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The Undesirable Effects of Banning Short Sales

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Summary

An in-depth study of the short-selling market calls into question both the reasons for the decision to ban short selling and the prejudices that weigh on those who short. According to recently published data (for the United States in particular), a large majority of short sellers are market makers who are hedging their bets on the options markets. They were not affected by the ban, which means that those who were using options to take synthetic short positions continued to do so. The others involved in short selling are mainly hedge funds. The average *return* over the last ten years for hedge funds that used short-sale, convertible arbitrage and long/short strategies was 3%, 4.75% and 7.00% respectively (Le Sourd 2009). One can hardly argue that they were over-informed and that they earned abnormal returns.

As a result, short sellers perhaps did not really merit the punishment that, by simply banning the shorting of the shares of financial institutions, the market authorities recently meted out. It also seems (and this study confirms it) that the shares that were the object of the ban were relatively unaffected by it. All the same, this drastic measure cast the market authorities in a particularly negative light. After all, the reasons for this measure are unclear, a lack of clarity that adds to the bewilderment of the market. The market, of course, reacted accordingly.

The ban on short selling was followed by a sharp rise in the volatility of the markets, and on the stock markets concerned the impact of the ban was systematic; the impact on volatility was greater than that of the financial crisis. In general, the risk/return possibilities of investors worsened. And although it is hard to substantiate the impact on the volatility of the shares, the rise in the volatility of these shares, which is undeniable, is a result of the rise in idiosyncratic risk and thus of the noise in the markets. As a consequence, share prices deviate yet more from their fundamental value. Finally, the desired effect on market trends has not been achieved (no reduction of the negative skewness of returns is being observed) and there is no evidence of the possible impact of this measure on extreme market movements. What is clear is that stock market indices now have components that are subject to different rules, differences that make them even less representative and relevant.

Broadly, the market seems to have reacted negatively to this ban; it views it as indicative of a deviation of the market authorities from their primary mission. It seems that these authorities are unable to manage the over-the-counter short sale market. The message for small investors is pessimistic as well. Finally, rather than opting for this facile response, greater efforts to democratise this market and to increase its transparency should perhaps have been made.

About the Author

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Introduction

The subprime crisis made investors wary of the shares of financial institutions. The share prices of these institutions have experienced exceptionally steep falls, none more so than those of the summer of 2008. To put a stop to this freefall, the market authorities of several developed economies (the United Kingdom, the United States, France, Spain, and others) banned the shorting of the shares of most financial institutions. The bans took effect in mid-September and the length of the ban varied from country to country. In February 2009, some of these countries dropped the ban, while others kept it in place.

This episode in the life of the financial markets gives us a good opportunity to examine the importance of short selling and, above all, the credibility of the market authorities. They essentially said nothing about the real reason for taking measures as extreme as these bans. If the objective was to counter a group of manipulators, this ban is clearly an avowal of weakness. If, by contrast, the objective was to slow the fall of stock prices, it is clearly an act of market interference that is not one of the missions with which the market authorities are charged. In any case, as the supervisory authorities have made no effort to explain themselves, the market cannot be certain about the real reasons for the ban. This uncertainty is, in all likelihood, reflected in the behaviour of the financial markets, and it is what we plan to study in this position paper.

We will begin with a look at the short sale market and those active in it; we then discuss the impact on the markets of the ban.[1]

1 - Several published studies review the academic literature on the subject, so we will not review it again in this paper. See, for example, Bris et al.'s (2007) encyclopaedic article.

1. Who are the Short Sellers?

Short sellers bet on downturns of the market in general or on the fall of a single security or group of securities. As the short sale market is an over-the-counter market, there is very little information on those involved in it, on their motivation, on their performance, and, above all, on their impact on the market. Recent years, however, have seen a certain number of academic studies that shed light on this market, at least in the United States.

It turns out that short sellers account for a significant share of the activity of financial markets. Diether *et al.* (2009) report that short sellers are responsible for 25% of daily trading in the stocks subject to the short sale price tests.[2] Boehmer *et al.* (2009) report that shorting accounts for approximately 20% of the daily transaction volume of the stocks put off limits by the SEC's September 2008 order; figures of similar magnitude are reported for the daily trading volumes of the stocks not subject to the ban.[3] In other words, short sellers are a significant component of the financial market.

In addition to forming a large group, short sellers are relatively homogeneous. Less than 2% of short sellers are individual investors; the large majority are financial institutions.[4] And a large fraction of the institutions that sell short are market makers. As it happens, whereas short selling accounted for 20% of daily trading volumes in normal times, it accounted for only 8% during the period of the ban.[5] As market makers alone were authorised to continue short selling, these figures suggest their weight in the group of short sellers. The rest of the group is made up in part of hedge funds that rely on quantitative strategies.

In short, then, this market is not a "democratic" market, as small investors are not active in it. These investors engage in short selling, but in synthetic fashion, through the options markets (as a result of the substantial presence of market makers). So the implicit costs paid on the options markets suggest the magnitude of the cost to investors of the imperfection of this market. For it to have been effective, in fact, the ban on short selling would have had to be accompanied by a ban on trading options or any other synthetic shorting instrument. In some ways, then, the failure to institute this ban renders the ban on short selling moot.

This market structure, which the regulator was surely aware of, also calls into question some of the arguments against short selling. Short sellers are assumed to be sophisticated and to contribute to market efficiency. According to recent empirical evidence, a short sale position has a term of some ten days, whereas a buy position has a term on the order of a year. Explaining why prices take less time to reflect negative information than the market does to incorporate positive information would require a plausible story. The large share of market makers, which in general duplicate short options, accounts in part for the short terms of short sales. Other institutions active in this market rely on contrarian strategies and are perhaps less concerned about price efficiencies.

In the main, then, short sellers are in it for the short term. Some (market makers) because it is their vocation, others because they are seeking speculative profits (which is no less legitimate). But the official line is that short selling drives prices down. For this view to be

2 - Their sample period is February 2005 through July 2005. Price tests refer to the uptick rule for NYSE stocks and the bid price test for the NASDAQ.
3 - Their sample period is August 1 through October 30, 2008.
4 - See Boehmer et al. *(2008), table 7.*
5 - See Boehmer et al. *(2009), table 2.*

correct, one of the two conditions below must be met:

- short sellers are always right and short selling is arbitrage more than it is a speculative strategy that can result in gains or losses;
- short sellers form a group with enough power over the markets to influence the price of assets.

Studies of the profitability of short selling do not all reach the same conclusions. Diether (2008) claim that short sales are profitable, but the problem is that this result cannot be generalised. Market makers may well make money on the short sale, but it simply offsets the loss on the position on the option. In addition, even if it is statistically significant, the gain (1 to 2% after adjustment for risk) is too low and may not pass the test of the joint hypothesis.[6]

As a consequence, whether short sellers have any impact whatsoever on the market—and if they do whether this impact is negative—has not been proven. To our knowledge, no study was done before the ban on short selling. If we say that 10% of short sellers are market makers and 10% what we might call speculators, having prohibited these parties from short selling is an avowal of weakness on the part of the authorities. The 10% group has manipulative power or can at least take the market with it, but it is impossible for the market authorities to prove that this behaviour has any penalising effect whatsoever.

So what was the impact—on the stock market and on the stocks that were off limits—of prohibiting non-market makers from engaging in short selling? In the section that follows we attempt to answer this question.

6 - The profits of the trading strategy are adjusted for risk according to an asset pricing model. Therefore, the profits are relative to this particular model and thus to the joint hypothesis.

2. What Was the Impact of the Short Sale Ban on the Stocks That Were Off Limits?

Preliminary evidence suggests those active in the short market didn't switch to such substitutes for short selling as options, as shorting activity declined substantially in the shorting market. Short sellers simply bailed out of the market after the ban. Boehmer *et al.* (2009) study in detail the impact of the ban on market trading activity and find, as expected, that it is substantial.

Other studies document the effects of short sales on the stocks affected by the ban. Bris (2008) focuses on the firms subject to the July 2008 SEC emergency order banning naked short sales. He finds that this ban has no particular impact on market quality (as measured by volatility, for example). There was an increase in the volatility of the stocks, but the volatility of the shares not subject to the ban increased as well. Likewise, the efficiency of the off-limits shares worsened, but so did that of the shares that were not off limits. Marsh and Niemer (2008) analyse the impact of the September 2008 ban on the returns of the stocks subject to the ban and on market efficiency. They find that the behaviour of the stocks that cannot be shorted is no different from that of those that can.

Although informative, the results above have some limitations; to substantiate the claim that the ban on short selling has no impact on the stocks more investigation is necessary. First, the standard method consists of using the off-limits stocks and building a control group. Although it is likely that this group has been built with all due diligence, one can nonetheless be sceptical of the results. Second, the method consists of comparing sample moment estimates over different sampling periods. But these sample estimates are known to be extremely problematic, especially with small samples such as those of the studies that look at the impact of the ban on short selling. Third, there is no clear identification of the cause of the increased volatility. Is it systematic risk or an increase of idiosyncratic risk and thus noise in the market? Finally, these studies are unable to disentangle the impact of the ongoing crisis in the financial markets from the impact of the ban on short selling.

In an attempt to overcome these limitations and provide a robust assessment of the ban, we propose an alternative method. It uses a large sample spanning the period from January 2007 to January 2009. We then built two dummies, one for the financial crisis (equal to 1 as of July 2007 and 0 before) and one for the short sale ban (equal to 1 as of September 2008 and 0 elsewhere).[7] Next, using sixty-day rolling windows, we build a long series of the volatility, skewness and kurtosis of a group of off-limits stocks.[8] By design, the time series features strong persistency that is accounted for in the regressions by adding a lag of the dependent variable in the regression. This method reduces the need for a control group since the two dummies capture the general economic environment. In addition, the presence of the lagged variable makes our analysis extremely conservative since it is well known that in the case of a persistent time series the lagged variable drives out almost any other explanatory variable.

We thus address the issue of the impact of the ban on short selling on the volatility of a group of off-limits stocks and of indices.

7 - Details are in the methodological note at the end of the document.
8 - We use stocks that were subject to the ban in the Paris stock market.

3. Revisiting the Impact of the Ban on Short Selling on the Volatility of Markets and on the Off-Limits Stocks

Table 1: Daily Volatility

	Jan. 2007 June 2007	Jan. 2007 Aug. 2008	Jan. 2007 Jan. 2009
NASDAQ	0.86	1.38	2.06
S&P 500	0.73	1.28	2.01
CAC 40	0.85	1.41	1.99
FTSE	0.97	1.24	1.84
DAX	0.74	1.37	1.86
IBEX 35	0.94	1.45	1.94
Allianz	1.45	2.07	3.31
April Group	1.59	2.16	3.15
Axa	1.49	2.56	4.06
BNP Paribas	1.40	2.28	3.40
CIC	1.39	1.67	1.80
CNP Assurance	1.55	1.97	2.20
Crédit Agricole	1.33	2.81	3.68
Euler Hermes	1.43	2.26	2.73
HSBC	0.70	1.66	2.30
Natixis	1.41	4.44	4.78
Société Générale	1.50	2.75	3.75

Preliminary evidence in table 1 confirms that there was an increase in the stocks' daily volatility during the crisis and an even greater increase after the ban on short selling. Together, the crisis and the ban lead to a multiplication by two to three of the daily volatility of the off-limits stocks. HSBC's daily volatility rose from 0.7% to 2.3%. On the other hand, CIC's volatility rose from 1.39% to only 1.8% per day after the short sale ban period. All in all, there is a systematic increase in volatility, although it does not increase homogeneously.

As off-limits stocks are not all part of some stock market index, the potential impact of the short sale ban on the market volatility as a whole is not obvious. Table 1 is informative on this issue since it happens that, although at a lower scale, the daily volatility of major indices is affected by the crisis as well as by the ban on shorting. NASDAQ's daily volatility was 0.86%; it rose from 0.52% to 1.38% during the financial crisis and another 0.68% to 2.06% after the ban. The daily volatility patterns of other indices are similar.

This spill-over is far from being foreseeable; only a few of the stocks off limits in France are in the CAC 40. Focusing on the indices is thus an interesting way to assess the broader impact of the shorting ban on the behaviour of the markets.

To distinguish between the effects of the financial crisis and those of the ban, we run a regression of the daily volatility on explanatory variables. The details of the method for table 2 and other tables are found in the methodological appendix.

Table 2 shows a key result of the current study. For the off-limits stocks, the crisis seems to have had a limited effect, if any, on daily volatility. Only three stocks have a positive (see column Coeff. Crisis for Axa, Euler Hermes and HSBC) and statistically significant (see column t stat. Crisis for the same stocks) coefficient; so the crisis had a positive impact on the daily volatility of these stocks. The ban on short selling had a more systematic and stronger impact on the volatility of the off-limits stocks. For seven stocks, the impact is statistically significant (see column t stat. Short for Allianz, April Group, Axa, CNP Assurance, Euler Hermes, Natixis and Société Générale). For six stocks (Allianz, April Group, Axa, CNP Assurance, Euler Hermes and Société Générale) the impact was positive while for Natixis it was negative. Where both the crisis and the ban had an impact on daily volatility, the impact of the ban was stronger than the impact of the crisis. For example, the crisis increased Axa's daily volatility by 0.03% (see column Coeff. Crisis for Axa), while the period of the ban on short sales increased this volatility by 0.13 % (see column Coeff. Short for Axa).

Table 2: The dynamic impact on daily volatility of banning short sales

	Coeff. Const.	Coeff. Lag.	Coeff. Crisis	Coeff. Short	t stat Const.	t stat Lag.	t stat Crisis	t stat Short
NASDAQ	0.02	0.97	0.02	0.08	3.35	195.70	3.41	6.74
S&P 500	0.02	0.97	0.02	0.09	3.14	188.94	3.16	6.54
CAC 40	0.02	0.98	0.02	0.05	1.94	172.35	2.43	3.83
FTSE	0.02	0.98	0.01	0.05	2.15	228.43	1.06	5.45
DAX	0.01	0.98	0.02	0.04	1.58	172.24	2.86	3.38
IBEX 35	0.01	0.99	0.01	0.02	1.27	170.78	1.29	1.91
Allianz	0.02	0.98	0.02	0.09	1.65	193.13	1.39	4.13
April Group	0.01	0.99	0.02	0.07	0.37	108.28	0.70	2.43
Axa	0.03	0.98	0.03	0.13	1.96	188.35	2.54	4.55
BNP Paribas	0.00	1.00	0.01	0.03	0.11	156.76	0.48	1.27
CIC	0.02	0.98	0.01	0.01	1.83	122.51	1.41	1.46
CNP Assurance	0.02	0.98	0.01	0.02	1.48	136.23	1.44	1.96
Crédit Agricole	-0.01	1.00	0.01	-0.02	-0.75	206.83	1.00	-1.14
Euler Hermes	0.00	0.99	0.02	0.02	0.26	228.34	1.97	1.85
HSBC	0.01	0.99	0.02	0.03	0.54	141.60	1.95	1.60
Natixis	-0.02	1.01	0.00	-0.11	-0.61	134.86	0.13	-2.71
Société Générale	0.02	0.99	0.01	0.05	1.63	173.63	0.68	2.13

Yet the volatility of only half of the stocks has been affected by either the crisis or the ban, a result that calls into question the impact of the ban.

Oddly, the reactions of the indices and thus of the markets as a whole were stronger and more systematic than those of the off-limits stocks. The ban had a great and highly significant impact on the daily volatility of the indices. For most indices, the crisis also had an impact, but it was not as great as that of the ban. The ban on short selling increased the daily volatility of the S&P 500 by 0.09%; the crisis increased it by only 0.02%. The figures for the FTSE were 0.05% and 0.01%.

The immediate conclusion to be drawn from the evidence above is that the market reacted more strongly to the ban than did the stocks that were the object of the ban. This reaction is perhaps indicative of the market's lack of confidence in the capacity of the regulatory authorities to guarantee fair markets and thus protect investors from those with the capacity to manipulate.

Since the sample period in general, and the ban period in particular, were eventful, the robustness of the previous results should be assessed. We thus included in the regression other variables meant to capture the particular economic environment that prevailed when the decision to ban short selling was made. The first variable is the market fluctuations themselves and thus for each market we added the corresponding index return as an explanatory variable. The second variable we have introduced is the absolute change in the TED spread, *i.e.*, the absolute change in the spread between the LIBOR and the Treasury bill rate. Since the financial crisis was also a liquidity crisis, many people use this indicator as a measure of the liquidity premium in the economy. Finally, since the ban period was particularly rich in failures of financial institutions or investment companies, we also introduced a measure of the default premium. For this purpose,

we used the yield spread between a BBB and an AAA corporate bond. The results of this robustness check confirm earlier results, as the short ban period dummy stays strongly significant although the credit spread turns out to be significant as well.[9]

9 - See the results in table A5 in the appendix.

4. The Impact of the Ban on the Volatility of Off-Limits Stocks and of the Markets: Noise or Systematic Risk?

Previous evidence sheds no light on the nature of this increase in the volatility of stocks and indices. For indices, comparing index/market volatility and the fundamentals requires a structural equilibrium model. However, a simple factor model can be used to assess the impact of the crisis and the ban on the systematic/idiosyncratic risk of the off-limits stocks. Since the group of the off-limits stocks is traded on the Paris stock market, we run CAPM-like regressions using the CAC 40 as a proxy for the market.

Table 3: Daily beta

	Jan. 2007 June 2007	Jan. 2007 Aug. 2008	Jan. 2007 Jan. 2009
Allianz	1.27	1.17	1.33
April Group	0.43	0.48	0.33
Axa	1.30	1.26	1.44
BNP Paribas	1.30	1.38	1.23
CIC	0.46	0.40	0.29
CNP Assurance	0.95	0.84	0.58
Crédit Agricole	1.17	1.53	1.37
Euler Hermes	0.83	0.86	0.70
HSBC	0.49	0.91	0.84
Natixis	0.97	1.86	1.34
Société Générale	1.25	1.42	1.25

Table 3 shows the beta of the stocks for different sample periods. The estimates turn out to be extremely sensitive to the sample period and a definitive conclusion as to the impact of the crisis and the ban cannot be drawn without further examination. For example, the beta of Société Générale increased from 1.25 to 1.42 during the crisis but returned to 1.25 during the period of the ban. On the other hand, Axa's beta fell from 1.30 to 1.26 during the crisis but rose to 1.44 during the period of the ban. Assessing the impact of current events on the beta of the stocks calls for a systematic regression analysis.

Table 4 shows the results of a CAPM-like time-series regression allowing for time variation in the stock loadings. This time variation is driven by the crisis and the short sale ban. The picture is clear now: the crisis had no impact on the stock loadings (only for HSBC and Natixis is the t stat significant), while the ban on short selling has a negative impact on these loadings. This impact is systematic and sizeable. The "usual" beta of April Group was 0.45; the period of the ban reduced this beta by 0.24 while the crisis increased it by 0.03. Overall, the beta fell from 0.45

Table 4: The impact of the short sale ban on daily beta

	Coeff. Const.	Coeff. CAC	Coeff. Crisis	Coeff. Short	t stat Const.	t stat CAC	t stat Crisis	t stat Short	Adj. R^2
Allianz	-0.01	1.27	-0.10	0.28	-0.16	5.91	-0.46	2.98	0.64
April Group	-0.03	0.45	0.03	-0.24	-0.25	1.35	0.10	-1.70	0.04
Axa	-0.02	1.30	-0.07	0.35	-0.13	4.23	-0.21	2.59	0.50
BNP Paribas	-0.07	1.30	0.09	-0.27	-0.69	5.11	0.33	-2.43	0.52
CIC	-0.20	0.47	-0.08	-0.19	-2.71	2.58	-0.39	-2.35	0.11
CNP Assurance	-0.03	0.95	-0.11	-0.45	-0.43	4.83	-0.51	-5.26	0.31
Crédit Agricole	-0.07	1.16	0.41	-0.31	-0.63	4.36	1.47	-2.72	0.55
Euler Hermes	-0.21	0.83	0.03	-0.27	-2.07	3.32	0.10	-2.44	0.27
HSBC	0.00	0.48	0.47	-0.15	-0.02	2.81	2.60	-2.09	0.53
Natixis	-0.39	0.99	0.97	-0.97	-2.30	2.37	2.21	-5.40	0.35
Société Générale	-0.12	1.26	0.18	-0.30	-0.99	4.16	0.57	-2.27	0.44

to 0.24. This reveals a greater impact of the events (crisis and short ban) than that which appears in table 3. For Société Générale, the "usual" beta was 1.26; the crisis increased this beta by 0.18 while the ban reduced it by 0.30, sending it to 1.14. Again, the picture is different from that obtained by looking at the sample estimates for different sub-periods.

As a consequence, the increase in volatility in the off-limits stocks reflects an increase in their idiosyncratic risk and thus an increase in the noise in the market. Prices are thus less informative and probably too far from their fundamental values. In other words, the ban not only failed to reverse the fall in the prices of the stocks but it also deteriorated their market.

5. Revisiting the Impact of the Ban on the Skewness of the Off-Limits Stocks and of the Market

Short sellers convey pessimistic opinions/ information to the market and therefore prevent the formation of bubbles or positively skewed returns. A standard implication of financial theory of short selling is that, when short selling can be done efficiently, stock returns are less negatively skewed. Previous work concludes that the ban had no impact. Here, we do a complementary analysis similar to that done for volatility.

Table 5: Daily skewness

	Jan. 2007 June 2007	Jan. 2007 Aug. 2008	Jan. 2007 Jan. 2009
NASDAQ	-1.05	-0.17	-0.12
S&P 500	-1.24	-0.30	-0.17
CAC 40	-0.33	0.50	0.31
FTSE	-0.53	-0.52	0.41
DAX	-0.51	0.53	0.07
IBEX 35	-0.53	0.28	0.14
Allianz	0.01	0.33	1.24
April Group	0.79	-1.95	-7.13
Axa	-0.79	0.37	0.24
BNP PARIBAS	-0.20	1.11	-0.03
CIC	0.16	-0.06	-0.04
CNP Assurance	1.00	-0.35	-0.41
Crédit Agricole	-0.27	1.42	0.49
Euler Hermes	-0.27	-0.72	-0.57
HSBC	-0.02	1.60	-0.15
Natixis	-0.20	-2.07	-1.57
Société Générale	0.97	0.79	-0.56

Table 5 shows the importance of distinguishing between the effects of the crisis and those of the ban. For example, CIC's skewness was 0.16 before the current events; during the ban it fell to -0.04. Nevertheless, isolating the effects of the crisis leads to a different picture: the financial crisis made CIC's skewness negative and equal to -0.06 and the period of the ban reduced the negativity of this skewness to -0.02 in complete accordance with theoretical predictions. But the pattern is not the same for all the off-limits stocks and it is thus impossible to draw a definitive conclusion. For example, the skewness of Société Générale was 0.97 before the events and became negative during the period of the ban, a move that is at odds with the predictions of the implications of the market presence of short sellers on stock prices.

The picture for the indices is clearer, as six of them were negatively skewed before the events (crisis and short ban), and four were positively skewed after the period of the ban. The ban is responsible only for the switch of the sign of the skewness of the FTSE; the switch of the sign of the other three indices is the result of the financial crisis. NASDAQ and the S&P 500 were negatively skewed before the ban; although it was reduced, this skewness was still negative during the period of the ban. On the other hand, the skewness of the DAX became positive when accounting for the crisis but it decreased (although at 0.07 it remained positive) during the period of the ban.

Again, these figures do not lend themselves to a clear conclusion. As it happens, the inability to rely on these figures for a conclusion shows the usefulness of a robust method of assessing the impact of short selling on the stock return moments.[10]

Table 6 now provides us with a decisive and unambiguous conclusion: there may have been changes in the skewness of the returns of both indices and off-limits stocks, but the crisis and the ban had no systematic impact. For the FTSE and IBEX 35 the impact of the crisis and of the ban was positive and statistically significant. During the ban, the skewness of the FTSE

10 - When, as suggested by Kim and White (2004), robust measures of skewness are used, the picture seems even worse from the point of view of the regulator. For four out of six indices the measure of skewness worsened (falling even more deeply into negative territory or becoming less positive). Similar patterns were obtained for some stocks. See table A1 in the appendix. Overall, the approach taken in the literature, an approach comparing measures of skewness from one sub-period to another, seems extremely problematic and not necessarily reliable.

5. Revisiting the Impact of the Ban on the Skewness of the Off-Limits Stocks and of the Market

Table 6: The impact of the short sale ban on daily skewness

	Coeff. Const.	Coeff. Lag.	Coeff. Crisis	Coeff. Short	t stat Const.	t stat Lag.	t stat Crisis	t stat Short	Adj. R^2
NASDAQ	-0.03	0.96	0.03	0.00	-1.57	74.71	1.50	0.30	0.96
S&P 500	-0.02	0.97	0.02	0.01	-1.19	78.42	1.02	0.44	0.96
CAC 40	-0.03	0.92	0.03	0.02	-1.50	45.20	1.64	1.41	0.90
FTSE	-0.07	0.88	0.05	0.09	-2.55	38.21	1.77	3.49	0.87
DAX	-0.03	0.94	0.04	0.00	-1.59	56.29	1.76	0.15	0.92
IBEX 35	-0.06	0.90	0.05	0.04	-2.53	41.84	2.21	1.86	0.87
Allianz	0.00	0.87	0.03	0.08	-0.23	37.08	1.46	3.45	0.86
April Group	0.00	0.98	-0.02	-0.07	-0.07	93.40	-0.38	-1.56	0.96
Axa	-0.01	0.98	0.02	0.00	-0.93	98.11	0.99	0.33	0.97
BNP PARIBAS	-0.01	0.97	0.03	-0.02	-0.71	82.04	1.82	-1.65	0.95
CIC	0.03	0.94	-0.04	0.03	1.12	59.60	-1.45	1.32	0.90
CNP ASSURANCE	0.03	0.96	-0.02	-0.02	0.85	76.12	-0.70	-0.61	0.94
Crédit Agricole	-0.03	0.96	0.04	0.00	-1.94	71.10	2.46	-0.05	0.95
Euler Hermes	0.00	0.98	0.00	0.00	-0.12	96.76	-0.09	0.02	0.95
HSBC	0.01	0.95	0.01	-0.03	0.31	62.54	0.52	-1.67	0.91
Natixis	-0.01	0.96	0.02	-0.03	-0.16	71.76	0.50	-0.84	0.94
Société Générale	0.07	0.94	-0.05	-0.03	3.20	62.57	-2.43	-2.02	0.92

increased by 0.09 more than the 0.05 increase caused by the crisis. For the IBEX 35, the impact of the crisis was 0.05 and that of the ban 0.04. The impact on the other indices was simply not significant. The great majority of the individual stocks were not affected at all.

We thus confirm the conclusions of previous studies on off-limits stocks and provide new results for the market indices.[11]

11 - Results similar to those shown in table 6 were obtained when using robust measures of skewness. See table A2 in the appendix. Similar results were also obtained for our regression approach when variables such as the market return and measures of the economic environment like the TED spread (the spread between the LIBOR and the Treasury bill rate) as a measure of liquidity premium and the credit spread as a measure of default premium are controlled for. See table A6 in the appendix.

6. Revisiting the Impact of the Ban on the Kurtosis of the Off-Limits Stocks and of the Markets

The last issue we want to deal with is the impact of the ban on extreme movements. The downturn in the market seemed too pronounced for the regulatory authorities and for this reason they banned short sales. Did this decision have any impact on the extreme movements of the market and the stocks?

While the effects of the crisis on the extreme movements of the market are ambiguous, the ban seems to have made the swings even wilder. For example, the kurtosis of the NASDAQ rose from 3.9 to 7.84 during the period of the ban. On the other hand, the kurtosis of the IBEX 35 kurtosis rose from 7.43 to only 8.48 during this period. American-based indices saw their kurtosis fall during the crisis, while European indices saw theirs rise.

Table 7: Daily kurtosis

	Jan. 2007 June 2007	Jan. 2007 Aug. 2008	Jan. 2007 Jan. 2009
NASDAQ	6.03	3.90	7.84
S&P 500	7.31	4.59	9.30
CAC 40	4.13	7.39	9.13
FTSE	4.16	7.29	11.27
DAX	4.56	6.86	8.39
IBEX 35	4.39	7.43	8.48
Allianz	3.49	8.71	13.76
April Group	5.63	20.24	106.46
Axa	5.25	7.14	8.12
BNP Paribas	4.64	9.06	11.11
CIC	3.06	5.99	5.74
CNP Assurance	9.77	10.90	7.99
Crédit Agricole	3.91	15.45	8.54
Euler Hermes	5.35	9.61	7.04
HSBC	4.40	16.71	11.64
Natixis	3.21	33.19	22.29
Société Générale	7.11	8.80	10.03

During the financial crisis, the kurtosis of all the individual stocks rose, a rise reflected in the indices. However, the impact of the ban is unclear. The ban period dramatically increased the kurtosis of April Group and substantially decreased that of Natixis.[12]

The figures for the time series of the kurtosis suggest that the impact of the crisis and the short sale ban was local, not global, a suggestion confirmed by the following regressions.

From these regressions, it is fair to conclude that neither the crisis nor the short sale ban had any impact on the extreme movements of markets or stocks. These results show how dangerous it is to draw inferences from simple moment estimates.[13]

12 - As with skewness, a relatively different picture of kurtosis obtains when robust measures are used. This again limits considerably the interpretability of the pattern obtained from these sub-sample comparisons. See table A3 in the appendix.

13 - Results similar to those shown in table 8 were obtained when robust measures of kurtosis were used (see table A4 in the appendix). Similar results were also obtained for our regression approach when other variables such as the market return and measures of the economic environment such as the TED spread (the spread between the LIBOR and the Treasury bill rate) as a measure of the liquidity premium and the credit spread as a measure of default premium were controlled for (see table A7 in the appendix).

6. Revisiting the Impact of the Ban on the Kurtosis of the Off-Limits Stocks and of the Markets

Table 8: The impact of the short sale ban on daily kurtosis

	Coeff. Const.	Coeff. Lag.	Coeff. Crisis	Coeff. Short	t stat Const.	t stat Lag.	t stat Crisis	t stat Short	Adj. R^2
NASDAQ	0.10	0.97	-0.02	0.02	1.19	72.36	-0.36	0.57	0.96
S&P 500	0.07	0.97	0.01	0.00	0.79	82.15	0.20	0.13	0.97
CAC 40	0.13	0.96	0.00	0.00	1.81	65.81	0.11	-0.02	0.93
FTSE	0.21	0.95	0.01	0.07	1.99	61.62	0.06	0.93	0.90
DAX	0.19	0.95	-0.02	0.00	2.17	57.90	-0.38	0.09	0.91
IBEX 35	0.13	0.97	0.01	-0.02	1.71	79.38	0.13	-0.36	0.93
Allianz	0.10	0.97	0.04	0.01	1.28	84.00	0.59	0.12	0.94
April Group	0.02	0.98	0.17	0.49	0.06	90.08	0.57	1.93	0.95
Axa	0.15	0.96	-0.03	-0.03	2.20	74.36	-0.72	-1.32	0.95
BNP Paribas	0.26	0.95	-0.09	0.02	3.49	62.26	-2.23	0.56	0.93
CIC	0.19	0.94	0.14	-0.07	2.81	62.12	1.99	-1.36	0.94
CNP Assurance	0.16	0.97	-0.02	-0.05	1.15	86.41	-0.21	-0.62	0.96
Crédit Agricole	0.15	0.97	-0.04	-0.02	2.42	70.13	-0.87	-0.65	0.93
Euler Hermes	0.13	0.98	-0.04	-0.02	1.63	100.72	-0.63	-0.25	0.96
HSBC	0.18	0.96	-0.02	0.00	1.88	54.78	-0.26	0.04	0.92
Natixis	0.13	0.96	0.16	-0.07	0.97	73.63	1.07	-0.63	0.93
Société Générale	0.56	0.91	-0.22	0.04	4.73	49.04	-3.22	0.69	0.88

7. Lessons for the Future

Regulatory authorities must above all explain to the markets the reasons for the choices they make. Explanations for changes in monetary policy contribute to the reconciliation of the markets to these changes, so there is no reason to think similar explanations for changes in other domains would not be equally well received. The mission of the regulatory authorities is to ensure that the markets they are supposed to oversee function properly. The markets must be convinced of the fairness of exchanges. The impact of the announcement of such an abrupt rule change is greater than the direct impact it has on the markets.

Second, it is of great importance that the regulatory authorities do careful and serious studies before taking any drastic measures. For example, in a study examining the impact of the emergency order of the SEC in July 2008 forbidding naked short sales, Bris (2008) shows that it is hard, *a priori*, to justify the order. The stocks concerned were not shorted more frequently than were those of a control group of firms. In addition, the negative returns of the off-limits firms were in no way related to shorting. Regulatory authorities should of course try to improve the trading environment, but before doing so they should document its failures.

Third, it is our hope that the regulatory authorities do not intend to influence market movements. Doing so has never been part of the regulatory mission. The loss of credibility that would accompany mistakes could have catastrophic consequences.

The good news is that those active in the market will now take the short market more seriously. Regulators should make every possible effort to ensure that this market is competitive and transparent.

Finally, we would like to sound an optimistic note. In the United States, single stock futures were introduced in 2004. They are probably the best instruments to substitute trading in the underlying. It is perhaps time to open such markets in Europe and to develop the US market even more. That initiating a futures position generates no cash is obviously not a barrier since in any case a short sale position generates no cash, and short sellers are not seeking liquidity. Neither should the short life of futures matter; short sale positions, after all, are short-term positions. The conditions for the success of single stock futures are present; we may only have to wait.

8. Methodological Note

We describe hereafter the data used in the previous analysis and also the methodology we used to obtain the results in each table.

The sample period is from January 3, 2007, to February 4, 2009. We use daily data for indices, stock prices/returns and trading volumes. The sample has been homogenised to account for days in which trading occurs in one country but not in others. For the whole sample, we examined the days in which all the markets were open; that is, 514 days.

In addition, we built two dummy variables, one for the crisis and one for the period of the short sale ban. The dummy for the crisis is equal to 0 until June 29, 2007, and then to 1 until February 4, 2009. The dummy for the short sale ban is equal to 0 until September 19, 2008, and then 1 until February 4, 2009. Adding or subtracting a few days for the crisis or for the short sale ban has no qualitative effects on the results.

We now describe the contents of each table.

Table 1: We show the moment estimate for the daily volatility (standard deviation) of the indices and the stocks. For each sample period, the sample estimate of the standard deviation is presented.

Table 2: We show the results of the regression of the daily volatility onto the lag of the daily volatility, the crisis dummy and the short dummy. Daily volatility is obtained by using a rolling window of the sixty previous days: for each day, we calculated the standard deviation of the returns of the previous sixty days. Since we have overlapping observations between two successive observations, the series is extremely persistent. To make the results of the regressions meaningful and the inference correct we added a lag of the dependent variable as an explanatory variable. As expected, the resulting adjusted R-squared is very close to 1 for all the stocks and indices, and it is for this reason that we do not show it.

Table 3: We show the CAPM beta for each stock and for each sample period. It is obtained by running a regression of the stock return onto the corresponding market return. Since all the stocks are traded on the Paris stock market, we naturally used the CAC 40 as our market index. Since stock returns were extremely volatile and sizeable for daily figures, we are confident that the beta obtained is similar to that one would obtain by using excess returns instead of returns.

Table 4: We show here the results of the regression of the stock returns onto the market return (CAC 40), the interaction of the market and the crisis (market return times the crisis dummy) and the interaction of the market return and the short sale ban period (market return and short dummy). This regression is a standard means of capturing time variation in stock loadings relative to a risk factor.

Table 5: We show the moment estimate for the daily skewness (a measure of the asymmetry of the return distribution) of the indices and the stocks. For each sample period, the sample estimate of the skewness is presented.

Table 6: We show the results of the regression of the daily skewness onto the lag of the daily skewness, the crisis dummy and the short dummy. Daily skewness is obtained by using a rolling window of the sixty previous days: for each day, we calculated the skewness of the returns of the previous sixty days.

8. Methodological Note

Since we have overlapping observations between two successive observations, the series is extremely persistent. To make the results of the regressions meaningful and the inference correct we added a lag of the dependent variable as an explanatory variable. As expected, the resulting adjusted R-squared is very high but sometimes fairly far from 1. For this reason we show it relative to the standard deviation case, in which it is nearly always equal to 1.

Table 7: We show the moment estimate for the daily kurtosis (a measure of the presence of fat tails in the return distribution) of the indices and the stocks. For each sample period, the sample estimate of the kurtosis is presented.

Table 8: We show the results of the regression of the daily kurtosis onto the lag of the daily kurtosis, the crisis dummy and the short dummy. Daily kurtosis is obtained by using a rolling window of the sixty previous days: for each day, we calculated the kurtosis of the returns of the sixty previous days. Since we have overlapping observations between two successive observations, the series is extremely persistent. To make the results of the regressions meaningful and the inference correct we added a lag of the dependent variable as an explanatory variable. As expected, the resulting adjusted R-squared is very high but sometimes fairly far from 1. For this reason we show it relative to the standard deviation case, in which it is nearly always equal to 1.

Appendix: Additional Robustness Checks of the Results

Methodological Note

We describe below the contents of tables A1 through A7.

Table A1: We show the moment estimate for the daily skewness (a measure of the asymmetry of the return distribution) of the indices and the stocks. For each sample period, the sample estimate of the skewness is presented. We use a robust measure of skewness introduced in Kim and White (2004), who define it as follows:

$$SK = \frac{Q_3 + Q_1 - 2Q_2}{Q_3 - Q_1}$$

where Q_i is the i^{th} quartile of the return distribution, $Q_1 = F^{-1}(0.25)$, $Q_2 = F^{-1}(0.5)$ and $Q_3 = F^{-1}(0.75)$, where F is the cumulative distribution.

Table A2: We show the results of the regression of the daily robust skewness (as defined in table A1) onto the lag of the daily robust skewness, the crisis dummy and the short dummy. Daily robust skewness is obtained by using a rolling window of the sixty previous days: for each day, we calculated the robust skewness of the returns of the previous sixty days. Since we have overlapping observations between two successive observations, the series is extremely persistent. To make the results of the regressions meaningful and the inference correct we added a lag of the dependent variable as an explanatory variable.

Table A3: We show the moment estimate for the daily kurtosis (a measure of the presence of fat tails in the return distribution) of the indices and the stocks. For each sample period, the sample estimate of the kurtosis is presented. We use the robust measure of kurtosis introduced in Kim and White (2004) and defined as:

$$KR = \frac{F^{-1}(0.975) - F^{-1}(0.025)}{F^{-1}(0.75) - F^{-1}(0.25)} - 2.91$$

Where F is the cumulative distribution of the return and 2.91 is the value for the standard normal distribution. Here then, we present the centred measure; in the previous table we did not.

Table A4: We show the results of the regression of the daily robust kurtosis (as defined in table A3) onto the lag of the daily robust kurtosis, the crisis dummy and the short dummy. Daily robust kurtosis is obtained by using a rolling window of the sixty previous days: for each day, we calculated the robust kurtosis of the returns of the previous sixty days. Since we have overlapping observations between two successive observations, the series is extremely persistent. To make the results of the regressions meaningful and the inference correct we added a lag of the dependent variable as an explanatory variable.

Table A5: We show the results of the regression of the daily volatility onto the lag of the daily volatility, the contemporaneous index return, the innovation in TED, the innovation in the credit spread, the crisis dummy and the short dummy. Daily volatility is obtained by using a rolling window of the sixty previous days: for each day, we calculated the standard deviation of the returns of the previous sixty days. Since we have overlapping observations between two successive observations, the series is extremely persistent. To make the results of the regressions meaningful and the inference correct we added a lag of the dependent variable as an explanatory variable. The TED spread (ted in the tables)

is the interest rate difference between the LIBOR and the Treasury bill rate as introduced by Brunnermeier (2009). The credit spread (cs in the tables) is the difference between the yield spread on a BBB and an AAA corporate bond.

Table A6: We show the results of the regression of the daily skewness onto the lag of the daily skewness, the contemporaneous index return, the innovation in TED, the crisis dummy and the short dummy. Daily skewness is obtained by using a rolling window of the sixty previous days: for each day, we calculated the standard deviation of the returns of the previous sixty days. Since we have overlapping observations between two successive observations, the series is extremely persistent. To make the results of the regressions meaningful and the inference correct we added a lag of the dependent variable as an explanatory variable. The TED spread is the interest rate difference between the LIBOR and the Treasury bill rate. The credit spread is the difference between the yield spread on a BBB and an AAA corporate bond.

Table A7: We show the results of the regression of the daily kurtosis onto the lag of the daily kurtosis, the contemporaneous index return, the absolute change in TED, the crisis dummy and the short dummy. Daily kurtosis is obtained by using a rolling window of the sixty previous days: for each day, we calculated the standard deviation of the returns of the previous sixty days. Since we have overlapping observations between two successive observations, the series is extremely persistent. To make the results of the regressions meaningful and the inference correct we added a lag of the dependent variable as an explanatory variable. The TED spread is the interest rate difference between the LIBOR and the Treasury bill rate. The credit spread is the difference between the yield spread on a BBB and an AAA corporate bond.

Table A1: Robust daily skewness

	Jan. 2007 Jun. 2007	Jan. 2007 Aug. 2008	Jan. 2007 Jan. 2009
Nasdaq	-0.03	-0.11	-0.13
S&P 500	0.24	-0.15	-0.23
CAC 40	0.11	0.07	0.00
FTSE	0.03	-0.10	-0.05
DAX	0.03	-0.02	0.00
IBEX 35	-0.06	-0.06	-0.09
Allianz	-0.24	-0.11	-0.14
April Group	0.22	0.10	0.05
Axa	-0.03	-0.08	-0.15
BNP Paribas	0.04	0.01	-0.01
CIC	0.17	0.01	-0.06
CNP Assurance	0.18	0.12	0.05
Crédit Agricole	0.16	0.04	0.00
Euler Hermes	-0.06	0.10	-0.01
HSBC	0.26	-0.06	-0.05
Natixis	0.00	0.03	0.03
Société Générale	-0.29	-0.01	0.03

Appendix: Additional Robustness Checks of the Results

Table A2: The dynamic impact on robust daily skewness of banning short sales

	Coeff. Const.	Coeff. Lag.	Coeff. Crisis	Coeff. Short	t stat Const.	t stat Lag.	t stat Crisis	t stat Short	Adj. R^2
Nasdaq	0.00	0.90	0.00	-0.01	-0.07	42.95	-0.50	-0.94	0.81
S&P 500	0.02	0.94	-0.02	0.01	1.89	61.87	-2.48	0.72	0.92
CAC 40	0.01	0.94	-0.01	-0.01	1.47	57.81	-1.47	-0.93	0.90
FTSE	-0.01	0.92	0.01	-0.01	-1.36	51.19	0.86	-1.50	0.87
DAX	0.01	0.95	-0.01	0.00	1.29	66.63	-1.26	0.18	0.91
IBEX 35	-0.02	0.85	0.02	-0.01	-1.91	35.01	1.44	-1.15	0.74
Allianz	-0.01	0.94	0.01	-0.01	-1.43	58.78	0.82	-0.82	0.89
April Group	0.01	0.95	0.00	0.00	0.76	63.57	-0.41	-0.73	0.90
Axa	-0.01	0.94	0.00	0.01	-0.98	54.11	0.24	1.94	0.88
BNP Paribas	-0.01	0.94	0.01	-0.02	-1.00	57.19	1.26	-2.51	0.91
CIC	0.01	0.90	-0.01	-0.02	1.30	43.63	-1.29	-2.37	0.87
CNP Assurance	0.02	0.82	0.00	-0.05	2.53	29.87	0.22	-4.87	0.84
Crédit Agricole	0.01	0.92	-0.01	0.00	1.72	48.01	-1.55	-0.51	0.86
Euler Hermes	0.00	0.93	0.01	-0.01	-0.66	52.93	1.24	-1.14	0.86
HSBC	0.02	0.90	-0.03	0.02	2.42	43.42	-2.85	2.51	0.89
Natixis	0.00	0.91	0.01	-0.01	0.26	46.64	1.11	-2.19	0.86
Société Générale	-0.01	0.95	0.02	-0.01	-1.66	63.17	1.84	-0.88	0.92

Table A3: Robust daily kurtosis

	Jan. 2007 Jun. 2007	Jan. 2007 Aug. 2008	Jan. 2007 Jan. 2009
Nasdaq	0.26	0.52	2.05
S&P 500	1.23	1.33	2.82
CAC 40	0.03	0.56	1.65
FTSE	2.32	0.44	1.95
DAX	0.41	0.74	1.49
IBEX 35	1.19	1.13	1.79
Allianz	0.11	1.03	2.40
April Group	0.34	0.61	0.99
Axa	0.90	0.92	2.91
BNP Paribas	0.54	0.67	2.25
CIC	0.37	1.93	2.81
CNP Assurance	0.69	1.32	1.57
Crédit Agricole	0.96	1.83	2.84
Euler Hermes	1.21	1.44	1.99
HSBC	0.86	1.40	2.22
Natixis	0.10	1.76	2.05
Société Générale	0.24	0.98	2.23

Table A4: The dynamic impact on robust daily kurtosis of banning short sales

	Coeff. Const.	Coeff. Lag.	Coeff. Crisis	Coeff. Short	t stat Const.	t stat Lag.	t stat Crisis	t stat Short	Adj. R^2
Nasdaq	0.02	0.97	-0.01	0.00	0.59	75.48	-0.27	0.20	0.94
S&P 500	0.08	0.94	-0.02	-0.02	1.85	55.51	-0.55	-0.53	0.89
CAC 40	0.03	0.96	-0.02	0.05	1.29	75.85	-1.01	2.34	0.94
FTSE	0.03	0.97	-0.02	0.06	0.68	77.79	-0.41	1.86	0.95
DAX	0.00	0.96	0.01	0.04	0.00	69.89	0.49	1.39	0.94
IBEX 35	0.00	0.98	0.01	0.02	0.12	107.96	0.17	0.87	0.97
Allianz	0.02	0.97	0.00	0.01	0.66	79.57	0.03	0.53	0.94
April Group	-0.01	0.98	0.04	0.02	-0.26	85.61	1.02	0.72	0.95
Axa	0.05	0.97	-0.03	-0.03	2.19	85.85	-1.44	-1.42	0.95
BNP Paribas	0.08	0.93	-0.06	0.05	2.51	50.27	-2.05	2.48	0.90
CIC	0.01	0.97	0.10	0.04	0.27	76.21	1.48	0.80	0.95
CNP Assurance	0.13	0.92	-0.05	0.00	2.63	46.87	-1.27	-0.10	0.86
Crédit Agricole	0.05	0.94	-0.01	-0.03	1.93	59.21	-0.45	-1.15	0.90
Euler Hermes	0.08	0.93	-0.04	0.00	2.34	52.92	-1.35	-0.01	0.88
HSBC	0.05	0.95	-0.04	0.05	1.60	64.13	-1.13	1.88	0.94
Natixis	0.01	0.91	0.07	0.06	0.50	46.48	2.00	2.01	0.90
Société Générale	0.01	0.93	0.03	0.02	0.27	51.14	1.03	0.74	0.87

Table A5: The dynamic impact on daily standard deviation of banning short sales

	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	t stat	t stat	t stat	t stat	t stat	t stat	t stat
	Const.	Lag.	index	ted	cs	Crisis	Short	Const.	Lag.	index	ted	cs	Crisis	Short
Nasdaq	0.02	0.97	0.00	-0.01	0.09	0.02	0.08	3.20	188.16	1.26	-0.60	1.93	3.30	5.95
S&P 500	0.02	0.97	0.00	-0.01	0.12	0.02	0.08	2.92	181.40	0.65	-0.53	2.34	2.94	5.54
CAC 40	0.02	0.98	0.00	-0.04	0.20	0.02	0.04	1.98	172.65	2.06	-2.87	3.87	2.44	3.27
FTSE	0.01	0.98	0.00	-0.01	0.18	0.01	0.04	1.75	223.45	2.55	-0.81	3.37	1.04	4.15
DAX	0.01	0.98	0.00	-0.04	0.20	0.02	0.03	1.62	172.62	0.96	-3.10	4.23	2.80	2.71
IBEX 35	0.01	0.99	0.00	-0.03	0.24	0.01	0.01	1.07	171.34	1.37	-1.70	4.39	1.09	0.94

	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	t stat	t stat	t stat	t stat	t stat	t stat	t stat
	Const.	Lag.	Cac	ted	cs	Crisis	Short	Const.	Lag.	cac	ted	cs	Crisis	Short
Allianz	0.02	0.98	0.01	-0.01	0.12	0.02	0.10	1.69	189.19	4.38	-0.46	1.24	1.58	3.97
April Group	0.02	0.98	0.00	-0.08	-0.27	0.02	0.08	0.52	105.01	-0.45	-1.23	-1.15	0.78	2.65
Axa	0.03	0.98	0.00	-0.02	0.01	0.03	0.14	2.12	181.19	1.90	-0.85	0.06	2.71	4.61
BNP Paribas	0.00	1.00	0.00	-0.06	0.17	0.01	0.02	0.05	152.43	2.65	-2.51	2.03	0.49	0.90
CIC	0.02	0.98	0.00	0.00	-0.01	0.01	0.01	1.81	121.23	-0.35	-0.24	-0.20	1.40	1.44
CNP Assurance	0.02	0.98	0.00	0.00	0.15	0.01	0.01	1.40	135.10	1.87	-0.22	2.03	1.44	1.41
Crédit Agricole	-0.01	1.00	0.00	-0.09	0.16	0.01	-0.03	-0.75	208.17	1.40	-3.56	1.80	1.01	-1.38
Euler Hermes	0.00	0.99	0.00	0.01	0.16	0.02	0.01	0.08	227.11	1.12	0.69	2.17	1.86	1.16
HSBC	0.00	0.99	0.00	-0.07	0.24	0.02	0.02	0.51	142.66	1.34	-3.94	3.63	1.87	1.01
Natixis	-0.02	1.01	0.00	-0.08	0.03	0.00	-0.11	-0.59	134.70	-1.13	-1.34	0.14	0.07	-2.78
Société Générale	0.02	0.99	0.00	-0.06	0.12	0.01	0.04	1.57	168.94	-0.43	-2.25	1.18	0.58	1.71

Table A6: The dynamic impact on daily skewness of banning short sales

	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	t stat	t stat	t stat	t stat	t stat	t stat	t stat
	Const.	Lag.	index	ted	cs	Crisis	Short	Const.	Lag.	index	ted	cs	Crisis	Short
Nasdaq	-0.03	0.96	0.01	-0.02	0.19	0.03	0.00	-1.74	77.41	6.60	-0.54	1.86	1.67	0.19
S&P 500	-0.03	0.97	0.02	-0.01	0.15	0.02	0.01	-1.32	82.05	7.32	-0.46	1.32	1.18	0.53
CAC 40	-0.02	0.93	0.02	-0.12	0.08	0.03	0.02	-1.41	48.70	6.62	-3.49	0.65	1.68	1.21
FTSE	-0.08	0.87	0.04	-0.07	-0.02	0.06	0.10	-3.26	41.43	9.42	-1.41	-0.10	2.52	4.14
DAX	-0.02	0.96	0.02	-0.13	0.06	0.03	0.00	-1.33	60.96	6.21	-3.95	0.47	1.61	-0.08
IBEX 35	-0.05	0.91	0.02	-0.14	-0.03	0.05	0.04	-2.45	44.57	5.97	-3.25	-0.17	2.26	1.88

	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	t stat	t stat	t stat	t stat	t stat	t stat	t stat
	Const.	Lag.	cac	ted	cs	Crisis	Short	Const.	Lag.	cac	ted	cs	Crisis	Short
Allianz	-0.01	0.86	0.02	-0.13	-0.28	0.04	0.10	-0.37	38.23	5.57	-2.85	-1.63	1.88	4.15
April Group	0.00	0.98	0.00	0.05	0.18	-0.02	-0.07	-0.07	91.39	0.18	0.51	0.44	-0.41	-1.59
Axa	-0.02	0.98	0.01	0.00	-0.12	0.02	0.01	-1.12	100.73	5.26	0.06	-1.12	1.28	0.93
BNP Paribas	-0.01	0.97	0.01	-0.12	-0.02	0.02	-0.02	-0.69	85.94	3.91	-4.43	-0.24	1.80	-1.54
CIC	0.03	0.94	0.01	-0.11	0.15	-0.04	0.02	1.12	59.54	1.38	-2.02	0.80	-1.44	1.08
CNP Assurance	0.02	0.97	0.01	-0.05	-0.06	-0.02	-0.01	0.77	76.21	1.49	-0.85	-0.26	-0.59	-0.44
Crédit Agricole	-0.02	0.97	0.00	-0.18	0.01	0.03	-0.01	-1.81	75.90	2.46	-6.62	0.06	2.42	-0.44
Euler Hermes	0.00	0.98	0.01	0.05	-0.03	0.00	0.00	-0.19	96.65	1.82	1.15	-0.21	0.00	0.21
HSBC	0.01	0.97	0.01	-0.22	-0.35	0.01	-0.02	0.46	66.41	3.32	-5.32	-2.32	0.38	-0.97
Natixis	-0.01	0.96	0.01	-0.12	0.20	0.02	-0.04	-0.20	71.68	1.81	-1.51	0.68	0.58	-1.00
Société Générale	0.06	0.95	0.01	-0.09	-0.01	-0.04	-0.03	2.94	63.63	3.33	-2.25	-0.06	-2.19	-1.72

Table A7: The dynamic impact on daily kurtosis of banning short sales

	Coeff. Const.	Coeff. Lag.	Coeff. index	Coeff. ted	Coeff. cs	Coeff. Crisis	Coeff. Short	t stat Const.	t stat Lag.	t stat index	t stat ted	t stat cs	t stat Crisis	t stat Short
Nasdaq	0.10	0.97	0.00	0.12	0.00	-0.02	0.02	1.15	71.82	-0.07	1.41	0.01	-0.33	0.57
S&P 500	0.07	0.97	0.00	0.08	0.04	0.01	0.00	0.78	81.81	0.35	0.99	0.12	0.20	0.14
CAC 40	0.08	0.98	0.01	-0.56	-0.37	0.02	-0.01	1.11	68.87	1.21	-6.24	-1.13	0.46	-0.22
FTSE	0.22	0.95	-0.03	0.18	0.13	-0.01	0.06	2.06	61.40	-2.09	0.95	0.18	-0.08	0.73
DAX	0.10	0.97	0.00	-0.48	-0.50	0.01	0.00	1.24	59.74	-0.06	-5.35	-1.55	0.16	-0.07
IBEX 35	0.13	0.97	0.00	-0.06	0.38	0.01	-0.03	1.76	78.67	-0.17	-0.50	0.82	0.09	-0.61

	Coeff. Const.	Coeff. Lag.	Coeff. cac	Coeff. ted	Coeff. cs	Coeff. Crisis	Coeff. Short	t stat Const.	t stat Lag.	t stat cac	t stat ted	t stat cs	t stat Crisis	t stat Short
Allianz	0.10	0.97	0.00	-0.03	0.34	0.04	0.00	1.29	83.73	0.29	-0.19	0.66	0.58	-0.07
April Group	0.02	0.98	0.00	-0.54	-1.91	0.19	0.56	0.09	87.63	0.00	-0.86	-0.81	0.63	2.07
Axa	0.14	0.97	0.01	0.04	-0.20	-0.02	-0.02	2.03	74.20	2.32	0.59	-0.86	-0.54	-0.86
BNP Paribas	0.18	0.97	0.01	-0.55	-0.42	-0.07	0.01	2.53	66.18	0.92	-7.47	-1.54	-1.76	0.27
CIC	0.19	0.94	0.00	-0.07	-0.18	0.14	-0.06	2.81	61.89	-0.09	-0.59	-0.41	1.99	-1.20
CNP Assurance	0.17	0.97	-0.01	0.06	0.47	-0.03	-0.07	1.16	85.93	-0.45	0.28	0.61	-0.24	-0.78
Crédit Agricole	0.09	0.98	0.01	-0.63	-0.03	-0.03	-0.04	1.51	73.52	1.83	-7.83	-0.11	-0.67	-1.31
Euler Hermes	0.13	0.98	0.00	0.03	0.06	-0.05	-0.02	1.62	100.28	-0.18	0.19	0.10	-0.64	-0.27
HSBC	0.10	0.98	0.02	-0.90	-0.43	0.00	-0.04	1.07	58.07	1.53	-6.75	-0.87	0.04	-0.62
Natixis	0.14	0.96	-0.03	-0.24	0.50	0.15	-0.10	1.04	72.87	-1.26	-0.78	0.44	1.03	-0.81
Société Générale	0.52	0.92	0.01	-0.23	-0.39	-0.21	0.05	4.33	48.88	1.28	-1.78	-0.82	-2.95	0.85

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