

Overreaction, Investor Sentiment and Market Sentiment of COVID-19

Vision

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Abstract

This study examines the impact of investor sentiment and market sentiment on overreaction in Europe and USA markets before and during COVID-19. The investor sentiment is calculated by the standard deviation, realized volatility, Parkinson's estimator and Garman and Klass's estimator. The market sentiment is measured by Business Confidence Index, Consumer Confidence Index, Labour Force Survey, Leading Index and Monetary Aggregates. The results of this study show that investor and market sentiments are correlated to stock return before COVID-19. Nonetheless, realized volatility is the only investor sentiment that is significant with the emergence of COVID-19. It shows that investors rely on the previous day's stock prices to trade under market uncertainty. Market sentiment is observed to be insignificant in the pandemic. Furthermore, the existence of overreaction is detected in European portfolios but no evidence of overreaction is shown in the USA during pre-COVID-19. Surprisingly, overreaction is observed in Europe and USA markets in the pandemic. The USA market has a higher overreaction tendency than Europe. The results of this study assist academicians, practitioners and investors in understanding and creating awareness of the existence of market overreaction and its determinants before and during COVID-19.

Key Words

Behavioural Finance, COVID-19, Investor Sentiment, Market Sentiment, Overreaction

Introduction

Overreaction is a common market anomaly that stipulates the often irrational psychological factors of investors that caused the securities to be wrongly priced in financial markets. Overreaction occurs when the winner stocks that previously performed well turn out to be one of the worst in the market (Ali et al., 2011). The existence of overreaction is documented in various markets such as the United States (USA) (Ma et al., 2018), the United Kingdom, Europe (Aleksandrievičienė & Aleksandravičiūtė, 2020) and China (Reddy et al., 2020). Nonetheless, COVID-19 is a disastrous shock to the stock markets. Therefore, there is a need and worth to examine the existence of overreaction during pre-COVID-19 and COVID-19 to determine the different investing behaviours exhibited by investors.

Furthermore, studies on the overreaction in COVID-19 mainly emphasize on China market due to the first announcement of the COVID-19 pandemic lockdown (Huo & Qiu, 2020; Loang & Ahmad, 2021). Nonetheless, the empirical evidence on the other world's largest stock markets such as the USA and Europe are still limited and

often overlooked. Europe and USA have experienced a higher rate of fatality compared to China after the few months of the first COVID-19 case. This is because the intergenerational residence patterns in Europe and USA has increased the fatalities of COVID-19 (Fenoll & Grossbard, 2020). Hence, it inspires this study to examine the existence of overreaction other than China market, which is USA and European markets.

The determinants of overreaction are often related to market sentiment and investor sentiment. Market sentiment represents the macro environment of a market that can cause the securities' prices to deviate from the fundamentals and disrupt the pricing mechanism (Ma et al., 2018). Investor sentiment describes the factors that affect the emotions of individual investors to drive the stock prices away from their intrinsic values (Piccoli & Chaudhury, 2018). Studies on the correlation between market sentiment, investor sentiment and overreaction are not new to the field of behavioural finance but no study looks at the impact of market sentiment and investor sentiment during COVID-19. Does the impact of market

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sentiment and investor sentiment on overreaction can still be validated when investors encounter the pandemic?

Therefore, this study begs to differ from previous studies and aims to examine the existence of overreaction during pre-COVID-19 and COVID-19. This study also intends to examine the impact of market sentiment and investor sentiment as the determinants of overreaction in the pandemic. In regards to the choice of research platform, this study selects the USA and European markets due to the overlook of the overreaction of these markets.

The results of this study can contribute to the academician, practitioners and investors in understanding the existence of overreaction in the pandemic as well as the root causes to cause overreaction. It creates awareness to investors and analysts to make and guide wise investment decisions under market stress. Regulators and policymakers can be benefited from this research as overreaction is a market anomaly.

Literature Review and Hypothesis Development

Market Sentiment and Investor Sentiment

The determinants of overreaction can be categorized into two main causes, which are market sentiment and investor sentiment. Piccoli and Chaudhury (2018) show that overreaction is correlated to the market sentiment, especially the extreme market events that can reshape the market environment as a whole. Parveen et al. (2020) also argue that the existence of overreaction is caused by investor sentiments such as heuristic and overconfidence. Investors can be misled by their emotions to make unwise decisions under uncertainty. Nevertheless, limited studies look at the market and investors' sentiments simultaneously as the determinants of overreaction in COVID-19.

In analyzing the determinants of market overreaction, the previous study tends to overlook the use of panel data regression. The study of overreactions necessitates the tracking of stocks' performance over time. Panel data regression, as opposed to the standard ordinary least square (OLS) approach, is a more appropriate choice in this case since it can account for the unobserved variables in the regression (Loang & Ahmad, 2020). Wu et al. (2016) show that when assessing a relationship with a temporal impact, the OLS approach can be biased. Panel data regression can also be extended into quantile panel regression, which is used to examine the impact of market sentiment and investor sentiment on different quantiles of overreaction.

Hence, this study aims to examine the impact of market sentiment and investor sentiment on market overreaction and proposes the following hypotheses:

H_1 : Market sentiment is significantly correlated to market overreaction before and during COVID-19.

H_2 : Investor sentiment is significantly correlated to market overreaction before and during COVID-19.

Market Overreaction

The study of market overreaction in the normal period has spawned a slew of articles (Phan & Narayan, 2020). Only a few pieces of research have looked at the existence of overreaction in the pandemic.

Huo and Qiu (2020) examine the market reaction to the COVID-19 lockdown announcement. They demonstrate that COVID-19 has a reverse effect on stock returns and investors have overreacted to it. Similar evidence is documented in the study of Yong and Laing (2021) in which they investigate the influence of COVID-19 on the USA market. They argue that investors react favourably to companies having a global presence. This is because COVID-19 has a worldwide influence rather than affecting specific equities. Despite this, no research has been done to investigate to compare the evidence of market overreaction before and during COVID-19.

The efficient market hypothesis (EMH) states that a market shall reflect all available information. Efficient markets can absorb information more quickly into stock prices than less efficient markets. In this perspective, the USA market is the world's largest stock exchange and it is observed to be more efficient than the European stock markets. This is because the less-developed markets lack the same level of openness and accountability as the developed market. The European market's tendency for overreaction is expected to be stronger, although no study has compared the overreaction between these two markets.

Therefore, this study intends to examine the existence of market overreaction in USA and Europe markets before and during COVID-19 with the following hypothesis:

H_3 : USA and Europe markets are overreacted before and during COVID-19.

H_{3a} : European market has a higher tendency of overreaction than the USA market before and during COVID-19.

Data and Methodology

The data of this study is ranged from 2015 to 2020. For pre-COVID, the data consists of monthly returns from 1 January 2015 to 31 December 2019. The data of COVID-19 is covered from 1 January 2020 to 31 October 2021. For sampling, only stocks listed in Nasdaq and Euronext are selected. This is because most studies on COVID-19 focus on the Asian market as China is the first country found with COVID-19 cases. The USA and Europe markets are often overlooked in the academic studies. All selected stocks should be listed before 1 January 2015 and maintain listed status on 31 October 2020. Figure 1 illustrates the total number of stocks selected as winner and loser portfolios from Nasdaq and Euronext.

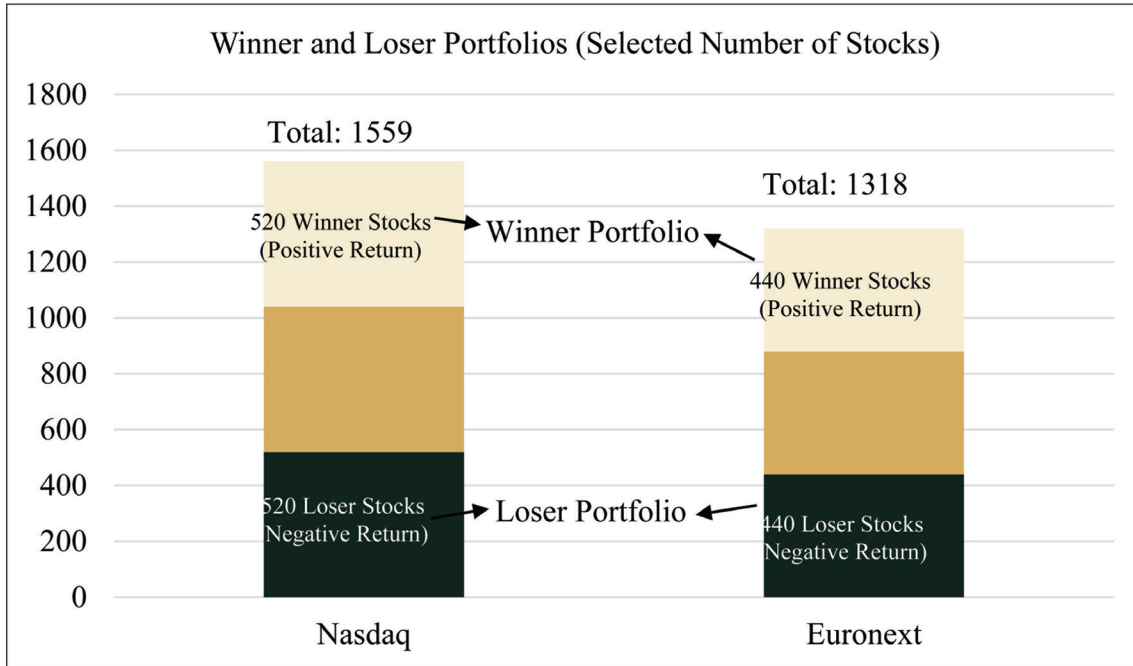


Figure 1. Total Number of Stocks Selected

Source: The author.

Market Overreaction

Overreaction can be determined by the returns of portfolios after the formation period. This study adopts the average excess cumulative return (AECR) as proposed in the study of Reddy et al. (2020) to measure the stock returns. AECR is measured by geometric mean, which is appropriate to determine capture the compounded growth rate of a portfolio. The cumulative return is given as:

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \quad (1)$$

$$CR_{i,t} = \prod_{j=1}^t (1 + R_{i,j}) = \sqrt[t]{(1 + R_{i,1})(1 + R_{i,2}) \dots (1 + R_{i,t})} - 1 \quad (2)$$

where $P_{i,t}$ is the stock price of stock i at time t and $R_{i,t}$ is the daily return of stock i in month j . The monthly returns are determined because the data of market sentiment are only available on monthly basis. The AECR is written as:

$$ECR_{i,t} = CR_{i,t} - CR_{m,t} \quad (3)$$

$$AECR_{W,t} = \frac{\sum_{j=1}^N ECR_{w,i,t}}{N}; t = 1, 2, 3 \dots 12 \text{ months} \quad (4)$$

$$AECR_{L,t} = \frac{\sum_{j=1}^N ECR_{L,i,t}}{N}; t = 1, 2, 3 \dots 12 \text{ Months} \quad (5)$$

where $ECR_{i,t}$ is the excess cumulative return of stock i at time t , $CR_{i,t}$ is the cumulative return of stock i at time t , $AECR_{W,t}$ and $AECR_{L,t}$ are average excess cumulative return for Nasdaq and Euronext winner and loser portfolios. Furthermore, AECR can be modified into the grand average excess cumulative return (GAECR). GAECR is used to determine the existence of contrarian profit of an arbitrage portfolio. The GAECR is given as:

$$GAECR_W = \frac{1}{n} \sum_{T=1}^N AECR_{W,t}; t = 1, 2, 3 \dots 12 \text{ months} \quad (6)$$

$$GAECR_L = \frac{1}{n} \sum_{T=1}^N AECR_{L,t}; t = 1, 2, 3 \dots 12 \text{ months} \quad (7)$$

$$DG_{L-W} = GAECR_L - GAECR_W \quad (8)$$

Where, DG_{L-W} is the average return of the arbitrage portfolio. The positive value of DG_{L-W} indicates that contrarian profit exists in the markets because the loser portfolio generates a positive return while the winner portfolio results in a negative return.

Investor Sentiment

Investor sentiment reflects the emotion of individual investors while market sentiments represent the collective decision of a whole group of investors in the markets. Four

different volatility measurements are adopted, which are standard deviation (Bentes & Menezes, 2012), RV (Wen et al., 2019), Parkinson's estimator (Parkinson, 1980) and Garman and Klass's estimator (Garman & Klass, 1980).

A conventional approach to measuring volatility is to compute the standard deviation of historical stock prices. It is a simple and common approach for investors to determine the price changes in the past. The standard deviation of volatility is written as:

$$r_{i,t} = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \quad (12)$$

$$\hat{\sigma}_{i,t} = \sqrt{\frac{\sum_{t=1}^T (r_{i,t} - \langle r_{i,t} \rangle)^2}{T-1}} \quad (13)$$

Where, $r_{i,t}$ is the return of stock i at time t , $\langle r_{i,t} \rangle$ is the average return of stock i at time t , $P_{i,t} - P_{i,t-1}$ denote the closing and opening stock prices over intraday T . The standard deviation approach can lead to abrupt changes in volatility in extreme events such as COVID-19 because a shock in the markets can be subsequently tranquil after the turbulence.

In this context, Wen et al. (2019) propose RV as the alternative measurement of volatility to capture the overnight data that is error-free and close to real volatility. The RV is measured using the variance of discrete returns measured at numerous intervals and it is given as:

$$RV_{i,t} = \sqrt{\frac{\sum_{i=1}^N R_{i,t}^2}{N}} \quad (14)$$

Where, $R_{i,t}$ represents the return of stock i at time t , which is calculated by using the previous day's closing stock prices. The RV captures the overnight adjusted stock prices while the standard deviation approach represents the intraday volatility without adjusting to overnight changes.

Another measurement of volatility is Parkinson's estimator. Rather than using the opening and closing stock prices, Parkinson (1980) argues that volatility can be computed using the maximum and minimum stock prices. It is a measurement to capture the extreme volatility. The Parkinson's estimator is expressed as:

$$\sigma_p = \frac{1}{2\sqrt{\ln 2}} \sqrt{\frac{1}{n} \sum_{t=1}^N P_{i,t}^2} \quad (15)$$

Where, $P_{i,t} = \ln \frac{H_{i,t}}{L_{i,t}}$ and $H_{i,t}$ is the maximum price of stock i at time t and $L_{i,t}$ is the minimum price of stock i at time t . Parkinson's estimator is suitable to examine the impact of COVID-19 as a disruption to the markets that drive the stock prices away from fundamentals.

Garman–Klass's estimator is enhanced from the Parkinson's estimator to rectify the underestimation of the

opening jumps because the Parkinson's estimator does not account for the opening stock prices. The Garman–Klass estimator is extended to include opening and closing stock prices as the markets are more active during the opening and closing periods. The Garman–Klass's estimator is expressed as:

$$\sigma_{GK} = \sqrt{\frac{1}{n} \sum_{t=1}^n \frac{1}{2} P_{i,t}^2 - (2\ln 2 - 1) Q_{i,t}^2 F} \quad (16)$$

Where $Q_{i,t} = \ln \frac{C_{i,t}}{O_{i,t}}$ and $C_{i,t}$ is the closing price of stock i at time t and $O_{i,t}$ is the opening price of stock i at time t . Garman–Klass's estimator is the most comprehensive measurement of volatility as it captures the opening, closing, maximum and minimum stock prices.

Market Sentiment

Market sentiment represents the collective decision of all the investors in the markets. This study proposes the market's sentiments to be represented by Business Confidence Index (BCI), Consumer Confidence Index (CCI), Labour Force Survey (LFS), Leading Index (LI) and Monetary Aggregates (MA). These indexes are measured by Organization for Economic Co-operation and Development (OECD) on monthly basis. Table 1 illustrates the variables, descriptions and literature of market sentiment.

Firm Characteristics

Few firm characteristics such as dividend payout ratio (DY), earnings per share (EPS) and price/earning-to-growth (PEG) ratio are selected as the control variables. This is because these variables were proven to affect stock returns in previous studies. Table 2 illustrates the firm characteristics, description, formula and relevant literature of control variables.

Panel Data Regression

Panel data regression is adopted to examine the impact of investor sentiment and market sentiment on overreaction. Panel data regression is used to examine the combination of time-series and cross-sectional data. Unlike the OLS method, the fixed and random models of panel data regression account for the unobserved variables in the regression. The following panel data regression is proposed:

$$ACER_{i,t} = \alpha_i + \beta_1 Investors' Sentiment_{i,t} + \beta_2 Markets' Sentiment_{m,t} + \beta_3 Firms' Characteristics_{i,t} + \epsilon_{i,t} \quad (17)$$

For robustness, quantile panel data regression is examined to determine the impact of investor sentiment and market

Table 1. Market Sentiment Variables

Variables	Description	Literature
Business Confidence Index	Provide information on businesses' future development. Data was collected from OECD's survey in production, orders and stocks of different industries.	Bielova et al. (2021)
Consumer Confidence Index	Provide information on household's consumption and saving. Data collected from OECD's survey on the household's expected financial situation, sentiment on economy, unemployment and capability of savings.	Ferrer et al. (2016)
Labour Force Survey	Measure the employment circumstance of the total population and the future expectation on labour market.	Wadsworth et al. (2016)
Leading Index	Signal the upcoming changes in the economy and turning points in the business cycle. It predicts the short-term economic fluctuation.	Dimpfl & Jank (2016)
Monetary Aggregates	Quantify the narrow money (M1) and broad money (M3) circulating in the markets.	Celebi & Hönig (2019)

Source: The author.

Table 2. Firm Characteristics Variables

Variables	Description	Formula	Literature
Dividend Payout Ratio	Measures the proportion of total dividends paid to shareholders over total earnings.	$DY_{i,t} = \frac{Dividend_{i,t}}{Net\ Income_{i,t}}$	Herawati & Fauzia (2018)
Earnings Per Share	Computes the total earning per outstanding share as an indicator of a company's profitability.	$EPS_{i,t} = \frac{Earnings_{i,t}}{Outstanding\ Shares_{i,t}}$	Jasman & Kasran (2017)
Price/Earning-to-Growth	Stock valuation method, which is derived from the price-to-earnings (P/E) ratio and divided by the growth rate of the company's earnings.	$PEG_{i,t} = \frac{P/E\ Ratio_{i,t}}{Earnings\ Growth\ Rate_{i,t}}$	Le et al. (2018)

Source: The author.

sentiment at the τ th quantiles. Panel data regression provides an aggregate opinion based on the samples by estimating the conditional mean. Quantile panel data regression measures the conditional median to study the correlation of sentiments and stock returns based on different quantiles of return. The quantile panel data regression is written as:

$$Q_{\tau}(\tau | V_{\tau}) = \beta_{0,\tau} + \beta_{1,\tau} \cdot Investors' \ Sentiment_{i,t} + \beta_{2,\tau} \cdot Markets' \ Sentiment_{m,t} + \beta_{3,\tau} \cdot Firms' \ Characteristics_{i,t} + \varepsilon_{i,t,\tau} \quad (18)$$

Empirical Results and Analysis

Descriptive Statistics

Table 3 illustrates the descriptive statistics of Euronext and Nasdaq independent variables, which are investor sentiment and market sentiment, and the firm characteristics as control variables.

Comparing the stock returns (AECR) of both markets, Nasdaq listed companies with a positive mean value of 0.03 perform better than Euronext's stocks with a mean value of -0.025. Euronext's stocks are more volatile than Nasdaq's stocks due to higher mean values. Furthermore, Nasdaq has resulted in positive market sentiment with BCI, CCI, LI and MA having positive mean values compared to Euronext. It indicates that the macro environment was releasing positive signals to the Nasdaq investors over

the years. Nonetheless, Euronext's stocks have better performance in firm characteristics with higher mean values of DY (3.001), EPS (4.466) and PEG (7.016) ratios compared to Nasdaq's stocks.

Estimates of Investor Sentiment and Market Sentiment (Pre-COVID-19)

Table 4 summarizes the panel data regression and quantile panel regression of the Euronext winner portfolio during pre-COVID-19. Table 5 illustrates the panel data regression and quantile panel regression of the Euronext loser portfolio during pre-COVID-19.

The panel data regression in Table 4 shows RV and Parkinson's estimator as the variables of investor sentiment that are found to be significant to stock returns at the significant level of 1%. Standard deviation and Garman and Klass's estimators are insignificant in the Euronext winner portfolio. It indicates that investors rely on the previous day's stock prices and extreme volatility (maximum and minimum stock prices) to trade. Furthermore, BCI, LFS, LI and MA are significantly correlated to stock returns. Only CCI is found to be insignificant to the stock return in the Euronext winner portfolio.

For the Euronext loser portfolio, similar results are obtained compared to the Euronext winner portfolio. Investor sentiment such as RV and Parkinson's estimator

Table 3. Descriptive Statistics

Variables	Mean	Median	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis
Euronext							
AECR	-0.025	-0.005	4.303	0.000	0.231	3.713	9.286
Standard Deviation	0.147	0.003	6.5384	0.000	1.847	3.868	1.615
RV	0.120	0.070	4.303	0.008	0.199	8.517	1.427
Garman and Klass	0.505	0.008	14.799	0.000	8.503	1.714	2.950
Parkinson	0.009	0.007	0.160	0.000	0.011	4.467	4.205
BCI	-2.004	-0.001	3.009	-4.302	0.182	-8.177	2.201
CCI	-0.057	0.000	5.957	-6.382	1.730	-3.631	13.693
LFS	-3.075	-0.017	8.009	-4.313	0.171	-12.538	2.662
LI	-2.301	-0.002	12.001	-14.674	6.563	-2.181	4.930
MA	-1.307	0.000	6.008	-0.153	0.009	-5.700	6.747
DY	3.001	0.001	7.660	0.000	0.125	-2.579	2.949
EPS	4.466	0.001	62.239	-6.753	16.305	-3.739	14.273
PEG	7.016	0.001	45.134	0.000	3.647	5.397	7.105
Nasdaq							
AECR	0.030	0.022	2.687	0.000	0.265	2.981	2.881
Standard Deviation	0.128	0.057	2.808	-0.545	0.336	1.854	1.151
RV	0.165	0.111	2.687	0.000	0.209	5.673	5.581
Garman and Klass	0.011	0.010	0.100	0.009	0.007	3.696	3.483
Parkinson	0.013	0.012	0.108	0.001	0.008	3.312	2.886
BCI	0.006	0.006	2.999	-0.410	0.067	4.900	1.048
CCI	0.001	0.001	1.001	-0.409	0.067	4.945	1.050
LFS	-0.005	-0.019	0.960	-0.429	0.073	3.434	7.403
LI	0.002	-0.001	7.988	-0.411	0.067	4.900	1.049
MA	0.006	0.004	4.901	-0.405	0.068	4.792	1.018
DY	0.004	0.001	1.191	0.000	0.114	2.088	3.230
EPS	0.079	0.001	23.530	-14.187	12.173	10.803	3.048
PEG	0.038	0.001	10.844	0.000	0.569	13.406	2.513

Source: The author.

Notes: AECR: Average excess cumulative return, BCI: Business confidence index, CCI: Consumer confidence index, LFS: Labour force survey, LI: Leading index, MA: Monetary aggregates, DY: Dividend payout ratio, EPS: Earnings per share, PEG: Price/earning-to-growth, RV: Realized volatility.

Table 4. Panel Data Regression and Quantile Panel Regression of Euronext Winner Portfolio During Pre-COVID-19

Variables	Panel Regression		Quantile Panel Regression			
	(Fixed-effect)	0.1	0.3	0.5	0.7	0.9
Constant	0.001 (0.085)	-0.020*** (-3.167)	-0.022*** (-1.056)	-0.004*** (1.271)	0.022*** (1.612)	0.024*** (2.911)
Investor Sentiment						
Standard Deviation (Volatility)	0.013 (0.424)	-0.000 (-0.416)	-0.007** (-2.107)	-0.020*** (-1.156)	-0.001 (-0.354)	-0.003 (-0.114)
Realized Volatility	-0.601*** (-14.700)	-0.899*** (-11.78)	-1.002*** (-8.233)	-0.205*** (-1.154)	0.984*** (8.644)	0.972*** (12.463)
Parkinson's Estimator	3.497*** (4.025)	-0.089 (-1.496)	-0.427*** (-4.007)	-1.367*** (-3.621)	0.140 (1.381)	-0.045 (-0.707)
Garman and Klass	0.443 (0.651)	0.187 (2.47)	0.889*** (21.857)	0.214*** (5.051)	-0.458*** (-2.599)	-0.362*** (-16.499)
Market Sentiment						
Business Confidence Index	-0.919*** (-25.548)	-0.797*** (-3.25)	-1.133*** (-14.387)	-1.257*** (-7.751)	-0.945*** (-7.144)	-1.076*** (-3.824)
Consumer Confidence Index	0.029 (0.705)	-0.000 (-0.08)	-0.007** (-2.097)	-0.002*** (-4.591)	-0.006*** (-2.317)	-0.003 (-0.126)

(Table 4 continued)

(Table 4 continued)

Variables	Panel Regression		Quantile Panel Regression			
	(Fixed-effect)	0.1	0.3	0.5	0.7	0.9
Labour Force Survey	−0.554*** (−10.348)	−0.688*** (−2.330)	−1.231*** (−6.916)	−0.205*** (−5.782)	0.985*** (8.879)	0.972*** (1.857)
Leading Index	3.744*** (4.244)	−0.114 (−1.665)	−0.427*** (−4.000)	−1.367*** (−5.013)	0.272*** (3.043)	−0.031 (−0.428)
Monetary Aggregates	1.281** (1.960)	0.453*** (7.837)	0.889*** (28.568)	0.214*** (7.772)	−0.695*** (−8.227)	−0.556*** (−7.983)
Firm Characteristics						
Dividend Payout	0.003 (0.130)	−0.001 (−0.555)	−0.003 (−0.002)	0.003 (0.025)	−0.002*** (−3.371)	−0.001 (−0.387)
Earnings Per Share	−0.001 (−0.562)	0.007 (0.109)	−0.169 (−0.002)	0.003 (0.064)	0.007 (0.815)	−0.001 (−0.290)
PEG Ratio	0.000 (0.125)	0.000 (0.529)	0.003 (0.002)	0.004 (0.006)	−0.001** (−2.112)	−0.001*** (−7.234)
Adjusted R-squared	0.740	0.851	0.692	0.555	0.673	0.804

Source: The author.

Notes: ***, ** and * are significant at the levels of 10%, 5% and 1%.

PEG: Price/earning-to-growth.

and market sentiments such as BCI, LFS, LI and MA are documented with significant correlation to stock returns.

Surprisingly, the firm characteristics as the control variables are insignificant to stock returns. It shows that the firm's characteristics do not affect the investors' behaviour because sentiments play a more significant role in affecting the returns of stocks.

Table 6 summarizes the panel data regression and quantile panel regression of Nasdaq winner portfolio during pre-COVID-19. Table 7 illustrates the panel data regression and quantile panel regression of the Nasdaq loser portfolio during pre-COVID-19.

For investor sentiment, RV is the only variable of investor sentiment significantly correlated to stock returns in Nasdaq winner and loser portfolios. Standard deviation, Parkinson's estimator and Garman and Klass's estimator are found to be insignificant to AECR. It indicates that investors rely on the previous day's stock prices as the benchmark to make an investment decision in Nasdaq winner and loser portfolios.

Furthermore, all variables of market sentiment such as BCI, CCI, LFS, LI and MA are documented with significant correlation to stock returns in Nasdaq winner portfolio. Nonetheless, BCI is insignificant in the Nasdaq loser portfolio.

For robustness, quantile panel regression is adopted to examine the impact of investor sentiment and market sentiment in different quantiles ($\tau_{th} = 0.1, 0.3, 0.5, 0.7, 0.9$) of AECR.

Estimates of Investor Sentiment and Market Sentiment (COVID-19)

Table 8 summarizes the panel data regression and quantile panel regression of the Euronext winner portfolio during

COVID-19. Table 9 illustrates the panel data regression and quantile panel regression of the Euronext loser portfolio during COVID-19.

In the Euronext market, the winner and loser portfolios show that RV is the only variable of investor sentiment that is found to be significant to the stock return during COVID-19. Standard deviation, Parkinson's estimator and Garman and Klass's estimator are insignificant. Besides, BCI, CCI, LFS, LI and MA as the variables of market sentiment are not correlated to the stock returns. This result is contradicted to the evidence of pre-COVID-19 as the market's sentiments were shown to be correlated. One of the possible explanations is that the factors of investor sentiment take over the impact of market trends as investors are panic about selling off their securities during the emergence of COVID-19. Therefore, the investors have a higher priority to safeguard their capital of investment to avoid and halt loss. The COVID-19 pandemic has brought an unparalleled market crash that was caused by the contagion effect of the irrational investors' behaviour (Baig et al., 2021).

Table 10 summarizes the panel data regression and quantile panel regression of Nasdaq winner portfolio during COVID-19. Table 11 illustrates the panel data regression and quantile panel regression of the Nasdaq loser portfolio during COVID-19.

In the Nasdaq market, RV is the only variable of investor sentiment that is found to be correlated to the stock returns in winner and loser portfolios during COVID-19. All variables of market sentiment are insignificant in the Nasdaq winner portfolio but CCI is found to be significant in the Nasdaq loser portfolio at the significant level of 1% during COVID-19.

The control variables, which are dividend payout, earnings per share and PEG ratio, are insignificant to the stock returns in Euronext and Nasdaq winner and loser portfolios

Table 5. Panel Data Regression and Quantile Panel Regression of Euronext Loser Portfolio During Pre-COVID-19

Euronext Loser Portfolio (Pre-COVID)						
Variables	Panel Regression	Quantile Panel Regression				
	(Fixed-Effect)	0.1	0.3	0.5	0.7	0.9
Constant	0.006* (1.876)	-0.010*** (-24.733)	-0.009*** (-16.625)	-0.008*** (-8.821)	-0.005*** (-8.245)	0.011*** (27.036)
Investor Sentiment Standard Deviation (Volatility)	-0.015 (-1.389)	-0.001 (-0.435)	0.002 (0.533)	0.006 (0.840)	0.003 (0.681)	0.001 (0.304)
Realized Volatility	-0.893*** (-4.935)	-1.206*** (-3.402)	-0.979*** (-3.931)	-0.896*** (-14.377)	-0.738*** (-5.758)	0.985*** (29.065)
Parkinson's Estimator	0.001*** (2.585)	0.000*** (6.298)	0.000*** (3.491)	0.001*** (3.008)	0.001*** (14.436)	0.004 (0.108)
Garman and Klass	0.355 (1.116)	-0.281*** (-4.667)	-0.021 (-0.258)	0.019 (0.164)	0.439*** (7.617)	-0.016 (-0.343)
Market Sentiment Business Confidence Index	-0.957*** (-3.592)	-0.936*** (-6.455)	-1.209*** (-4.763)	-0.985*** (-5.652)	-0.938*** (-2.298)	-1.162*** (-6.147)
Consumer Confidence Index	-0.009 (-0.603)	-0.009 (-0.508)	0.002 (0.528)	0.006 (0.825)	0.004 (0.839)	0.001 (0.290)
Labour Force Survey	-0.829*** (-26.600)	-1.156*** (-28.608)	-0.975*** (-28.725)	-0.894*** (-14.538)	-0.729*** (-5.915)	0.985 (2.941)
Leading index	0.000** (2.329)	0.001*** (5.633)	0.000*** (3.213)	0.001*** (2.949)	0.001*** (13.857)	0.004*** (0.101)
Monetary Aggregates	1.116*** (3.414)	-0.311*** (-6.614)	-0.021 (-0.306)	0.019 (0.177)	0.491*** (4.431)	-0.016 (-0.299)
Firm Characteristics Dividend Payout	0.020 (0.656)	0.001 (0.930)	0.007 (0.002)	0.002 (0.001)	-0.002* (-1.679)	-0.003 (-0.001)
Earnings Per Share	0.003 (0.035)	-0.001 (-0.242)	0.002 (0.003)	-0.002 (-0.000)	-0.003 (-0.335)	-0.001 (-0.001)
PEG Ratio	0.002 (0.328)	-0.000 (-0.221)	0.001 (0.008)	0.005 (0.000)	-0.001 (-0.915)	-0.001 (-0.001)
Adjusted R-squared	0.906	0.942	0.860	0.759	0.626	0.666

Source: The author.

Notes: ***, ** and * are significant at the levels of 10%, 5% and 1%.

PEG: Price/earning-to-growth.

Table 6. Panel Data Regression and Quantile Panel Regression of Nasdaq Winner Portfolio During Pre-COVID-19

Nasdaq Winner Portfolio (Pre-COVID)						
Variables	Panel Regression	Quantile Panel Regression				
	(Random-effect)	0.1	0.3	0.5	0.7	0.9
Constant	0.555*** (4.481)	0.001 (0.003)	0.140 (1.333)	0.289*** (2.841)	0.076 (1.493)	-0.004 (-0.140)
Investor Sentiment Standard Deviation (Volatility)	0.032 (1.090)	0.008 (0.006)	0.009 (0.004)	0.001 (0.007)	-0.002 (-0.002)	-0.001 (-0.002)
Realized Volatility	0.639*** (14.535)	-1.542*** (-18.426)	-0.942*** (-11.958)	1.129*** (7.744)	1.227*** (8.148)	1.080*** (12.423)
Parkinson's Estimator	-3.318 (-0.397)	-0.009 (-0.002)	-0.005 (-0.000)	-0.008 (-0.002)	-0.005 (-0.001)	-0.002 (-0.001)
Garman and Klass	4.026 (0.544)	0.001 (0.003)	0.006 (0.001)	0.008 (0.002)	0.005 (0.002)	0.001 (0.001)
Market Sentiment Business Confidence Index	-4.708*** (-4.565)	-0.001 (-0.002)	-1.229 (-1.312)	-2.035** (-2.467)	-5.606 (-0.001)	7.196 (0.254)
Consumer Confidence Index	3.482*** (4.926)	0.009 (0.002)	8.727 (1.354)	1.625*** (2.686)	4.382 (0.001)	-4.350 (-0.219)

(Table 6 continued)

(Table 6 continued)

Nasdaq Winner Portfolio (Pre-COVID)						
Variables	Panel Regression	Quantile Panel Regression				
	(Random-effect)	0.1	0.3	0.5	0.7	0.9
Labour Force Survey	2.515*** (5.590)	0.007 (0.003)	4.886 (1.261)	1.221*** (3.091)	3.095 (0.001)	-0.173 (-0.135)
Leading Index	2.095*** (4.220)	0.007 (0.002)	5.408 (1.233)	8.439** (2.284)	2.202 (0.001)	-5.508 (-0.413)
Monetary Aggregates	-1.132*** (-5.329)	-0.003 (-0.002)	-2.396 (-1.280)	-5.735*** (-3.015)	-1.488 (-0.001)	0.836 (0.137)
Firm Characteristics						
Dividend Payout	0.119 (1.454)	0.001 (0.004)	-0.009 (-0.002)	-0.001 (-0.004)	-0.004 (-0.001)	-0.007 (-0.002)
Earnings Per Share	-0.003 (-0.051)	-0.008 (-0.003)	-0.000 (-0.434)	-0.003 (-0.001)	-0.005 (-0.002)	0.007 (0.004)
PEG Ratio	-0.015 (-0.952)	0.009 (0.002)	-0.001 (-0.001)	-0.005 (-0.003)	-0.002 (-0.001)	-0.005 (-0.004)
Adjusted R-squared	0.796	0.471	0.569	0.869	0.459	0.724

Source: The author.**Notes:** ***, ** and * are significant at the levels of 10%, 5% and 1%.

PEG: Price/earning-to-growth.

Table 7. Panel Data Regression and Quantile Panel Regression of Nasdaq Loser Portfolio During Pre-COVID-19

Nasdaq Loser Portfolio (Pre-COVID)						
Variables	Panel Regression	Quantile Panel Regression				
	(Fixed-effect)	0.1	0.3	0.5	0.7	0.9
Constant	-0.060*** (-3.290)	-0.002 (-0.567)	-0.048*** (-4.617)	-0.007 (-1.623)	0.002 (0.001)	-0.008 (-0.005)
Investor Sentiment						
Standard Deviation (Volatility)	0.006 (0.469)	0.006 (0.001)	0.001 (0.000)	0.001 (0.009)	-0.006 (-0.004)	0.003 (0.003)
Realized Volatility	-0.103*** (-3.292)	1.052*** (-19.139)	-0.960*** (-9.835)	1.518*** (13.301)	1.434*** (18.404)	1.222*** (31.038)
Parkinson's Estimator	0.925 (0.368)	0.004 (0.008)	0.002 (0.002)	0.007 (0.001)	-0.007 (-0.002)	-0.001 (-0.005)
Garman and Klass	-1.068 (-0.473)	0.003 (0.006)	-0.000 (-0.000)	-0.008 (-0.002)	0.004 (0.001)	-0.006 (-0.003)
Market Sentiment						
Business Confidence Index	-2.021 (-0.497)	1.074 (0.860)	-8.730*** (-3.649)	3.398** (2.043)	0.002 (0.003)	0.002 (0.006)
Consumer Confidence Index	-3.086*** (-5.465)	-2.188 (-1.323)	-1.917*** (-5.441)	0.714 (0.703)	0.008 (0.009)	-0.005 (-0.001)
Labour Force Survey	-0.618** (-2.193)	-0.025 (-0.319)	-0.315** (-2.433)	0.101 (1.588)	0.003 (0.009)	-0.009 (-0.003)
Leading Index	2.274*** (3.370)	-0.826 (-0.411)	19.692*** (4.613)	-5.328** (-2.022)	-0.001 (-0.009)	-0.001 (-0.001)
Monetary Aggregates	9.925*** (5.868)	-0.034 (-0.06)	6.528*** (5.193)	1.113* (1.869)	-0.003 (-0.001)	0.002 (0.00)
Firm Characteristics						
Dividend Payout	-0.017 (-0.888)	0.001 (0.005)	-0.004 (-0.000)	-0.005 (-0.004)	-0.006 (-0.006)	-0.001 (-0.003)
Earnings Per Share	-0.009 (-0.222)	0.001 (0.005)	-0.002 (-0.222)	0.005 (0.001)	-0.001 (-0.005)	0.005 (0.002)
PEG Ratio	-0.017 (-0.834)	-0.002 (-0.002)	-0.009 (-0.000)	-0.003 (-0.001)	-0.001 (-0.007)	-0.004 (-0.003)
Adjusted R-squared	0.821	0.541	0.794	0.780	0.639	0.795

Source: The author.**Notes:** ***, ** and * are significant at the levels of 10%, 5% and 1%.

PEG: Price/earning-to-growth.

Table 8. Panel Data Regression and Quantile Panel Regression of Euronext Winner Portfolio During COVID-19

Euronext Winner Portfolio (COVID)						
Variables	Panel Regression	Quantile Panel Regression				
	(Fixed-effect)	0.1	0.3	0.5	0.7	0.9
Constant	0.039 (1.405)	-0.012 (-0.571)	-0.017 (-1.194)	-0.003 (-0.308)	-0.003 (-0.003)	-0.005 (-0.009)
Investor Sentiment Standard Deviation (Volatility)	-0.025 (-1.566)	-0.008 (-0.001)	-0.025 (-0.475)	-0.009 (-0.003)	-0.007 (-0.003)	0.002 (0.001)
Realized Volatility	-0.377*** (-5.044)	-1.385*** (-25.950)	0.980*** (12.086)	1.660*** (15.131)	1.571*** (17.504)	1.351*** (28.459)
Parkinson's Estimator	-0.337 (-0.452)	0.002 (0.004)	0.003 (0.023)	0.002 (0.009)	-0.005 (-0.002)	-0.008 (-0.005)
Garman and Klass	1.103 (1.676)	0.003 (0.004)	0.209 (0.590)	0.003 (0.001)	-0.008 (-0.004)	0.001 (0.009)
Market Sentiment Business Confidence Index	-0.254 (-1.169)	-0.018 (-0.114)	-0.226*** (-3.520)	-0.010 (-0.673)	-0.003 (-0.002)	-0.006 (-0.001)
Consumer Confidence Index	-0.273 (-0.960)	-1.987*** (-10.915)	-0.146 (-0.894)	-0.003 (-0.241)	0.002 (0.001)	-0.001 (-0.002)
Labour Force Survey	-0.337 (-0.452)	-0.001 (-0.001)	0.003 (0.023)	-0.004 (-0.000)	-0.005 (-0.002)	-0.008 (-0.005)
Leading Index	0.302 (0.658)	0.794 (0.975)	1.883** (2.374)	0.088 (0.799)	0.008 (0.001)	0.001 (0.002)
Monetary Aggregates	0.620 (0.677)	0.366 (0.556)	0.568* (1.803)	0.030 (0.635)	0.002 (0.006)	0.007 (0.003)
Firm characteristics Dividend Payout	-0.012 (-0.198)	0.002 (0.003)	-0.004 (-0.602)	-0.001 (-0.006)	0.001 (0.007)	0.001 (0.008)
Earnings Per Share	0.001 (0.235)	-0.008 (-0.001)	-0.000 (-0.534)	0.004 (0.003)	0.009 (0.009)	-0.003 (-0.005)
PEG Ratio	-0.002 (-0.480)	0.001 (0.882)	0.006 (0.233)	-0.002 (-0.001)	-0.001 (-0.001)	0.009 (0.001)
Adjusted R-squared	0.629	0.605	0.421	0.424	0.607	0.775

Source: The author.

Notes: ***, ** and * are significant at the levels of 10%, 5% and 1%.

PEG: Price/earning-to-growth.

Table 9. Panel Data Regression and Quantile Panel Regression of Euronext Loser Portfolio During COVID-19

Euronext Loser Portfolio (COVID)						
Variables	Panel Regression	Quantile Panel Regression				
	(Fixed-effect)	0.1	0.3	0.5	0.7	0.9
Constant	-0.335 (-0.235)	-1.712** (-2.419)	-0.220** (-1.121)	-0.044 (-0.167)	-0.002 (-0.001)	-0.001 (-0.011)
Investor Sentiment Standard Deviation (Volatility)	0.046 (1.083)	0.004 (0.002)	0.007 (0.002)	0.022 (0.564)	-0.002 (-0.005)	-0.009 (-0.002)
Realized Volatility	0.345*** (5.459)	-1.152*** (-6.558)	-1.211*** (-4.738)	-0.984*** (-3.477)	1.102*** (9.769)	1.271*** (15.945)
Parkinson's Estimator	-2.999 (-1.370)	-0.006 (-0.002)	0.001 (0.002)	-0.032 (-0.065)	0.003 (0.009)	-0.002 (-0.001)
Garman and Klass	1.309 (0.794)	0.001 (0.001)	-0.005 (-0.001)	-0.064 (-0.213)	-0.003 (-0.001)	-0.001 (-0.007)
Market Sentiment Business Confidence Index	-0.012 (-0.025)	0.127 (0.696)	-0.146 (-0.429)	0.019 (0.214)	-0.002 (-0.005)	-0.003 (-0.008)
Consumer Confidence Index	-1.067 (-0.806)	-2.734*** (-15.654)	-2.482*** (-4.547)	-1.990*** (-7.505)	1.102*** (9.769)	-0.004 (-0.003)

(Table 9 continued)

(Table 9 continued)

Euronext Loser Portfolio (COVID)

Variables	Panel Regression (Fixed-effect)	Quantile Panel Regression				
		0.1	0.3	0.5	0.7	0.9
Labour Force Survey	-1.176 (-0.133)	-0.264 (-0.009)	1.792 (0.639)	0.046 (0.017)	0.003 (0.009)	0.002 (0.001)
Leading Index	-0.182 (-0.027)	-3.507** (-1.992)	0.023 (0.006)	-0.043 (-0.021)	-0.003 (-0.001)	-0.007 (-0.007)
Monetary Aggregates	0.522 (0.243)	2.521** (2.249)	2.599 (0.891)	7.579 (0.214)	-0.002 (-0.005)	0.001 (0.001)
Firm Characteristics						
Dividend Payout	0.943 (5.128)	0.004 (0.002)	-0.008 (-0.003)	0.017 (0.528)	0.001 (0.001)	-0.003 (-0.004)
Earnings Per Share	-0.004 (-0.406)	-0.002 (-0.001)	0.004 (0.001)	-0.000 (-0.445)	-0.007 (-0.002)	-0.003 (-0.002)
PEG Ratio	0.299 (0.262)	-0.003 (-0.002)	0.004 (0.001)	0.005 (0.203)	0.009 (0.003)	0.007 (0.005)
Adjusted R-squared	0.757	0.761	0.546	0.782	0.687	0.657

Source: The author.

Notes: ***, ** and * are significant at the levels of 10%, 5% and 1%.

PEG: Price/earning-to-growth.

Table 10. Panel Data Regression and Quantile Panel Regression of Nasdaq Winner Portfolio During COVID-19

Nasdaq Winner Portfolio (COVID)

Variables	Panel Regression (Fixed-effect)	Quantile Panel Regression				
		0.1	0.3	0.5	0.7	0.9
Constant	-0.143 (-0.040)	0.679 (0.603)	0.786 (0.531)	0.292 (0.298)	0.002 (0.003)	-0.001 (-0.002)
Investor Sentiment						
Standard deviation (Volatility)	-0.035 (-0.838)	0.001 (0.001)	-0.003 (-0.001)	-0.001 (-0.038)	0.001 (0.005)	-0.007 (-0.006)
Realized Volatility	0.748*** (4.366)	-1.129*** (-6.630)	-1.516*** (-3.469)	1.009*** (5.719)	1.150*** (6.650)	1.120*** (10.965)
Parkinson's Estimator	3.204 (0.773)	-0.001 (-0.008)	0.006 (0.001)	0.202 (0.119)	0.003 (0.002)	0.001 (0.001)
Garman and Klass	-2.061 (-0.564)	0.001 (0.009)	-0.004 (-0.001)	-0.205 (-0.138)	-0.001 (-0.001)	-0.001 (-0.001)
Market Sentiment						
Business Confidence Index	-0.069 (-0.437)	-0.042 (-0.232)	-0.068 (-0.915)	-0.022 (-0.402)	0.005 (0.001)	-0.009 (-0.003)
Consumer Confidence Index	-0.197 (-0.367)	-0.002 (-0.002)	-2.098*** (-8.324)	-0.047 (0.291)	-0.003 (-0.002)	0.009 (0.001)
Labour Force Survey	-1.433 (-0.041)	5.094 (0.461)	7.790 (0.540)	2.919 (0.306)	0.002 (0.003)	-0.001 (-0.002)
Leading Index	-1.721 (-0.039)	-5.841 (-0.422)	-9.228 (-0.507)	-3.615 (-0.300)	-0.002 (-0.002)	0.001 (0.001)
Monetary Aggregates	-0.644 (-0.178)	-14.370*** (-1.978)	0.473 (0.300)	0.325 (0.301)	0.001 (0.001)	0.004 (0.008)
Firm Characteristics						
Dividend Payout	-0.044 (-0.877)	-0.004 (-0.002)	-0.007 (-0.002)	0.007 (0.318)	-0.002 (-0.001)	0.001 (0.008)
Earnings Per Share	0.000 (0.266)	0.005 (0.002)	0.001 (0.003)	-0.000 (-0.676)	-0.008 (-0.002)	-0.001 (-0.006)
PEG Ratio	0.028 (0.829)	0.003 (0.002)	0.007 (0.003)	0.003 (0.230)	0.001 (0.009)	0.001 (0.001)
Adjusted R-squared	0.743	0.701	0.694	0.659	0.761	0.764

Source: The author.

Notes: ***, ** and * are significant at the levels of 10%, 5% and 1%.

PEG: Price/earning-to-growth.

Table 11. Panel Data Regression and Quantile Panel Regression of Nasdaq Loser Portfolio During COVID-19

Nasdaq Loser Portfolio (COVID)						
Variables	Panel Regression (Fixed-effect)	Quantile Panel Regression				
		0.1	0.3	0.5	0.7	0.9
Constant	-0.808 (-0.561)	-0.005 (-0.001)	-0.579 (-1.365)	-0.219 (-0.646)	-0.203 (-0.716)	0.844 (0.333)
Investor Sentiment Standard Deviation (Volatility)	-0.080 (-1.355)	-0.001 (-0.003)	-0.075 (-1.375)	-0.002 (-0.009)	-0.009 (-0.005)	0.003 (0.002)
Realized Volatility	0.939*** (2.364)	-1.173*** (-5.769)	1.205*** (6.125)	1.628*** (11.590)	1.219*** (13.852)	1.596*** (17.869)
Parkinson's Estimator	6.938 (1.451)	0.001 (0.005)	3.976 (0.732)	0.004 (0.003)	0.006 (0.005)	-0.008 (-0.009)
Garman and Klass	-6.266 (-1.367)	-0.005 (-0.002)	-4.737 (-0.968)	-0.003 (-0.002)	-0.004 (-0.004)	0.008 (0.009)
Market Sentiment Business Confidence Index	-0.241 (-0.856)	-0.008 (-0.005)	0.004 (0.036)	-0.011 (-0.084)	-0.005 (-0.046)	-0.195 (-0.360)
Consumer Confidence Index	1.614*** (3.953)	0.009 (0.004)	1.986*** (2.486)	2.012*** (2.106)	2.016*** (2.521)	1.049 (0.770)
Labour Force Survey	-9.933 (-0.511)	-0.006 (-0.009)	-7.342 (-1.258)	-2.862 (-0.623)	-2.636 (-0.686)	11.433 (0.339)
Leading Index	7.945 (0.379)	0.007 (0.001)	6.022 (0.921)	2.937 (0.608)	2.645 (0.655)	-1.573 (-0.350)
Monetary Aggregates	0.919 (1.343)	0.003 (0.001)	0.278 (1.024)	0.035 (0.182)	0.084 (0.491)	0.588 (0.802)
Firm Characteristics Dividend Payout	0.120 (1.598)	0.001 (0.004)	0.215 (0.963)	-0.003 (-0.001)	-0.001 (-0.009)	0.008 (0.005)
Earnings Per Share	-0.000 (-0.417)	0.001 (0.001)	-0.000* (-1.932)	0.006 (0.003)	-0.003 (-0.002)	0.001 (0.001)
PEG Ratio	0.016 (0.504)	-0.006 (-0.001)	0.038 (0.664)	-0.009 (-0.001)	-0.002 (-0.004)	-0.003 (-0.007)
Adjusted R-squared	0.706	0.659	0.683	0.503	0.701	0.860

Source: The author.

Notes: ***, ** and * are significant at the levels of 10%, 5% and %.

PEG: Price/earning-to-growth.

during COVID-19. This result is similar to the results of pre-COVID-19 as firm characteristics are insignificant to affect the behaviours of investors. It proves that the impact of firm characteristics is not as crucial as the investors' and market sentiment in influencing stock prices.

For robustness, quantile panel regression is used to examine the impact of investor sentiment and market sentiment on stock returns from quantile 0.1 to 0.9.

Existence of Market Overreaction

The second objective of this study is to examine the existence of market overreaction in Euronext and Nasdaq markets. Table 12 summarizes the existence of Euronext and Nasdaq market overreaction and contrarian profit from Months 1 to 12 during pre-COVID-19 and COVID-19. If a market is overreacted, the winner portfolio will generate negative returns while the loser portfolio will yield positive returns after 12 months formation period.

During pre-COVID-19, the Euronext winner portfolio is found to be overreacted from Month 7 to 12. This is

because the winner portfolio results in negative returns after Month 5. The Euronext loser portfolio is overreacted from Months 1 to 5 with positive stock returns. In the Nasdaq market, there is no evidence to indicate the existence of winner and loser portfolios during pre-COVID-19. The Nasdaq winner portfolio generates positive returns from Months 1 to 12. Nasdaq loser portfolio has negative returns over the 12 months of observation. The overreaction evidence is not obvious during pre-COVID-19 as in the study of Piccoli et al. (2017) and Blackburn and Cakici (2017) due to different data ranges and methods are used to examine the existence of overreaction.

For the COVID-19, Euronext and Nasdaq winner and loser portfolios are documented with the evidence of overreaction from Months 1 to 12. All the winner portfolios experience negative returns after the formation period. The Euronext and Nasdaq loser portfolios also generate positive returns during the observation period. For comparing the overreaction tendency, Nasdaq has a higher level of tendency than Euronext in pandemic while Euronext exists with overreaction in pre-COVID-19, which was not found

Table 12. Euronext and Nasdaq Market Overreaction and Contrarian Profit from Months 1 to 12 During Pre-COVID-19 and COVID-19

Observation	Returns (%)	Pre-COVID-19				COVID-19			
		Winner Portfolio		Loser Portfolio		Winner Portfolio		Loser Portfolio	
		Euronext	Nasdaq	Euronext	Nasdaq	Euronext	Nasdaq	Euronext	Nasdaq
Month 1	AECR	3.489 (0.485)	0.024 (0.309)	0.673 (0.101)	-0.007 (-0.128)	-0.707 (-0.137)	-0.642 (-0.129)	1.735 (0.231)	1.246 (0.229)
Month 2	AECR	0.162 (0.019)	0.001 (0.007)	0.107 (0.024)	-0.010 (-0.205)	-1.025 (-0.258)	-1.640 (-0.274)	0.223 (0.039)	1.000 (0.132)
Month 3	AECR	0.710 (0.145)	0.018 (0.294)	0.474 (0.120)	-0.001 (-0.030)	-0.130 (-0.052)	-0.891 (-0.142)	0.247 (0.037)	2.051 (0.529)
Month 5	AECR	2.758 (0.243)	0.011 (0.083)	2.467 (0.275)	-0.031 (-0.283)	-0.648 (-0.038)	-5.074 (-0.220)	1.874 (0.298)	14.572 (0.564)
Month 7	AECR	-1.238 (-0.121)	0.020 (0.115)	-1.436 (-0.149)	-0.024 (-0.268)	-1.038 (-0.060)	-5.233 (-0.374)	4.344 (0.205)	5.110 (0.282)
Month 9	AECR	-0.433 (-0.045)	0.003 (0.017)	-1.006 (-0.130)	-0.049 (-0.439)	-0.902 (-0.118)	-4.524 (-0.292)	3.118 (0.122)	6.057 (0.261)
Month 12	AECR	-1.130 (-0.046)	0.032 (0.122)	-1.344 (-0.106)	-0.068 (-0.256)	-0.751 (-0.392)	-3.413 (-0.101)	1.654 (0.469)	21.706 (0.750)
Overreaction		Months 7–12	No	Months 1–5	No	Yes	Yes	Yes	Yes

Observation	Returns (%)	Pre-COVID-19		COVID-19	
		Euronext	Nasdaq	Euronext	Nasdaq
Month 1	GAECR	-2.817 (-0.289)	-0.031 (-0.443)	2.442 (0.272)	1.889 (0.269)
Month 2	GAECR	-0.055 (-0.006)	-0.011 (-0.175)	1.248 (0.182)	2.641 (0.283)
Month 3	GAECR	-0.237 (-0.041)	-0.019 (-0.373)	0.377 (0.053)	2.943 (0.464)
Month 5	GAECR	-0.291 (-0.021)	-0.042 (-0.336)	2.456 (0.299)	19.647 (0.583)
Month 7	GAECR	-0.198 (-0.015)	-0.044 (-0.368)	5.381 (0.201)	10.343 (0.475)
Month 9	GAECR	-0.573 (-0.050)	-0.052 (-0.377)	4.019 (0.150)	10.581 (0.425)
Month 12	GAECR	-0.213 (-0.008)	-0.100 (-0.340)	2.405 (0.624)	25.119 (0.559)
Contrarian Profit		No	No	Yes	Yes

Source: The author.

Notes: AECR: Average excess cumulative return, GAECR: Grand average excess cumulative return.

in Nasdaq. Surprisingly, the tendency of overreaction of the loser portfolio is higher than the winner portfolio due to higher stock returns. For example, the Nasdaq loser portfolio has resulted in 21.706% of positive returns in Month 12.

The existence of contrarian profit is proven if the GAECR is shown with positive value because the loser portfolio outperforms the winner portfolio. From Table 12, there is no evidence of contrarian profit documented during pre-COVID-19. On the contrary, Euronext and Nasdaq markets have shown contrarian profit during COVID-19. This is because the GAECR has resulted in positive values, which suggests investors trade against the market trend.

Conclusion

There are two objectives in this study. The first objective of this study is to examine the impact of market sentiment and investor sentiment on overreaction in Euronext and Nasdaq

markets during pre-COVID-19 and COVID-19. Second, this study aims to explore the existence of overreaction and compare the overreaction tendency between two markets. The results of this study indicate that market sentiment and investor sentiment are correlated to stock return in pre-COVID-19. RV and Parkinson's estimator are found to be significant in Euronext winner and loser portfolios. Nevertheless, RV is the only variable of investor sentiment that is shown to be significantly correlated in Nasdaq winner and loser portfolios. Besides, the variables of market sentiment are observed to be correlated in Euronext winner and loser portfolios (BCI, LFS, LI and MA) as well as Nasdaq winner (BCI, CCI, LFS, LI and MA) and loser (CCI, LFS, LI and MA) portfolios.

Surprisingly, RV of investor sentiment is the only variable documented with significant correlation to stock return in Euronext and Nasdaq winner and loser portfolios during the pandemic. However, there is no evidence to

indicate the impact of market sentiment in Euronext and Nasdaq except for Nasdaq loser portfolio in COVID-19. It indicates that investors rely on the previous day's stock prices as the benchmark to trade in the turbulent period. Besides, the market sentiment is not crucial in affecting the investors' behaviour in the turbulent period as the investors can be triggered by their emotions. Investors can be panic to observe the changes in volatility and subsequently trade and overreact in the markets.

The empirical evidence shows that there is no evidence of overreaction exists in Nasdaq winner and loser portfolios during pre-COVID-19. Overreaction is only found in the Euronext winner portfolio from Months 7 to 12 and the Euronext loser portfolio from Months 1 to 5. On the contrary, the existence of overreaction is detected in Euronext and Nasdaq winner and loser portfolios from Months 1 to 12. Additionally, Nasdaq has a higher overreaction tendency than Euronext in pandemic while Euronext exists with overreaction in pre-COVID-19, which was not found in Nasdaq.

Additionally, GAECR is used to detect the existence of contrarian profit of arbitrage portfolios. The result of this study indicates that contrarian profit exists in pandemic for Euronext and Nasdaq markets while there is no evidence to indicate the existence of contrarian profit in pre-COVID-19. The occurrence of contrarian profit suggests the investors invest against the market trend to sell-off winner portfolio and buy loser portfolio. This is because the overreaction has caused the market to misprice the securities.

For theoretical implication, this study contributes to the literature of behavioural finance, more specifically on the existence of overreaction. The existence of overreaction is against EMH because EMH argues that all information shall be reflected in stock prices. The markets have yet to reflect the impact of COVID-19 and thus, investors panic and overreact in the markets. For practical implication, the results of this study assist academicians, practitioners and investors in understanding the existence of overreaction and the impact of market sentiment and investor sentiment on overreaction. Policymakers and regulators can also be benefited from the results of this study to be aware of the occurrence of overreaction in a turbulent period.

Due to data limitations, this study does not distinguish between the behaviours of local and international investors in a pandemic. Future research should look at the effects of other macroeconomic factors on overreaction, such as inflation, exchange rate and GDP. Future research is recommended to identify the correlation between herding and market overreaction.

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