Reexamining Short Position Disclosures: Evidence from the UK

Yinqiao Li

July 31, 2018

Supervised by

Dr. E. Smajlbegovic

Second reader

Dr. X. Zhan

Bachelor Thesis Financial Economics

Bachelor of Science in Economics and Business Economics

Erasmus School of Economics, Erasmus University Rotterdam

Abstract

Short selling and its restrictions have always been controversial since their very existence. This paper investigates the informativeness of short position disclosures by analyzing a daily updated dataset maintained by the British Financial Conduct Authority (FCA). Using a sample of all short positions disclosed to the public during the period of November 11, 2012 to June 30, 2017, this research applies event study methodology to test whether the cumulative abnormal returns generated after public disclosures are significantly negative. Main results show that only short event windows generate negative returns, while longer windows exhibit positive returns. Although this is contradictive to the results of Jones, Reed and Walker (2016), this paper offers two possible explanations: the abnormal returns generated are due to manipulation rather than information; short sellers are informed and are sophisticated enough to close their short position before price recovers. Moreover, cross-sectional differences of the cumulative abnormal returns are examined for one-day lag idiosyncratic volatility and illiquidity measures, and results indicate some prediction power for idiosyncratic volatility, but no significant contribution for illiquidity.

Key words: short seller, price informativeness, abnormal returns, event study.

Table of Contents

1. Introduction

Short selling and its regulations have always been controversial both in academia and in society since their very existence. While some already have enough to criticize short sales for that they allow investors to profit from falls in stock prices, others view short selling as an economically beneficial practice that enhances market efficiency (Macey, Mitchell, & Netter, 1988). The Charted Financial Analyst (CFA) UK, for instance, states that short selling contributes to price discovery and liquidity, and that in a May 2009 survey conducted among CFA Institute's global membership, 91% of the respondents hold the same opinion (Radia, 2013).

Following the 2008 financial crisis, governments and financial regulatory authorities have become increasingly aware of the rising needs of reducing risks in the financial industry; restrictions in short selling were introduced as a consequence. In the United States, the Securities and Exchange Commission (the 'SEC') constructed an alternative uptick rule in 2010 to restrict short selling from further driving down a stock price that has dropped more than 10% in one day[1]. In the European Union (EU), a pan-European disclosure regime which requires significant net short positions in shares be disclosed to the public when they at least equal to 0.5% of company issued share capital and every 0.1% above that[2]. China also clamped down on short selling after the stock market crash in 2015 by imposing a variety of short-selling restrictions and investigating a number of suspected securities violations.

The effects of all forms of short-sale constraints have aroused wide concern in the public, especially among investors. Although there is no clear conclusion of the overall impact of these regulatory requirements on equity markets, many hypothesize that such requirements would negatively affect investors' tendency to participate in short-selling, thus reducing equity liquidity. Based on broker-dealer survey data collected by Oliver Wyman, approximately 20-25% of the US and UK market liquidity was received from short-sellers 9 months before the short-sale ban in 2008. During the post-ban period, in the US (without public short-selling disclosure requirements) short-selling liquidity returned to pre-ban levels, while in the UK (with public short-selling disclosure requirements) it did not recover as fully as (Ziff & Moeller, 2010).

[1] See press release of the SEC, Feb. 24, 2010. https://www.sec.gov/news/press/2010/2010-26.htm
[2] See short selling regulation by the European Securities and Markets Authority (ESMA). https://www.esma.europa.eu/regulation/trading/short-selling

In the existing literature, the role that short sellers play in the stock market remains vague. Since both the costs and risks of holding a short position are higher than those of holding a long position, short sellers are usually perceived as sophisticated speculators (Dechow, Hutton, Meulbroek, & Sloan, 2001) in the stock market. Theories show that short-selling activities improve market efficiency by enabling prices to incorporate public information quickly (Boehmer & Wu, 2012). This suggests that short sale constraints or restrictions may lead to inefficiency of the market. However, short position disclosures can still be beneficial if the short positions reflect changes in the fundamental value of the underlying stocks. In this case, the short-selling activities are important components of the price discovery process. On the other hand, if the short positions are not informative, then there may be reckless speculations and vicious attacks involved, which tend to increase risks in the equity markets. Therefore, a short position disclosure that do not encourage predatory short-selling activities means that the short positions and consequently their disclosures, are informative.

Triggered by the research of Jones, Reed and Walker (2016), the purpose of this paper is to investigate whether these short-selling position disclosures are informative. In addition, this paper follows a similar methodology in testing the sign and significance of cumulative abnormal returns after disclosure. Jones et al. (2016) use the short position disclosures of European short sellers to conduct analysis This study concludes that short sellers are well-informed, and their activities are driven by information rather than manipulation. However, there are some doubts in whether their main results which are derived from analyzing first disclosures only, can be applied to draw conclusions on the informativeness of all short position disclosures. As a supplement to their research, this paper reexamines the results by introducing another definition of events in the analysis and tests results in one country, rather than across Europe.

Due to the unavailability of short position data, however, researchers before Jones et al. (2016) have mostly provided indirect approaches to study the informativeness of short selling activities. This difficulty was overcome after the pan-European short position disclosure regime came into effect in November 1, 2012. The disclosure regime makes it possible to obtain the daily short selling position disclosure data, which specifies each position holder, share issuer, net short position and position date, thus making the following research question feasible to answer:

To what extent are public short-selling position disclosures informative under the current regulatory regime in the UK?

The rest of the paper proceeds as follows. The second section reviews the conceptual and empirical literature on short selling-related studies. The third section presents the data used for the analyses, followed by a methodology description. The fourth section describes the results of this study in details. Finally, the fifth section presents the conclusion from this research and discusses its limitations and future research recommendations.

2. Theoretical Framework

2.1 Short Selling and Informativeness of Prices

There is an abundance of literature on the informativeness of prices and short sellers' contribution to it. Diamond and Verrecchia (1987) assert that short sellers tend to be informed since they do not sell short for liquidity reasons. They point out that short sellers will only trade if the falls in price are enough to compensate their costs and risks from shorting. Other empirical studies imply that short sellers are more likely to have information advantage, mostly due to better information processing abilities rather than anticipation of events (Engelberg, Reed, & Ringgenberg, 2012). Intuitively, this particular advantage indicates that short selling activities play a vital role in improving overall informativeness of prices. For example, using evidence from the Chinese market, Chang, Luo and Ren (2014) argue that short sellers trades away temporal overpricing in the market and that these trades predict future returns; Drake, Myers, Myers and Stuart (2015) find that short sellers do facilitate current stock prices to reflect future earnings. In contrast, alternative theories reveal possibilities that short selling can cause prices to fall below their fundamental values. Speculators tend to trade in the same direction within a short time period, resulting in price deviations from the real value of the firm (Goldstein, Ozdenoren, & Yuan, 2013).

At this point, most would still assume that in the absence of short selling, the informativeness of prices and market efficiency would be reduced. Numerous studies examine the effects of the

temporary short sale ban[3] imposed in the US after the 2008 financial crisis. Substantial price inflation in the banned stocks was observed and a conservative estimate of $2.3 to $4.9 billion of wealth was transferred from buyers to sellers (Harris, Namvar, & Phillips, 2009). Another interesting research conducted by Boehmer, Jones and Zhang (2013) suggests that all but small-cap stocks subject to the ban suffered dramatic decline in market quality (as measured by quoted spreads, effective spreads, or five-minute price impact). Although there is no definite conclusion of whether the SEC should have imposed the ban or not, it is certain that this degradation of market quality implies higher explicit costs for investors, leading to the deterioration of market efficiency.

It is heavily documented that in addition to short sale bans, short sale restrictions may also affect market efficiency adversely. One frequently noted consequence of these restrictions is stock overvaluation, which is consistent with Miller's (1977) theories. The intuition behind this is quite simple. In the presence of short sale constraints, investors holding negative opinions on the stock are driven out of the market owing to short sale costs. Hence negative information is not sufficiently incorporated in prices and security buyers would need to bid more than what is fair. Empirical findings tend to support this argument. By analyzing information from 46 equity markets, Bris, Goetzmann and Zhu (2007) provide evidence that short sale restrictions are related to less negative skewness in market returns. In other words, these restrictions associate with less diffusion of negative information into prices and can possibly diminish market panic in the event of a crisis. The implementation of short sale constraints thus seems to sacrifice some efficiency to reduce risks of a sudden crash in the stock market. However, there are contrasting opinions on the effect of short selling constraints. Kolasinski, Reed and Thornock (2013) contend that informed trading may actually increase after short restrictions are introduced, as a result of a rise in proportions of informed traders.

Even though short sellers and short selling activities are well-perceived to be important components of a fair and efficient market, it is difficult to draw any clear conclusion on whether certain restrictions on short selling are more harmful than beneficial to the market, since short selling activities can also be predatory and manipulated. To investigate the actual effects of

[3] The SEC temporarily halted short selling of financial stocks to protect investors and markets in September 2018. See "SEC Halts Short Selling of Financial Stocks to Protect Investors and Markets", https://www.sec.gov/news/press/2008/2008-211.htm

short selling restrictions, further steps must be taken to identify different varieties of short selling activities.

2.2 Two Models of Short Selling Activities

It is generally accepted that secondary stock market prices indirectly guide the allocation process of resources or capital such that they influence investment by transferring information (Dow & Gorton, 1997). Buyers in the secondary stock market use the information entailed in the prices to make their trading decisions. Goldstein and Guembel (2008) claim that short sellers, however, may have incentives to sell stocks without being informed, due to the presence of a feedback effect from the financial market. Additionally, this trading strategy can be profitable, partly due to the distortion of the corresponding firm's investment (Goldstein & Guembel, 2008). This raises a question of whether such manipulative short selling, which negatively affects the informativeness of price, exists under certain short selling restrictions such as short position disclosures.

Citing previous literature, Jones et al. (2016) distinguish between two models about short selling activities in their examination of large short position disclosures: one in which short sellers are well-informed about fundamentals and the other where short sellers are uninformed (predatory or manipulative short selling). To be more specific, if short sellers are well-informed, negative information must be incorporated into the prices and significantly negative returns should be observed after large short sales are revealed; if alternatively, short selling activities are predatory trading or manipulative attacks, price informativeness is reduced and return reversals should be observed. These two models of short selling activities and facilitate the investigation of whether the short sellers are informed or not, therefore making it feasible to assess the informativeness of the short position disclosures and answer the research question of this paper. Their results from a study of twelve countries under the European short position disclosure regimes are consistent with the information, rather than manipulation theory (Jones, Reed, & Waller, 2016).

2.3 The European Short Position Disclosure Regime

A European short position disclosure regime[4] came into effect on November 1, 2012 across all EU members. Some of the aims of the EU Regulation on Short Selling are to increase transparency of short positions held by investors in certain EU securities, reduce settlement and other risks linked with uncovered or naked short selling and create a harmonized framework for coordinated action at European level. The disclosure regime requires mandatory transparency of net short positions[5]. Significant net short positions in shares must be disclosed to the public when they at least equal to 0.50% of a company's issued share capital and every 0.10% above that. For example, a net short position reaching 0.60%, 0.70%, 0.80%, etc. should be reported to the National Competent Authorities (NCA) and thereafter be disclosed to the public. If the net short position is less than 0.50%, but equal to at least 0.20% of the issued share capital, and again at every 0.10% increment above that, the market participant must report it to the NCA, but this information will not be disclosed to the public.

There is little literature on the impact of this disclosure regime, given its short period of implementation and relatively few countries involved. The aforementioned study of Jones et al. (2016) find that the disclosure regime itself discourages some informed trading and that the overall impact of the regime is not evident. In the research of Jank, Roling and Smajlbegovic (2016), a sizable percentage of short positions are just below the public disclosure threshold, meaning that investors attempt to avoid the reporting costs and keep their positions in secret. This suggests that the disclosure policy results in overpricing of the stocks and thus less informativeness in the stock prices. The regulator of the disclosure rules, the European Securities and Market Authority (ESMA) argue in their recent report (2018) that public disclosure can improve price efficiency when positions are disclosed by informed short sellers but can also encourage inefficient herd behavior when positions are disclosed by other investors.

2.4 Hypotheses

Although the short disclosure requirements have ambiguous effects on price efficiency in the stock market, investor responses to the disclosures are not difficult to predict. Aitken, Frino,

[4] This regulation regime also entails certain aspects of credit default swaps that are not discussed in this paper, since they are not relevant for this research.
See "Short Selling", ESMA, https://www.esma.europa.eu/regulation/trading/short-selling
[5] Exemptions are available for market making activities and authorized primary dealers. Market makers and dealers provide liquidity in the market. Since they are neither informed traders nor predatory speculators, they are not relevant for this study.

McCorry and Swan (1998) postulate that short sales are perceived almost immediately by the market as negative news. Based on evidence from the Australian Stock Exchange, they support this argument by investigating market reactions where short sales are transparent and find average downward adjustments in stock prices of up to -0.20% following short sales.

Using 28,442 public disclosures from 28 EU members, Jank and Smajlbegovic (2017) add to the existing literature by studying the cross-sectional differences among different institutional investors. The results confirm the conclusion that short sellers, especially the predominant hedge funds, generate significantly positive returns by holding short positions, indicating that the stocks they shorted would generate negative returns after the short sales. Jones et al. (2016) also find that 90-day cumulative abnormal returns after disclosures are significant -5.23%. These lead to the following hypothesis:

Hypothesis 1: *On average, after short selling position disclosures, the stocks of the share issuers generate significantly negative returns.*

In addition to that, the negative returns of the share issuers after short selling position disclosures may be subject to the characteristics of the share issuers. For instance, the magnitude of the market reactions can be significantly different among share issuers with some certain characteristics differing. Therefore, it is interesting to examine whether there are cross-sectional variations in these negative returns and the second hypothesis is formulated:

Hypothesis 2: *On average, after short selling position disclosures, there are cross-sectional differences in the magnitude of the negative returns of the share issuers.*

Previous literature has shown that firm characteristics other than the widely accepted factors (Book-to-market ratio, size, momentum, etc.) may link to cross-sectional variation in stock returns. Ang, Hodrick, Xing, and Zhang (2006) find that idiosyncratic volatility is negatively associated with stock returns. According to them, a possible explanation for this effect can be asymmetry of return distribution in economic recessions and expansions. Following this, if short selling position disclosures are in fact informative (i.e. the stocks that are shorted are indeed stocks with low expected returns), the negative returns are thereby expected to be larger for stocks with higher idiosyncratic volatilities, leading to Hypothesis 2a.

Hypothesis 2a: *On average, after short selling position disclosures, idiosyncratic volatility significantly correlates the negative returns of the share issuers.*

Besides, Amihud (2002) shows that there is an illiquidity premium and that illiquidity is positively linked to stock returns. Similarly, one can preliminarily assume that illiquidity has an association with the negative returns after short selling position disclosures. Thus, Hypothesis 2b is raised as follows.

Hypothesis 2b: *On average, after short selling position disclosures, illiquidity significantly correlates the negative returns of the share issuers in the UK.*

3. Data and Methodology

3.1 UK Disclosure Data

In order to test the hypotheses, short position disclosure data need to be obtained from the websites of the NCAs for the participating EU countries. In this study, the short position disclosure data are obtained from the British Financial Conduct Authority (FCA), which was established in 1 April, 2013, taking over responsibility for conduct and regulation from the FSA. From November 1, 2012, the beginning of the disclosure policy, until June 30, 2017, the net short position data are retrieved from the website of the British FCA[6]. This data is updated daily with two sections, current disclosures (of one trading day before) and all historical disclosures. Information of the position holder, name of share issuer, ISIN, net short position (%) and position date are shown in the data sheet.

Whereas previous researchers (Jones, Reed, & Waller, 2016; Jank & Smajlbegovic, 2017) utilize public disclosures from all 28 EU member states in their studies, this paper only uses data from one country (the UK), for the following reasons. First, conducting analysis within a single jurisdiction makes individual data points comparable without the additional work to rule out country-specific factors. Second, the obtained disclosure data has a time span of November 1, 2012 (the beginning of the disclosure policy) to June 30, 2017, which contains 31,953 disclosures of net short positions in 518 distinct equity stocks. Due to a longer sample period, this data set is larger than previously used, as the disclosure data available in the aforementioned researches are less than 30,000, even though there are more countries involved. Third, according to ESMA's research (Mazzacurati, 2018), UK is the second hub for net short

[6] See "Notification and disclosure of net short positions", https://www.fca.org.uk/markets/short-selling/notification-and-disclosure-net-short-positions

position holders in the world (30%), while other EU countries only account for around 15% of the total number of short sellers. This means that short selling activities are highly concentrated in the UK and analyzing the UK data only could still produce similar results to analyzing data from more EU countries. Fourth, the UK Financial Services Authority (FSA) was the first in Europe to introduce the short position disclosure regime which requires disclosures from June 20, 2008, in stocks undergoing rights issues. After a series of changes in the regime, in 1 November, 2012, the disclosure requirements were expanded to all stocks. Investors in the UK are therefore more adapted to disclosures than in other countries, and less transitional effects due to the introduction of new rules will affect UK short sellers. To summarize, using the UK data only has many benefits and the validity of this research still remains.

Table 1

Descriptive Statistics of UK Short Position Disclosures

Industry	# of positions		# of events		# of disclosed stocks		mean # of positions per stock	mean # of events per stock
Oil & Gas	3,250	*10%*	1,789	*10%*	43	*8%*	75.58	41.60
Basic Materials	3,475	*11%*	1,927	*11%*	54	*10%*	64.35	35.69
Industrials	6,927	*22%*	3,703	*21%*	104	*20%*	66.61	35.61
Consumer Goods	1,747	*5%*	942	*5%*	37	*7%*	47.22	25.46
Health Care	1,289	*4%*	713	*4%*	28	*5%*	46.04	25.46
Consumer Services	8,880	*28%*	4,706	*27%*	98	*19%*	90.61	48.02
Telecommunications	648	*2%*	347	*2%*	8	*2%*	81.00	43.38
Utilities	435	*1%*	230	*1%*	6	*1%*	72.50	38.33
Financials	3,233	*10%*	1,850	*11%*	106	*20%*	30.50	17.45
Technology	2,069	*6%*	1,133	*7%*	34	*7%*	60.85	33.32
Total	31,953	*100%*	17,340	*100%*	518	*100%*	61.69	33.47

Notes. The table presents descriptive statistics of disclosed net short positions in the UK during the sample period from November 1, 2012 to June 30, 2017. An event occurs whenever an investor shorts the stock for the first time at or above 0.5%; or an investor increases the already disclosed short position by 0.1% or more. This is discussed further in later section. The Industry Classification Benchmark (ICB) is used to classify firms into 10 industries.

During the period of interest, there are in total 518 distinct stocks that were sold short at or above the threshold of 0.5%. The descriptive statistics are shown in Table 1. As can be seen from the table, stocks from the Consumer Services industry have the most number of positions disclosed as well as the disclosures that are defined as events by this paper. Moreover, Consumer Services stocks are also disclosed the most, with a mean number of positions per stock of 90.61.

3.2 Stock Return and Volume Data

The daily stock return and turnover volume data of the shorted stocks are obtained from Thomson Reuters Datastream. To capture the actual returns of these stocks, the total return index (TRI) instead of share price for each equity stock is used. The total return index of a stock tracks its capital gains over time, assuming that any dividend or other distributions are reinvested back into the index, therefore reflects the actual performance more accurately than share price. After retrieving the daily data of total return index, the daily return of stock can be calculated as percentage changes of the index:

$$R_{i,t} = \frac{TRI_{i,t} - TRI_{i,t-1}}{TRI_{i,t-1}},$$

where $R_{i,t}$ is the return of stock i on date t, $TRI_{i,t}$ is the total return index of stock on date t.

The daily turnover volume used to test Hypothesis 2b is given by the pound volume of total shares traded during each trading day. The summary statistics of the data are presented in Appendix A, Table 1.

3.3 Disclosure Effects on Stock Returns: An Event Study

Using a calendar-portfolio approach, Jones et al. (2016) mainly examine the abnormal returns around the first short position disclosure in each stock, while Jank and Smajlbegovic (2017) forms a portfolio that shorts a stock whenever a short position above the threshold is disclosed, until the position falls below 0.50%. Following a similar method, this paper applies the event study approach and defines an event date as the date whenever a short position discloser increases its short position in a stock. This includes two scenarios: (1) an investor shorts the stock for the first time at or above 0.5%; (2) an investor increases its already disclosed short

position by 0.1% or more. Note that a downward adjustment in the short position disclosed is not considered as an event of interest, since it does not indicate more negative information of the stock.

The process of the event study is described as follows. First, an estimation window of 30 trading days prior to the event is chosen to estimate the normal returns or expected returns. The Fama-French (1993) three-factor model is used to predict daily returns in the event window. The factor data in this model (risk-free rate, market excess return, SMB and HML) are obtained from an updated and extended data from Asness, Frazzini and Pedersen's (2017) paper through AQR's website[7]. The Capital Asset Pricing Model (CAPM) and the Market Model are also applied to follow the same procedure. In these two models, the FTSE All-Share Index's total return index[8] is used as a proxy to determine the market return, and the UK 3-month Treasury Bills rate is used as a proxy for the risk-free rate. The summary statistics of these variables can be found in Appendix A, Table 1.

Furthermore, the event window of the analysis needs to be chosen. It is reasonable to assume that no information of the disclosure is leaked before the position is disclosed to the public. Therefore, any appropriate event windows should start at least from the event date. Since there is little literature on using short position disclosures as events, this research utilizes multiple event windows, including [0,1], [0,2], [0,5], [0,10], [0,20], [0,30], [0,40], [0,50], [0,60], [0,70], [0,80], [0,90]. Although longer event windows are more likely to suffer from the effects of confounding events (McWilliams, Siegel, & Teoh, 1999), they are still useful to examine return reversals, which is an important indicator of manipulation.

Next, to calculate the daily abnormal returns ($AR_{i,j,t}$) for stock i regarding event j, in the specified event windows, the following equation is applied:

$$AR_{i,j,t} = R_{i,j,t} - \left(\hat{\alpha}_{i,j} + \boldsymbol{f}_t'\hat{\beta}_{i,j} + \varepsilon_{i,j,t}\right),$$

[7] AQR is an investment management firm which provides monthly updated data related to several asset pricing papers. See https://www.aqr.com/Insights/Datasets/Quality-Minus-Junk-Factors-Monthly. Although the paper is focused on US equities, the data set also provides equity factors for 23 international equity markets. Note that there is a potential issue in this data. Since the factor data are generated from US dollar-denominated stock prices, but the stock returns data are obtained from UK pound-denominated total return indexes, it may bring inaccuracies to the regression model. Besides This underlying limitation of the research is compensated by introducing two other asset pricing models in the analysis, the CAPM and the Market Model.

[8] The FTSE All-Share Index measures the share price performance of about 98% of the market capitalization of listed shares in the UK. The total return index is used for the same reason as to determine the stock returns data.

where $\boldsymbol{f_t'}$ is a vector of pricing factors in a chosen asset pricing model. The cumulative abnormal returns for stock i regarding event j in the event window of $[\tau_1, \tau_2]$ are then determined by summing the abnormal returns ($AR_{i,j,t}$) generated in each event window, which is specified as follows:

$$CAR_{i,j(\tau_1,\tau_2)} = \sum_{t=\tau_1}^{\tau_2} AR_{i,j,t}.$$

Finally, to test the results for significance, two types of t-tests are used:

The Cross-Sectional T-Test defined as:

$$T_{cross} = \frac{CAAR_{(\tau_1,\tau_2)}}{\hat{\sigma}_{CAAR_{(\tau_1,\tau_2)}}},$$

where the cross-sectional average of the cumulative abnormal returns of a total of M firms with M events each, is given by:

$$CAAR_{(\tau_1,\tau_2)} = \frac{1}{MN} \sum_{i=1,j=1}^{i=M,j=N} CAR_{i,j(\tau_1,\tau_2)}.$$

Proposed by Cowan (1992), the Generalized Sign Test is a commonly used non-parametric event study test. The test statistic is:

$$Z_G = \frac{w - n\hat{p}}{\sqrt{n\hat{p}(1-\hat{p})}}.$$

where w is the number of stocks in the event window for which $CAR_{i,j(\tau_1,\tau_2)}$ is positive and n is the total number of $CAR_{i,j(\tau_1,\tau_2)}$. The fraction $\hat{p}$ is defined as the percentage of positive cumulative abnormal returns from the estimation period. Since the purpose of this study his paper is to examine negative returns, this paper redefines the parameter $\hat{p}$ as the fraction of negative cumulative abnormal returns.

4. Cross-Sectional Differences: Linear Regression

For Hypothesis 2, the cumulative abnormal returns are regressed on the cross-sectional variables to find the corresponding cross-sectional effects.

According to Ang, Hodrick, Xing, and Zhang (2006), the idiosyncratic volatility ($IVOL_{i,t}$) is given by:

$$IVOL_{i,t} = \sqrt{var(\varepsilon_{i,t})}$$

in the Fama-French (1993) three-factor model. This paper extends this definition to allow for other asset pricing models, which gives the following equation:

$$R_{i,t} = \hat{\alpha}_i + \boldsymbol{f}_t'\hat{\beta}_i + \varepsilon_{i,t}.$$

Following (Amihud, 2002), the illiquidity measure ($ILLIQ_{i,t}$) is defined as the average ratio of the daily absolute return to the trading volume $VOL_{i,t}$ on that day:

$$ILLIQ_{i,t} = \frac{|R_{i,t}|}{VOL_{i,t}}.$$

At this stage, this research presents three specifications of the cross-sectional regression, in which $IVOL_{i,\tau_0-1}$ and $ILLIQ_{i,\tau_0-1}$ are measures one trading day before the event date τ_0, leading to the following equations:

$$CAR_{i,j(\tau_1,\tau_2)} = \hat{\alpha}_{i,j} + IVOL_{i,\tau_0-1} + \varepsilon_{i,j},$$

$$CAR_{i,j(\tau_1,\tau_2)} = \hat{\alpha}_{i,j} + ILLIQ_{i,\tau_0-1} + \varepsilon_{i,j},$$

$$CAR_{i,j(\tau_1,\tau_2)} = \hat{\alpha}_{i,j} + IVOL_{i,\tau_0-1} + ILLIQ_{i,\tau_0-1} + \varepsilon_{i,j}.$$

The reasoning behind this is that the daily measures of the two variables may reflect some characteristics of the stock that are crucial in determining the price informativeness of the stock.

4. Results

4.1 Cumulative Abnormal Returns after Disclosures

This section begins by discussing the results from the event study mentioned in the previous section. To test Hypothesis 1, cumulative abnormal returns after each public disclosure are generated through 12 different event windows, and two statistical tests are applied to examine the significance of these results. Three asset pricing models used in this analysis only give two sets of distinct results; the CAPM and the Market Model generate almost identical results. Consequently, only the results of one model (CAPM) are presented in the paper.

Table 2

Abnormal Returns after Disclosure

Event	Fama-French Three-Factor Model				CAPM			
Window	CAAR	CAAR*	SE	DAR	CAAR	CAAR*	SE	DAR
[0,1]	-0.0014***	-0.0014***	-0.0004	-0.0007	-0.0017***	-0.0017***	-0.0004	-0.0008
[0,2]	-0.0006	-0.0006	-0.0004	-0.0002	-0.0011*	-0.0011***	-0.0005	-0.0004
[0,5]	0.0013*	0.0013	-0.0006	0.0002	0.0004	0.0004	-0.0007	0.0001
[0,10]	0.0042***	0.0042**	-0.0009	0.0004	0.0028**	0.0028*	-0.0010	0.0003
[0,20]	0.0110***	0.0110***	-0.0013	0.0005	0.0098***	0.0098***	-0.0015	0.0005
[0,30]	0.0190***	0.0190***	-0.0018	0.0006	0.0165***	0.0165***	-0.0020	0.0005
[0,40]	0.0253***	0.0253***	-0.0022	0.0006	0.0215***	0.0215***	-0.0025	0.0005
[0,50]	0.0314***	0.0314***	-0.0026	0.0006	0.0267***	0.0267***	-0.0029	0.0005
[0,60]	0.0378***	0.0378***	-0.0030	0.0006	0.0323***	0.0323***	-0.0034	0.0005
[0,70]	0.0450***	0.0450***	-0.0034	0.0006	0.0391***	0.0391***	-0.0038	0.0006
[0,80]	0.0477***	0.0477***	-0.0037	0.0006	0.0410***	0.0410***	-0.0043	0.0005
[0,90]	0.0525***	0.0525***	-0.0041	0.0006	0.0447***	0.0447***	-0.0047	0.0005

Notes. This table exhibits the cross-sectional average of cumulative abnormal returns (CAAR) generated from 12 different event windows. Fama-French (1993) three-factor model and the CAPM are used to predict normal returns. The CAAR column presents results tested by the cross-sectional t-test, while the CAAR* column shows the results tested by the generalized sign test. Full details of this sign test is presented in Appendix B, Table 1. Standard Errors (SE) and Daily Abnormal Returns (DAR) are also reported. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table 2 displays a comparison of results derived from two asset pricing models. The overall patterns of the results of the two models are not remarkably different. Although there are discrepancies between the two models and between the two significance tests, it is clear that in both models, longer event windows indicate significantly positive CAARs, while their shorter

counterparts are more likely to display significantly negative CAARs. Negative CARs are observed only in the first days after disclosures, especially within the [0,1] window, where CAARs are statistically negative at the 1% significance level in both models. As event windows get longer, this effect diminishes until it disappears and become reversed. As soon as day 5, the CAAR turns positive and steadily increases both in significance and magnitude.

Another noticeable point is the DAR, which also increases over time, but the pace is not as fast as the CAAR. In the Fama-French three-factor model, the DAR converges to 0.0006, while in the CAPM, it reaches 0.0006 but then falls to 0.0005.

So far, the first hypothesis can be answered partially: within a brief period (1 to 3 days) after the disclosure, the stock disclosed is likely to suffer from significantly negative returns. However, the negative returns are quickly reversed after a week, and the cumulative abnormal returns become significantly positive.

4.2 Cross-Sectional Regression Results

After arriving at CARs, this research goes further to investigate the relationships between the magnitude of the CARs and several firm-specific characteristics. Three regression models involving two variables are conducted, and the results are shown in Table 3. Note that although the CARs from all 12 event windows are included in the analysis, only a selection of the results are presented for simplicity. These results show some but not much significance when examining the prediction power of idiosyncratic volatility and illiquidity, each are measured one day prior to the event date.

Table 3

Selection of Cross-Sectional Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	CAR window [0,1]			CAR window [0,30]			CAR window [0,90]		
IVOL	-0.124*		-0.107*	0.093		0.133	1.611*		1.678*
	(-2.44)		(-2.09)	(-0.35)		(-0.49)	(-2.46)		(-2.54)
ILLIQ		0.900	1.068		-7.862	-8.070		-1.077	-3.702
		(-0.39)	(-0.46)		(-0.88)	(-0.90)		(-0.06)	(-0.21)
Intercept	0.001	-0.002***	0.001	0.014**	0.017***	0.014**	0.008	0.046***	0.008
	(-1.13)	(-4.04)	(-0.77)	(-2.86)	(-8.47)	(-2.78)	(-0.66)	(-9.63)	(-0.64)
adj. R^2	0.001	0.000	0.001	0.000	0.000	0.000	0.001	0.000	0.001
N	14135	13893	13893	14135	13893	13893	14135	13893	13893

Notes. The table presents the coefficients and t statistics (in the parenthesis) for idiosyncratic volatility (IVOL) and illiquidity (ILLIQ) in three regression models. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

In all the three regression models presented here, the illiquidity measure shows no major influence on the CAR. If the event window is [0,1], the coefficients of IVOL are significant at 10% level when regressed alone or together with ILLIQ. This means that IVOL may relate to the CAR. However, given a window of one month after the disclosure, the correlation seems to disappear. The [0,90] window results in higher coefficients at the significance level of 10%.

Regressions based on other event windows mostly generate insignificant coefficients. While ILLIQ does not seem to associate with CAR at all, IVOL only have significant coefficients (also at 10% level) in the [0,70] and [0,80] models. It is thus difficult to draw any conclusions based on this analysis since there is not enough evidence to prove that IVOL and ILLIQ are

related to the cross-sectional differences in CARs. Hypothesis 2a and 2b are therefore both rejected.

5. Conclusion and Discussion

5.1 Summary of the Research

Backed by the disclosure data published and updated by the British FCA, this research seeks to reexamine the informativeness of short position disclosures by utilizing event study methods. Furthermore, two models of short selling originally proposed by Jones et al. (2016) allow practical tests to be utilized in investigating this issue.

To accomplish the research goal, this paper first tests the signs and significance of the cross-sectional average of cumulative abnormal returns. Results confirm the hypothesis only within short event windows and the exact opposite holds when the event window is chosen to be longer. If the methods are robust, and the data reflect true representation of the facts, then there are two possible explanations available. First, the negative returns observed immediately after the disclosure could be a sign of manipulation or coordination among short sellers, as the negative returns do not sustain over longer horizons. Investors may base their trading strategies on speculation instead of information. If this is the case, the reversal of returns afterwards should be a signal that the previous short sales are not informed. Second, the investors could still be informed and use their negative information on the short selling, but they are sophisticated enough to close their short positions before positive information is incorporated into the price. This should also lead to the reversal of returns. At this stage, no evidence in this research can offer support to determine which theory is more likely to hold. Besides, the chances that both cases are true can not be ruled out, either. It may as well be that some short sellers are coordinating with one another to form predatory allies, while others succeed in leaving before their profits are eaten out.

After cumulative abnormal returns are generated, the cross-sectional differences regarding idiosyncratic volatility and illiquidity are examined. Previous research (Fu, 2009) indicates that idiosyncratic volatility is positively correlated with expected returns, which means a high idiosyncratic volatility relates to lower abnormal returns. Although not significant across all event windows, there may exist some relationship between idiosyncratic volatility and the

abnormal performance in stock returns. Evidence from using multiple event windows indicate that there is hardly any correlation between illiquidity and the magnitude of cumulative abnormal returns after disclosures. Since illiquidity captures how well a stock is traded in the market, the less a stock is transferred from hands to hands, the slower it is to reveal true information in the price. This means high illiquidity may result in low abnormal returns generated by short sellers because of lack of potential buyers. However, findings from this research show that this may not be the case.

5.2 Discussion and Further Research

The findings of this research contradict with previous findings on the same issue (Jones, Reed, & Waller, 2016). Some reasons are discussed as follows. First, the sample period and data source are different. For instance, in this paper, only the UK data are examined, while in Jones et al.'s study, a collection of pan-European data is used. Second, the definition of events differs from each other. First disclosures are considered more informative than follow-ups and thus Jones et al. only uses first disclosures to conduct their analysis. This paper, however, aims to draw general conclusions on all disclosures and thus also includes disclosures to increase short positions. Third, different methodologies are used, which may result in significant discrepancies in results.

This research nonetheless suffers from some limitations. First and foremost, the Fama-French three-factor data used as part of the event study may suffer from exchange rate issues, since the data is based on US portfolios of UK stocks. Other models such as the CAPM and the Market Model are utilized as a supplement to the Fama-French model. Second, for the cross-sectional analysis, the current idiosyncratic volatility and illiquidity measures are taken as one day-lag before the event dates. This can be extended to examine more lags before the event windows or use the measures from the estimation window as the variables of interest. Third, this paper uses a sample of the UK data, but this can be extended to include more countries and a longer sample period of interest. Fourth, some potential issues mentioned by Ince and Porter (2006) about retrieving data from Datastream could have been avoided.

This research has several implications to the short selling literature. First, it provides new ways of defining event windows and finds out opposing results to those in the previous research. Second, it encourages future researchers to reexamine the original analysis by testing the

robustness of the analysis under different assumptions. Third, it is relevant for regulators such as the ESMA to evaluate their policies and rules.

Further research on this topic could possibly investigate in the following aspects. First, instead of using a combined dataset of several European countries, future researchers can use certain factors to sort these countries into groups and conduct the analysis for each group. This can potentially help to discover underlying factors that contribute to differences across countries. Second, the net effect of the short disclosure policy on European equity markets can be researched and a cost-benefit analysis can be taken to evaluate the current regimes. Another interesting topic is to look into whether the effects of the policy have changed over time.

6. References

Aitken, M. J., Frino, A., McCorry, M. S., & Swan, P. L. (1998). Short sales are almost instantaneously bad news: Evidence from the Australian Stock Exchange. *The Journal of Finance, 53*(6), 2205-2223.

Amihud, Y. (2002). Illiquidity and stock returns: cross-section and time-series effects. *Journal of financial markets, 5*(1), 31-56.

Ang, A., Hodrick, R. J., Xing, Y., & Zhang, X. (2006). The cross-section of volatility and expected returns. *The Journal of Finance, 61*(1), 259-299.

Asness, C. S., Frazzini, A., & Pedersen, L. H. (2017). Quality minus junk. Retrieved from https://ssrn.com/abstract=231243

Boehmer, E., & Wu, J. (2012). Short selling and the price discovery process. *The Review of Financial Studies, 26*(2), 287-322.

Boehmer, E., Jones, C. M., & Zhang, X. (2013). Shackling short sellers: The 2008 shorting ban. *The Review of Financial Studies, 26*(6), 1363-1400.

Bris, A., Goetzmann, W. N., & Zhu, N. (2007). Efficiency and the bear: Short sales and markets around the world. *The Journal of Finance, 62*(3), 1029-1079.

Chang, E. C., Luo, Y., & Ren, J. (2014). Short-selling, margin-trading, and price efficiency: Evidence from the Chinese market. *Journal of Banking & Finance, 48*, 411-424.

Cowan, A. R. (1992). Nonparametric event study tests. *Review of Quantitative Finance and Accounting, 2*(4), 343-358.

Dechow, P. M., Hutton, A. P., Meulbroek, L., & Sloan, R. G. (2001). Short-sellers, fundamental analysis, and stock returns. *Journal of Financial Economics, 61*(1), 77-106.

Diamond, D. W., & Verrecchia, R. E. (1987). Constraints on short-selling and asset price adjustment to private information. *Journal of Financial Economics, 18*(2), 277-311.

Dow, J., & Gorton, G. (1997). Stock market efficiency and economic efficiency: is there a connection? *The Journal of Finance, 52*(3), 1087-1129.

Drake, M. S., Myers, J. N., Myers, L. A., & Stuart, M. D. (2015). Short sellers and the informativeness of stock prices with respect to future earnings. *Review of Accounting Studies, 20*(2), 747-774.

Engelberg, J. E., Reed, A. V., & Ringgenberg, M. C. (2012). How are shorts informed?: Short sellers, news, and information processing. *Journal of Financial Economics*, *105*(2), 260-278.

Fama, E. F., & French, K. R. (1993). Common risk factors in the returns on stocks and bonds. *Journal of financial economics*, *33*(1), 3-56.

Fu, F. (2009). Idiosyncratic risk and the cross-section of expected stock returns. *Journal of financial Economics*, *91*(1), 24-37.

Goldstein, I., & Guembel, A. (2008). Manipulation and the allocational role of prices. *The Review of Economic Studies*, *75*(1), 133-164.

Goldstein, I., Ozdenoren, E., & Yuan, K. (2013). Trading frenzies and their impact on real investment. *Journal of Financial Economics*, *109*(2), 566-582.

Harris, L., Namvar, E., & Phillips, B. (2009). Price inflation and wealth transfer during the 2008 SEC short-sale ban. *The Journal of Investment Management*. doi:10.2139/ssrn.1364390

Ince, O. S., & Porter, R. B. (2006). Individual equity return data from Thomson Datastream: Handle with care! *Journal of Financial Research*, *29*(4), 463-479.

Jank, S., & Smajlbegovic, E. (2017). Dissecting short-sale performance: Evidence from large position disclosures.

Jank, S., Roling, C., & Smajlbegovic, E. (2016). Flying Under the Radar: The Effects of Short-Sale Disclosure Rules on Investor Behavior and Stock Prices. *Paris December 2016 Finance Meeting EUROFIDAI - AFFI.* Paris: Deutsche Bundesbank No 25/2016.

Jones, C. M., Reed, A. V., & Waller, W. (2016). Revealing Shorts An Examination of Large Short Position Disclosures. *The Review of Financial Studies*, *29*(12), 3278-3320.

Kolasinski, A. C., Reed, A., & Thornock, J. R. (2013). Can short restrictions actually increase informed short selling? *Financial Management*, *42*(1), 155-181.

Macey, J. R., Mitchell, M., & Netter, J. (1988). Restrictions on Short Sales: An Analysis of the Uptick Rule and Its Role in View of the October 1987 Stack Market Crash. *Cornell Literature Review*, *74*, 799.

Mazzacurati, J. (2018). *The public disclosure of net short positions.* Paris: European Securities and Market Authority (ESMA).

McWilliams, A., Siegel, D., & Teoh, S. H. (1999). Issues in the use of the event study methodology: A critical analysis of corporate social responsibility studies. *Organizational Research Methods*, *2*(4), 340-365.

Miller, E. M. (1977). Risk, uncertainty, and divergence of opinion. *The Journal of finance*, *32*(4), 1151-1168.

Radia, S. (2013). *Short Selling.* London: CFA UK.

Ziff, B. K., & Moeller, T. (2010). *The effects of short-selling public disclosure regimes on equity markets.* Oliver Wyman.

7. Appendix

7.1 Appendix A

Table 1

Descriptive Statistics for Key Study Variables

Panel A: Stock Data and Fama-French Three-Factor Data (AQR)

Variable	Obs.	Mean	Std.Dev.	Min.	Max.
R	533,551	0.0005639	0.0264135	-0.787	4.9036
VOL	507,470	2,248.418	9,121.974	0	1,503,915
MKT	1,217	0.0002333	0.010084	-0.1177344	0.0588164
SMB	1,217	0.0000553	0.0062913	-0.0254054	0.02603
HML	1,217	-0.0001111	0.0056859	-0.0221712	0.029902
Rf	1,217	6.73e-06	8.62e-06	-4.00e-07	0.0000384

Notes. VOL (Daily Turnover Volume, in UK pounds) have less observations than R (Daily Stock Return) due to occasional missing data. MKT, SMB, HML are Fama-French (1993) three-factor data that are obtained following Asness et al. 's (2017) paper. Rf is the risk-free rate. Note that these factor data are obtained in the US by forming portfolios containing UK stocks, resulting in different trading days from the UK market.

Panel B: UK Data for CAPM and Market Model

Variable	Obs.	Mean	Std.Dev.	Min.	Max.
MKT*	1,178	-0.0034432	0.0084661	-0.00501074	0.0303515
Rf*	1,178	-0.0038572	0.000947	0.00166	0.00513

Notes. MKT* and Rf* are obtained in the UK market and therefore have different number of observations from the same factors presented in Panel A. MKT* is the daily total return data of FTSE All-Share Index, which is used as a proxy of market return. Rf, the three-month UK Treasury Bills rate is used as a proxy of risk-free rate in the UK market.

7.2 Appendix B

Table 1

Generalized Sign Test for the Cumulative Abnormal Returns

Panel A: Fama-French Three-Factor Model

Window	# of Positive CAAR	# of Negative CAAR	N	$\hat{p}$	Z_G	Significance Level
[0,1]	7,753	8,380	16,133	0.519432	3.882358	1%
[0,2]	7,920	8,213	16,133	0.509081	1.252672	-
[0,5]	8,065	8,068	16,133	0.500093	-1.03059	-
[0,10]	8,109	8,024	16,133	0.497366	-1.72344	5%
[0,20]	8,408	7,725	16,133	0.478832	-6.43168	1%
[0,30]	8,540	7,593	16,133	0.47065	-8.51023	1%
[0,40]	8,555	7,578	16,133	0.46972	-8.74643	1%
[0,50]	8,633	7,500	16,133	0.464886	-9.97467	1%
[0,60]	8,632	7,501	16,133	0.464948	-9.95892	1%
[0,70]	8,672	7,461	16,133	0.462468	-10.5888	1%
[0,80]	8,660	7,473	16,133	0.463212	-10.3998	1%
[0,90]	8,607	7,526	16,133	0.466497	-9.56526	1%
Estimation Window	238,380	242,370	480,750	0.50415	-	-

Notes. N is the number of total events, $\hat{p}$ is the fraction of negative CAR and Z_G is the test statistic of the Generalized Sign Test.

Panel B: Fama-French Three-Factor Model

Window	# of Positive CAAR	# of Negative CAAR	N	$\hat{p}$	Z_G	Significance Level
[0,1]	6,772	7,339	14,111	0.520091	3.933285	1%
[0,2]	6,847	7,264	14,111	0.514776	2.670518	1%
[0,5]	7,000	7,111	14,111	0.503933	0.094473	-
[0,10]	7,095	7,016	14,111	0.497201	-1.50503	-
[0,20]	7,326	6,785	14,111	0.480831	-5.39435	10%
[0,30]	7,401	6,710	14,111	0.475516	-6.65712	1%
[0,40]	7,527	6,584	14,111	0.466586	-8.77857	1%
[0,50]	7,535	6,576	14,111	0.466019	-8.91326	1%
[0,60]	7,543	6,568	14,111	0.465452	-9.04796	1%
[0,70]	7,599	6,512	14,111	0.461484	-9.99083	1%
[0,80]	7,593	6,518	14,111	0.461909	-9.8898	1%
[0,90]	7,579	6,532	14,111	0.462901	-9.65409	1%
Estimation Window	208,530	211,500	420,030	0.503535	-	-

Notes. N is the number of total events, $\hat{p}$ is the fraction of negative CAR and Z_G is the test statistic of the Generalized Sign Test.