraine conflict as events study to divide our data into the pre-covid outbreak, post-covid outbreak and Russian-Ukraine conflict periods.

First, we analyse the effects of the two events on market volatility. We show that there is high volatility persistence and asymmetric effects during the pre-covid outbreak and post-covid outbreak periods in market volatility. The negative shocks in the market increase the volatility more than the positive shocks. These characteristics are consistent with the literature on stock markets. We proceed to identify the effect of short-selling activities on market volatility. Our results show that during the pre-covid outbreak period, short selling is associated with an increase in market volatility. The period is characterized by increasing market activities and prices and short sellers can analyse available information. The Short selling activities are associated with an increase in market volatility during bullish market conditions.

Our findings during the post-covid outbreak period show while uncertainties in the financial

market and economy increased, short selling has no significant effect on market volatility. We argue that the uncertainties were short-term and caused by the speculations of investors and have no economic or fundamental basis. There were no short-selling bans in the U.S. markets and the policies introduced by the government to control the pandemic restored investors' confidence and market recovery from the sharp price falls. The Russian-Ukraine conflict has led to unprecedented inflation across the globe. As a result, central banks have increased their interest rates as a measure. This directly affects the financial markets. During the Russian-Ukraine conflict period, short-selling activities reduce market volatility. This implies investors can use their short positions to reduce their risk exposure.

Our results provide important implications for policymakers and regulators. Our findings show that short-selling activities can continue during crisis periods and we recommend regulators should not introduce new bans. However, strengthen their monitoring activities of short sellers to prevent market manipulations. The findings give better insights to investors and short sellers on the periods to either increase or decrease their short positions in their portfolio to profit from price falls and mitigate against risk during crisis periods.

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7 ANNEX

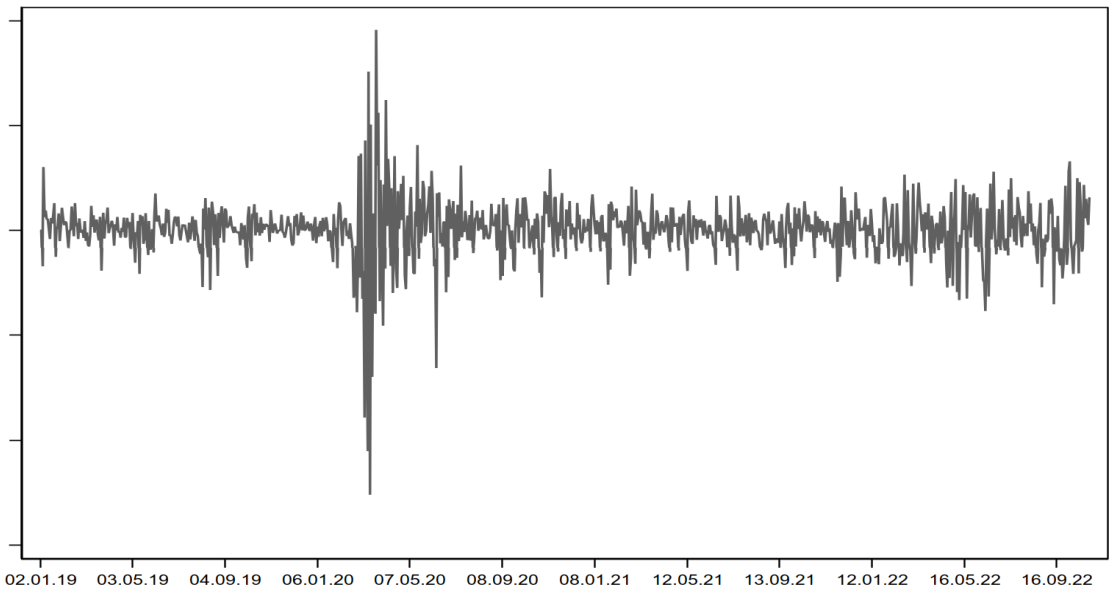

Fig. 3: NYSE Composite returns

Tab. 3: Descriptive statistics

	NYSE CI	Return of NYSE CI	Short Vol. (in $ millions)	Total Vol. (in $ millions)	Short Ratio
Full Period					
Mean	14258.00	0.0003	374.04	825.51	0.4514
Max.	17353.76	0.0956	1006.38	2444.21	0.5125
Min.	8777.38	−0.1260	152.60	329.50	0.3734
S.D.	1848.54	0.0140	139.14	299.63	0.0246
Skewness	−0.07	−1.1950	1.14	1.34	−0.3083
Kurtosis	−0.95	16.3161	2.10	2.94	−0.6185
Jarque-Bera	36.85***	10933.72***	385.52***	633.39***	30.69***
Obs.	965	965	965	965	965
Pre-Covid Outbreak					
Mean	12984.53	0.0001	240.10	545.58	0.4389
Max.	14183.20	0.0429	497.39	1072.68	0.4998
Min.	11190.44	−0.0892	152.60	329.50	0.3882
S.D.	584.25	0.0104	55.36	111.44	0.0257
Skewness	0.00	−2.2879	1.47	1.42	0.2084
Kurtosis	0.09	20.6674	2.64	3.74	−1.0727
Jarque-Bera	0.09	5582.31***	194.78***	274.91***	16.50***
Obs.	299	299	299	299	299
Post-Covid Outbreak					
Mean	14686.68	0.0007	455.53	1004.98	0.4531
Max.	17353.76	0.0956	1006.38	2444.21	0.5125
Min.	8777.38	−0.1260	243.26	552.23	0.3734
S.D.	2165.53	0.0156	131.69	287.58	0.0222
Skewness	−0.60	−1.2037	1.42	1.61	−0.2926
Kurtosis	−0.91	17.9435	2.27	3.17	−0.0915
Jarque-Bera	46.97***	6746.49***	272.53***	420.75***	7.22**
Obs.	494	494	494	494	494
Russian-Ukraine Conflict					
Mean	15240.58	−0.0005	372.85	796.69	0.4683
Max.	17014.76	0.0329	586.22	1325.67	0.5003
Min.	13472.18	−0.0384	227.06	464.08	0.4194
S.D.	900.65	0.0140	56.94	123.08	0.0165
Skewness	0.05	−0.1498	0.42	0.67	−0.4483
Kurtosis	−0.88	−0.0115	0.62	1.52	0.2058
Jarque-Bera	5.62	0.6400	7.7**	29.42***	6.06**
Obs.	172	172	172	172	172

Note: This table presents the descriptive statistics of all variables; NYSE Composite index, short volumes, and total volumes from January 2019 to October 2022. The observations include all variables (obs), the mean, maximum value (max.), minimum value (min.), standard deviation (S.D.), skewness, kurtosis, Jarque-Bera (1987) test which is normally distributed and ***, ** represent significance at 1% and 5% respectively.

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