"MUCH ADO ABOUT NOTHING": SHORT SELLING BAN EFFECTIVENESS ON BANK STOCK PRICES

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Abstract

Most regulators around the world reacted to the 2007-09 crisis by imposing bans on short selling. Using data from seven equity markets, this study empirically examines the impact of the 2008 short-selling bans on financial stocks. Using panel and matching techniques, evidence indicates that bans on short-selling (i) on the whole widen volatility both in terms of High-Low spread and GARCH analysis, (ii) were not able to reduce systematic risk, (iii) overall failed to support prices. On the whole our results are in line with previous literature.

Keywords: Short Selling Ban, Event Studies, Garch Analysis, Financial Crisis, Systematic Risk, Financial Regulation

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1 Introduction

Most financial market regulators, around the world, as soon as the financial crisis worsened and with share prices falling sharply, reacted with hurried interventions by imposing tight restrictions on the short selling of financial stocks.

These measures which among different countries varied for duration and intensity, were presented with the goal to restore the orderly functioning of securities markets and mainly to limit la drastic drops in securities prices. Effectively regulators feared that short selling and bans are intended to maintain fair and orderly markets by preventing speculators from placing excessive downward pressure and increase the downturn on troubled financial firm stock prices. For example Callum McCarthy, Chairman of the FSA, notes that "(T)here is a danger in a trading system which allows financial institutions to be targeted and subject to extreme short-selling pressures, because movements in equity prices can be translated into uncertainty in the minds of those who place deposits with those institutions with consequent financial stability issues. It (the short-selling ban) is designed to have a calming effect − something which the equity markets for financial firms badly need."[20]

Some evidence cast doubt on the benefits of short-selling bans, suggesting instead that they may reduce market liquidity and not necessarily supporting security prices. These concerns are particularly relevant in the context of the crisis: if short selling bans did contribute to the decrease in stock market liquidity, and does not contribute to the support of the stock prices, they would have inflicted serious damage on market participants in 2008 and 2009.

Following, among others Grünewald et al. (2010), short selling may be defined as the practice of selling a security the seller does not own at the time of the sale. The seller goes short with the attempt to later repurchase the security at a lower price. Following this way of thinking, poorly speaking, the short seller bets on the specific stock price to fall. From the economic perspective, the central argument in favor of allowing short selling is that if short selling is prohibited, not all information will be fully reflected in stock prices. This represents a failure of the hypothesis of market efficiency, as poor price discovery, in turn, implies misallocation of capital.

In particular in September 2008 became apparent that the crisis would not confine itself to the sub-prime mortgage market in the United States, but on September 14, 2008 with the bankruptcy of Lehman Brothers, the global financial crisis entered a new phase marked by the failure of prominent American and European banks.

According to its former Chairman and CEO, the collapse of Lehman Brothers is partly due to short selling which allegedly depressed the stock price (see Fuld, 2008).

To give a further example related to the previous evidence, the investment company, Olivant,

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[20] Recent market conditions have made us concerned that short-selling in the securities of a wider range of financial institutions may be causing sudden and excessive fluctuations of the prices of such securities in such a manner so as to threaten fair and orderly markets. SEC RELEASE NO. 34 -58592/September 18, 2008.

reported that it was not able to locate its equity stake of almost 2.8 per cent of total United Bank of Switzerland (UBS) shares owing to the collapse of Lehman Brothers, which was Olivant's prime broker and depository of its UBS shares (Grünewald et al., 2010)[21].

The restrictions commenced on September 19, 2008, with regulators in the United Kingdom banning short-selling on leading financial stocks. In the Us, on the same day the Securities and Exchange Commission (SEC) announced a ban on the short-selling on financial stocks effective September 22, 2008 until October 9, 2008.

Other Financial Regulators, Worldwide, soon followed and adopted short-sale restrictions and lifted at different dates, which varied considerably in intensity, scope, sets of stocks (only financials in some countries, all stocks in others) and duration: for example France, Italy, banning naked short-selling on leading financial stocks; and Japan banning naked short-selling on all stocks see Table 1 for details of regulatory interventions worldwide). Some of these restrictions have remained in place for a fairly long time.

The purpose of this study is to exploit this international variation in short-sale regimes to identify the effect of short-selling bans on (i) liquidity, as measured by trading volume , (ii) abnormal returns as measured by the excess returns on stocks subject to bans relative to those on exempt stocks. We use an event study methodology to test for the effect of short-selling bans over a set of windows of zero or one day before and from 1 to 3 days after the ban inception date. Iii) stock price volatility and systematic risk. In testing volatility return to short selling restrictions we apply (Garch) method. and Wilcoxon test on high-low spread, while we run panel data to estimate impact on systematic risk.

Our sample consists of daily data for 671 financial stocks, related broad financial index, in 7 countries, from January 1996 to December 2012.

The remainder of this paper is structured as follows. Section I briefly reviews the relevant literature to develop the testable hypotheses. Section 2 reviews the literature on short-sale constraints. Section 3 describes the data used in this study. Section 4 reports methodology and empirical analysis of the impact of the bans on returns, liquidity and stock price volatility. Section 5 concludes.

2 Literature review

The literature on short-sales constraints essentially comprises three lines of research. First deal with overpricing effect on stock price, other focuses mainly on liquidity, and lost focuses on the relationship between short-sales and stock return volatility.

2.1 Overpricing

This prediction emanates from the seminal work of Miller (1977) who develops a model that details how short-sale constrained securities become overpriced because pessimists are restricted from acting on their beliefs. In this scenario, stock prices reflect only the valuations of bullish investors while bearish investors are excluded from trading.

This mechanical prediction of Miller's model does not survive in the rational expectations framework of Diamond and Verrecchia (1987), where in the market there are some informative trades, but stock prices do not bias upward. Prohibiting traders from shorting reduces the adjustment speed of prices to private information, especially to bad news. Central point of research is that in equilibrium stocks are not systematically overpriced when short sales are banned. This evidence hinges not only on the assumption of rational expectations but also on investors' risk neutrality.

Chang, Chang, and Yu (2007) examine the relationship between covered short-sale constraints and stock price overvaluation on the Hong Kong Stock Exchange (HKEx). Also Isaka (2007) provides empirical support for this hypothesis.

Evidence consistent with the overpricing hypothesis is also reported by Chang, Cheng, and Yu (2007), who rely on data from the Hong Kong stock market. But in contrast to these findings, research on the suspension or removal of short-sale price tests such as the uptick rule in the United States finds no significant stock price effects. Other studies, including Boulton and Braga-Alves (2010), Saffi and Sigurdsson (2011), Boehmer, Huszar, and Jordan (2010), Chen and Rhee (2010), Boehmer and Wu (2010), Tseng (2010), predict that short sellers remove the upward bias from stock prices, and this evidence get to negative abnormal returns after the implementation of some form of short-selling restriction.

Boehmer *et al* (2008) find that stocks on SEC list of September 2008, which temporarily covered nearly 1000 financial stocks with a comprehensive short selling ban, experienced a share price increase at the start of the ban and a temporary share price decline when shorting resumed after the ban expired. Boehmer, Jones, and Zhang (2009) document large price increases for banned stocks upon announcement of the ban, followed by gradual decreases during the ban period. In a large panel of NYSE-listed stocks greater shorting flow reduces post-earnings announcement drift for negative earnings surprises. They also admit that the correlation with the ban could be spurious, since the concomitant announcement of the Troubled Asset Relief Program

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[21] If stock owners entrust their securities to a securities lender (in this particular case Lehman Brothers), they risk that they will not get them back in case the lender fi les for bankruptcy (Grünewald et al., 2010).

(TARP) could have been affected the prices of U.S. financials To confirm this hypothesis they find that stocks that were later added to the ban list experienced no positive share price effects.

However, Harris, Namvar, and Phillips (2009) try to control for the concomitant bank bailout announcements. They estimate that the ban on short-selling financial stocks imposed by the SEC in September 2008 led to price inflation of 10-12% in the banned stocks based on a factor-analytic model that extracts common valuation information from the prices of stocks that were not banned. This inflation reversed approximately two weeks after the ban for stocks with negative pre-ban performance. In contrast, similar magnitude price inflation was sustained following the ban for stocks with positive pre-ban performance, suggesting the ban was successful in stabilizing prices for these stocks. Bai, Chang, and Wang (2006) consider a fully rational expectations equilibrium model, in which investors trade to share risk and to speculate on private information in the presence of short-sale constraints. Shortsale constraints limit both types of trades, and thus reduce the allocational and informational efficiency of the market. Limiting short sales driven by risk-sharing simply shifts the demand for the asset upwards and consequently its price. However, limiting short sales driven by private information increases the uncertainty about the asset as perceived by less informed investors, which reduces their demand for the asset. When this information effect dominates, short-sale constraints actually cause asset prices to decrease and price volatility to increase.

Also Hong and Stein (2003) predict that a short-selling ban may aggravate a decline in prices, rather than prevent it, because the presence of unrevealed negative information of investors who would have engaged in short sales surfaces only when the market begins to drop and this could be thereby aggravating the price decline.

Diether et al. (2009a) document that short sellers increase their trading following positive returns and they correctly predict future negative abnormal returns. The results are consistent with short sellers trading on short-term overreaction of stock prices.

2.2 Volatility

A significant decrease in trading volume and price volatility coupled with short-sale constraints measures are predicted by Scheinkman and Xiong (2003).

Chang et al. (2007) using a direct measure of short-sale constraints, find that when short sales are allowed, individual stock return exhibits higher volatility and less positive skewness.

Consistently, Henry and McKenzie (2006) find that the Hong Kong market after a period of short-selling exhibits both greater price volatility and

volatility asymmetry. This finding is confirmed by Boulton and Braga-Alves (2010) for a sample of financial stocks in the US. Alexander and Peterson (2008) and Diether, Lee, and Werner (2009b) examining the removal of short-sale constrain observe insignificant or weak increases in daily and intraday return volatility.

United Kingdom's Financial Services Authority (FSA) has provided a review of the effects of its temporary ban on short selling of UK financial sector stocks, which was in place from 18 September 2008 to 16 January 2009 (FSA, 2009a). They found no statistical significance change in volatilities of the stocks covered by the ban and those stocks that were not.

2.3 Liquidity

Evidence on short-sale constraints and liquidity is relatively unexplored. Jones (2012) investigates relationship between short-sale constraints and liquidity during the Great Depression in the United States. He finds that the 1932 restriction interventions decreased liquidity, but in 1931 and 1938 the rule that short sales be executed only on upticks increased liquidity. United Kingdom ' s Financial Services Authority (FSA, 2009a), found evidence that there was a marked decrease in trading volume for the restricted shares as well as an increase in bid-ask spreads for restricted stocks that is higher than the increase of spreads for the market as a whole. Alexander and Peterson (2008), Diether et al. (2009b) and Boulton and Braga-Alves (2010) find that the short-sale restriction results in only slightly wider bid-ask spreads.

Bris (2008) finds that this temporary prohibition was associated with a decline in the liquidity of these stocks. He considers the Securities and Exchange Commission ' s (SEC) Emergency Order of 15 July 2008, which required anyone engaging in a short sale in 19 particular financial stocks to arrange beforehand to borrow the securities and deliver them at settlement date, thus effectively prohibiting naked short selling of these stocks.

Charoenrook and Daouk (2005) find that short-sale restrictions are correlated with greater market liquidity in terms of total stock market trading volume. Their sample cover for 111 countries,. Boehmer, Jones, and Zhang (2009), use panel data techniques to analyze the response of liquidity — as measured by spreads and price impacts — to the short-selling ban imposed from September 18 to October 8 in the United States, find a significant detriment in liquidity for stocks subject to the ban. This finding is confirmed by Kolasinski, Reed, and Thornock (2012). Beber and Pagano (2009) using a sample of 17 040 stocks from 30 countries for the period from 1 January 2008 to 23 June 2009,,investigate the effects of the regulatory constraints temporarily adopted and they found

evidence that short selling bans involves a deteriorated market liquidity.

Marsh and Payne (2012) analyze data for the United Kingdom, find that, as soon as the ban applied to financial stocks, their market depth, in terms of bid-ask spreads, declined much more than those for exempt nonfinancial stocks.

3 Data and hypothesis

To examine the impact of the 2008 short-selling bans on the market quality of banned stocks we run model on dataset consisting of daily stock prices, daily high, low and volumes, inception dates, and lifting dates for 671 stocks from 7 countries (most European markets). All data are drawn from Bloomberg and Datastream. We use daily level data over the period spanning from January 1996 to December 2012. Table 1 documents seven markets that, among others, experienced some form of short-selling ban starting from 2008.

Miller's (1977) models, predict that a short selling bans regulatory interventions could be able to prevent some pessimist investors from taking a bearish position in a financial stock. Thus, short-selling bans should restore the orderly functioning of securities markets and limit unwarranted drops in securities prices capable of exacerbating the crisis

Hypothesis 1.Banned stocks experience on average positive abnormal returns when the short-selling ban is imposed.

Bai et al. (2006) experienced higher price volatility when short-selling is restricted, as some better informed investors are cut out from trading and therefore, on the market, there are a part of investor community trading with a low level of information about real stock riskiness. These stocks are perceived with higher risk level than how they can achieved in a fully informed situation. Following also Frino et al. (2011), thus we test the following hypothesis: Hypothesis 2. Stock price volatility increases in the banned stocks when the short-selling ban is imposed.

Diamond and Verrecchia (1987) predict wider bid-ask spreads when short-selling is restricted. This is due to the exclusion of traders that following their negative views are willing to sell stocks that are content of these bad outlooks, but are prevented due to short-selling constraints. To give an idea of the magnitude of short selling flows on markets, the evidence indicates that in 2005, for example, short selling represented roughly 24 per cent of share volume on the New York Stock Exchange (NYSE) and more than 30 per cent of NASDAQ share volume (Diether et al , 2007), while short-sales are extremely prevalent and in late 2007 approximately 40% of trading volume involves a short seller (Diether et al. 2009a). Intuitively this suggests that a short-selling ban could worsen market liquidity in terms of trading activity. Therefore we test the following Hypothesis 3:High-Low spread widen in the banned stocks when the short-selling ban is imposed.

Table 1. Short-Selling Ban

Country	Ban Start Date	Ban Lift Date	Scope of Ban
United States	September 19, 2008	October 8, 2008	Financials
United Kingdom	September 19, 2008	January 16, 2009	Financials
Germany	September 20, 2008		Financials
Japan	October 30, 2008	April 1, 2013	All stocks
Spain	September 24, 2008		All stocks
France	September 22, 2008		Financials
Italy	September 22, 2008*	June 1, 2009	Financials, then all

Notes: This table describes the main characteristics of the short-selling bans for our international sample of countries. *The ban initially applied to financials, and was extended to all stocks on October 10, 2008.

4 Methodology and empirical results

To test for changes in abnormal returns we calculate cumulative abnormal returns for each market around their respective event dates, as they are represented in Table 1. Essentially we consider as event dates: announcement, start and end dates of the measures.

We measure the market reaction following the ban intervention at two levels. Specifically, we estimate abnormal returns (ARs), which is the forecast error of a specific normal return-generating

mode, focusing on banking indices (capturing the financial stock market in each country) and stock returns on each bank of the whole sample.

Regarding the stock markets, we select seven stock and financial indices (S&P 500 Composite - Price Index, France Cac 40 - Price Index, Dax 30 Performance - Price Index, Ibex 35 - Price Index, Nikkei 500 - Price Index, Ftse Switzerland - Price Index, Ftse Mib Index - Price Index, Ftse Germany Banks - Price Index, Ftse Italy Banks - Price Index, Ftse Japan Banks - Price Index, Ftse Spain Banks -

Price Index, Ftse Switzerland Banks - Price Index, Ftse Usa Banks - Price Index, Ftse France Banks - Price Index). As a result, we have one observation for each event date. For each country bank sample, we select stock price time-series for each of the constituent members of each broad FTSE index. Here we have one observation for each event date related to each single bank.

Regarding the estimation procedure, we estimate the AR, adopting the market model (MacKinlay, 1997). Normal returns for every i-th observation (Rit) - where Rit is stock i's return on day t, that is the broad financial index or a single bank stock return- are obtained as a function of the market portfolio return (RMt), represented by a broad country equity or financial index:

$$R_{it} = \alpha_t + \beta_i R_{Mt} + \varepsilon_i \qquad E(\varepsilon_{it}) = 0, \ \ \text{var}(\varepsilon_{it}) = \sigma_{\varepsilon_i}^2 \qquad (1)$$

Market model parameters, α_i and β_i are estimates of the intercept and slope coefficients in the OLS market model, when Rit and RMt. are obtained with daily log returns, able to represent the market portfolio over a 252-day estimation period, ending 20 days before the event date. ARs are then obtained as the difference between the actual stock return and the return predicted by the market model:

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{Mt}) \qquad (2)$$

ARs are cumulated over a time period (Cumulative Abnormal Return, CAR) around the announcement date (t=0). Following Aït-Sahalia et al. (2010, 2012), we focus on the following short event windows: 5- day (-1; +3), 3-day (-1;+1) and one-day (0;0). As a robustness check, we also estimate CARs on (0; +1) and (-1;0). For each event window, CARs are obtained as follows:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{it} \qquad (3)$$

Where t1 and t2 are the start and the end date of the considered window. ARs can be aggregated on a time or a cross-section basis for a portfolio of N observations. The Cumulative Average Abnormal Return (CAAR) is calculated as:

$$CAAR(t_1, t_2) = \frac{1}{N} \sum_{i=1}^{N} CAR_i(t_1, t_2) \qquad (4)$$

After the calculation of CAARs, we test the hypothesis of a market reaction significantly different from zero. As noted in Cummins and Weiss (2004), various studies have documented a variance increase in ARs during the days near to the event, with respect to the estimation period, as an effect of the announcement. If hypothesis testing is conducted without considering this increase in variance, results can be biased in the direction of a too frequent rejection of the null hypothesis in favor of the alternative. In order to overcome this limitation and avoid considering as significant a null value creation or destruction, we follow the approach first proposed by Mikkelson and Partch (1988) and then adopted in some recent studies (e.g. Harrington and Shrider, 2007; Mentz and Schierek, 2008), suggesting using the Boehmer et al. (1991) test statistic. First of all, we calculate a standardization factor:

$$SR_i = \frac{CAR_i(t_1, t_2)}{\hat{\sigma}_{\varepsilon_i} \sqrt{T_s + \frac{T_s^2}{T} + \frac{\sum_{t=t_1}^{t_2} \left(R_{Mt} - T_s\left(\overline{R_M}\right)\right)^2}{\sum_{t=1}^{T} \left(R_{Mt} - \overline{R_m}\right)^2}}} \qquad (5)$$

Where $\hat{\sigma}_{\varepsilon_i}$ is the standard deviation of abnormal returns estimated with the market model; Ts is the number of days in the considered event window (t1, t2); T is the number of days in the estimation period; RM is the market portfolio return and $\overline{R_m}$ is the average market portfolio return during the

estimation period. Then, the Z statistic (with a t-distribution with T-2 degrees of freedom and converging to a unit normal) is determined as follows (Mentz and Schierek, 2008, p. 207):

$$Z = \frac{\frac{1}{N}\sum_{i=1}^{N} SR_i}{\sqrt{\frac{1}{N(N-1)}\sum_{i=1}^{N}\left(SR_i - \sum_{i=1}^{N}\frac{SR_i}{N}\right)^2}} \qquad (6)$$

Focusing on the effect of short selling restrictions (Table 2), on country broad banking index, we find overall, that ban measures do not produce a statistically significant (at the 10% confidence level or less) effect on the stock markets. Conversely, we observe negative and statistically significant (at the 10% confidence level or less) CAR in the event windows (0,+1).

Table 2. Financial Stock Index response to short selling restriction interventions

Window -1 3		Window -1 1		Window 0		Window 0 1		Window -1 0	
car	z	car	z	car	z	car	z	car	z
0.0095	0.8995	0.0117	1.2706	0.0065	-0.7785	0.0109	-2.541**	0.0073	0.8513

Notes: This table reports the test statistics of Cumulated Abnormal Returns estimated over various event windows short selling restriction interventions over September, 2008 – June, 2009. The impact of the short selling restriction interventions is estimated focusing on Financial Sector Index return. The statistical significance of Cumulated Average Abnormal Returns is tested using the Brown and Warner (1985) as implemented in Aït-Sahalia et al. (2012). ***,**,* denote that estimates are statistically significant at the 1, 5 and 10% levels. Source of financial data: DataStream and Bloomberg, authors' own.

Table 3 reports the CARs, for the analysis in which we regress single bank stock return on broad country financial index. We find that ban measures are not statistically related to mean CARs for all countries in sample period, while we estimate statistically significant (at the 10% confidence level or less) CARs 1 day around the announcement just for Us, showing a detriment effect in abnormal return. Overall, we find that short selling restriction measures were not effective during sample period.

Table 3. Bank response to short selling restriction interventions

	Observations	Window -1 3		Window -1 1		Window 0		Window 0 1		Window -1 0	
		car	z	car	z	car	z	car	z	car	z
Uk	303	0.0120	0.0532	0.0255	0.4126	0.0026	-0.0640	0.0163	0.1970	0.0119	0.2502
Usa	240	-0.0338	-0.9668	0.0508	-1.8064*	-0.0071	-0.3866	-0.0379	-1.5898	-0.0199	-0.8871
Germany	15	0.0220	0.6977	0.0125	0.3625	0.0072	0.3562	0.0172	0.6044	0.0025	0.0872
Spain	18	-0.0029	-0.0883	0.0048	0.1893	0.0010	-0.1130	-0.0016	-0.1752	0.0074	0.3277
France	10	0.0037	0.1672	0.0017	-0.0144	0.0008	0.0785	-0.0082	-0.3183	0.0073	0.3564
Italy	33	-0.0090	-0.0385	0.0069	-0.0695	-0.0065	-0.2400	-0.0090	-0.2047	-0.0044	-0.0502
Japan	52	0.0453	0.9740	0.0493	1.4091	0.0316	1.5408	0.0382	1.3803	0.0426	1.4566

Notes. (1) *, **, *** imply significant levels of 10%, 5%, and 1% respectively; and (2) Source: DataStream, authors' own. This table reports the test statistics of Cumulated Abnormal Returns estimated over various event windows short selling restriction interventions over September, 2008 – June, 2009. The impact of the short selling restriction interventions is estimated focusing on Bank Stock Return. Sample Bank is formed by all bank constituents of the country Financial Sector Index of the previous table. The statistical significance of Cumulated Average Abnormal Returns is tested using the Brown and Warner (1985) as implemented in Aït-Sahalia et al. (2012). ***,**,* denote that estimates are statistically significant at the 1, 5 and 10% levels. Source of financial data: DataStream and Bloomberg, authors' own.

To examine whether market volatility change for treatment stocks relative to control stocks, we provide summary statistics, calculating the percentage and ratio High-Low spread difference

between the pre- and post-event averages for each variable. We measure price volatility as Percentage High-Low for the Stocks and as ratio of High-Low.

The difference is statistically different from zero at the 1% level for all countries, based on the Wilcoxon test for the difference between the median

in the ban period and the median in the pre-ban and (where available) the post-ban period. Columns 4 show that the median high-low spread during the ban period is on average 1.52 times as large as its pre-ban value, and over two times as large for Italy, and France.

Table 4. High Low Spread Reaction

Country	Percentage High-Low for the Stocks			Ratio of High-Low for the Stocks	
	Before	During	After	During /Before	During/After
France	2.256153	4.553187		2.02	
Germany	2.372196	3.402198	4.089454	1.43	0.83
Italy	1.128512	2.526437	3.320632	2.24	0.76
Japan	2.317908	3.155852	1.70729	1.36	1.85
Spain	2.056476	3.627486		1.76	
United Kingdom	3.253878	4.096175	3.996663	1.26	1.02
United Stats of America	3.004576	1.723038	2.230916	0.57	0.77

Notes: The asterisks on the figures in columns 2 indicate that the median High-Low spread during the ban is significantly different from the median before and (if available) after the ban at the 1% , 5% and 10% level, based on a Wilcoxon test for di fferences between medians.

For France, Germany, Japan, Spain and United Kingdom the result came out with three asterisks of significance to stress the different of the median before and after the short-selling periods, while for the other countries the different of the median came significantly (Italy 5% of significance). The ratio obtained in column 4 and 5 show this difference as a ratio in the period of during/before and during/after. France, Italy and Switzerland came to have the highest ratio among the other countries analyzed in the period during/before, while Japan and United Kingdom show the highest ratio for the period during/after.

We also apply Garch methodology to test impact on stock return of ban short selling measure. The introduction of these models has led to a better understanding of the financial theory. As demonstrated by several empirical studies, the process GARCH (1.1) provides very good estimates of the volatility of financial series compared with other models from the ARCH family. Numerous empirical tests have shown that the time series of returns of many financial time series has, in some respects, the characteristics of a stochastic model known in literature as the white noise (white noise).

The principle advantage of employing such models is the ability to capture the common empirical observations in daily time series: fat tails due to time-varying volatility, skewness resulting from mean non-stationarity, nonlinearity dependence, and volatility clustering.

This study employs GARCH (1,1) specifications[22]. The GARCH class of models used in this study has proven to be particularly suited for modeling the behavior of financial data. As emphasized by Pagan (1996), these models are capable of capturing the common characteristics of many financial time series. First, asset prices are generally non-stationary and often have a unit root, whereas returns are usually stationary. Second, return series usually show little autocorrelation, while serial independence between the squared values of the series is often rejected pointing towards the existence of non-linear relationships between the subsequent observations. Volatility of returns appears to be clustered. Returns go through periods of high and low variances. These facts point towards time-varying conditional variances. Most empirical evidence indicates that the empirical distribution of return series differs significantly from sampling independent observations from an identical Gaussian distribution. The series are characterized by leptokurtosis, which could be related to the time-variation in the conditional variance. Finally, some

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series exhibit asymmetric behavior in the conditional variance (leverage effects).

The conditional variance for the standard GARCH (1.1) model can be written as follows:

$$h_t = \beta_0 + \beta_1 \varepsilon_{t-1}^2 + \beta_2 h_{t-1}^2 \qquad (7)$$

with

$$\beta_0 > 0, \beta_1 \geq 0, \beta_2 \geq 0 \; and \; \beta_1 + \beta_2 < 1 \qquad (8)$$

In this model, the conditional variance is a function of three terms: First, the mean, β_0. Second, news about volatility from the previous period, measured by the lag of the squared residual from the mean equation, ε_{t-1}^2 (the ARCH term). Third, last period's forecast variance, ε_{t-1}^2 the (GARCH term). The coefficients of the model are easily interpreted. The estimate of β_1 shows the impact of current news on the conditional variance process and the estimate of β_2 the persistence of volatility to a shock or, alternatively, the impact of "old" news on volatility.

Engle and Bolleslev (1986) show that the persistence of shocks to volatility depends on the sum of $\beta_1 + \beta_2$. Values of the sum lower than unity imply a tendency for the volatility response to decay over time, at a slower rate the closer the sum is to unity. In contrast, values of the sum equal to (or greater) unity imply indefinite (or increasing) volatility persistence to shocks over time.

In the case of a GARCH (1.1) of the model, the average level of volatility can be assessed as long-term average of observed values of ht. In terms of model parameters, is given by

$$\sigma^2 = \frac{\omega}{1 - \alpha_1 - \beta_1} \qquad (9)$$

In order to check the hypothesis of the impact of short-selling on volatility of market returns, forecasting time-varying financial market volatility models of GARCH (1.1.) were applied. The main results of using GARCH models estimated for each consolidation project are presented in Tables 5.

In this section, this paper runs GARCH analysis using the return of three stock markets namely; Spain, Japan and France. This return calculated from the daily stock prices of these markets. The periods of estimation used in this analysis divided into two main periods (before-during). The starting period for all the markets employed is Jan-94.While the end of the before ban period is oct-08 for Japan and Spain, the end of the before ban period for France is Sep-08.the end of the during ban period employed for all stock markets is Dec-12.

Tables 5 report the results of GARCH (1.1.) models for four stock exchange markets. It should be noted that for the performance of the shares, it is particularly unlikely that positive and negative shocks have the same effect on volatility. This asymmetry is sometimes attributed to a leverage effect and sometimes to a risk premium effect. According to the first theory, as the price of the stock falls, its debt-to-equity ratio increases, thus, increasing the volatility of returns to shareholders. Furthermore, according to the second theory, the increased volatility reported by news has reduced the demand for a security due to a risk aversion. The resulting decline in the value of action is followed by increased volatility as expected by the news.

Bollerslev-Wooldndge robust standard error was computed for all the estimates (Gregoriou, Kontonikas, & Tsitsianis, 2004), which indicates that the series have positive and stationary variance. By dividing the sample into three periods (before, and during), the authors show that the ARCH process is significant in all stock markets before the short-selling ban, where the p-value is unable to reject the null hypothesis manifesting a serial correlation in the residuals for up to one lag at the significant level of 5% for all series in the ARCH-LM test. Hence, the conditional mean and volatility estimates are not mis-specified, which indicates that returns for all markets have taken into account the volatility of stock returns.

The tests for heteroskedasticity in presence of outliers are very similar to the performance of the tests for linearity, in which the null hypothesis is often rejected. Almost all these tests are based on the residuals of robustly estimated conditional means, once the outliers have been removed and an auxiliary regression of the Breusch-Pagan type is taken into account to check for the presence of linear ARCH effects.

GARCH results are significant and different at the level of volatility, reflecting different performance of those stock markets before and during the short-selling ban. The main point of this analysis is to demonstrate the impact of the short-selling on the performance of the stock markets. In fact, the results prove the bad effect of the short-selling in most of the stock markets. ARCH is still above GARCH for France and Spain stock exchanges indexes, suggesting obviously that large market

shocks have affected the estimate of anticipated volatility. According to the dynamic volatility performance and the indication for the level of market sensitivity in dealing with the new information, the authors could notice the impact of short-selling increased for most of the analyzed markets. Furthermore, it reflects the stock markets' sensitivity to the new information. In fact, the findings show that Spain and France stock exchange indexes seem to have taken better the advantages of the short-selling.

Table 5. Garch Analysis

	France		Japan		Spain	
	Before	**During**	**Before**	**During**	**Before**	**During**
Mean equation	0.000419	-0.406384	0.000598	-0.772148	0.000346	-0.294703
Variance Equation						
C	0.000349**	5.37E-01	0.000365***	4.85E-01	0.000207*	0.485141
ARCH	0.109187***	0.037422	0.132126***	0.015281	0.100934***	0.014825
GARCH	0.884219***	0.534675	0.85327***	0.515698	0.902876***	0.516317
LOG likelihood	3587.578	-1626.576	3869.111	-1532.607	3364.95	-1538.29518
A I C	-5.692738	2.943278	-6.139969	2.845568	-5.339079	2.845591

Notes: *, **, *** imply significant levels of 10%, 5%, and 1% respectively; and (2) Source: DataStream, authors' own.

In this section we discuss the impact on bank stock return of the short selling-ban using dummy variables in the CAPM formulations. Trough the CAPM formulation, we analyze the time varying Beta following Faff and Brooks (1998) and Volis et al. (2011) in order to capture the change of Beta caused by naked position ban. The change of Beta, in the period where the ban is on, may be assumed like a change in the risk of stocks.

In a CAPM world, the variance of returns can be writen as:

$$\sigma_i^2 = \frac{\sum_{i=1}^{n}\left[R_i - E\left(R_i\right)\right]^2}{\left(n-1\right)} = \frac{\sum_{i=1}^{n}\left[\left(\alpha_i - \beta_i R_m + \in_{i,t}\right) - \left(\alpha_i - \beta_i R_m + \in_{i,t}\right)\right]^2}{\left(n-1\right)} \tag{10}$$

Rearranging the algebra at the end comes out:

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_{e,i}^2 \tag{11}$$

Single asset return variance, with respective of Single Index Model, can be decomposing in two components:

Systematic risk: $\beta_i^2 \sigma_m^2$.

Specific risk: $\sigma_{e,i}^2$.

We test the impact on the Beta of Market Model, with bank indexes as dependent variable regress on broad index. In the second model we verify the change of Beta, in a market model with single bank return, as x variate, and country bank index as explanatory variable. The bank sample is constituted by the constituent list, as drawn by Bloomberg, of each bank index, for each country.

To perform analysis, for each country we estimate, through the Pooled OLS, the coefficients β_1, β_2 for the system of equations below:

$$r_{it} = \alpha + b_0 r_{mt} + b_1 D_1 * r_{mt} + b_2 D_2 * r_{mt} \tag{12}$$

where r_{it} = represent the time series of stock returns for the bank i;
r_{mt} = represent the time series of the country bank index;
D_1 = is a binary variable that takes value 1 during the no ban-period of naked position;
D_2 = is a binary variable that takes value 1 during the ban-period of naked position.

The table 6 shows the results of the model system described above for the different countries. The values shows both market indices and dummies are significant for all countries analyzed. The coefficient associated to indicates the sensitivity of the returns of individual banks relative to the market of the country concerned, these coefficients have similar values for different countries except for Spain, and UK where there have been relatively lower. The values associated to "D" indicates a change in the Beta sector in the period of the ban on short selling. A negative value associated with this coefficient is indicative of a reduction in the sensitivity of individual banks to changes in the performance of the Market; by contrary, a positive value indicates an increase in the sensitivity of individual banks to Market. The change value of the dummy coefficient indicates how much the risk beta changing during the ban-period. The change value of beta coefficient indicates how much the Market Risk beta changing during the ban-period. The previous table shows that during the ban period the market beta risk rises, with the exception of Italy, all of changes are significant while all intercept are not.

Summarize, the results suggest that the restriction in short selling trading, has not determined a decrease the market beta risk for the single bank.

Table 6. Risk Systematic Reaction to Short Selling Ban

Country	Parameter	Coefficient	St. Error	Total Pool Observation	Adjusted R-squared	Difference
France	c	0.0005***	0.0002	13480	0.528397	0.78183
	$D1$	2.3698***	0.0299			
	$D2$	3.1516***	0.0336			
Germany	c	0.0000	0.0001	16850	0.466759	0.299285
	$D1$	2.4393***	0.0223			
	$D2$	2.7386***	0.0522			
Italy	c	0.0001	0.0001	37070	0.442123	-0.32385
	$D1$	2.2574***	0.0141			
	$D2$	1.9335***	0.0309			
Japan	c	0.0001	0.0001	53794	0.425231	0.323416
	$D1$	2.5000***	0.0183			
	$D2$	2.8234***	0.0194			
Spain	c	0.0001	0.0001	30330	0.40652	0.766201
	$D1$	1.3931***	0.0178			
	$D2$	2.1593***	0.0178			
Uk	c	0.0004***	0.0001	67400	0.244991	0.076301
	$D1$	1.9496***	0.0147			
	$D2$	2.0259***	0.0309			
Us	c	0.0004***	0.0000	269600	0.362933	0.987211
	$D1$	2.7611***	0.0073			
	$D2$	3.7483***	0.0358			

Notes: This table reports the values associated to the Betas of markets, for each country, over the period January 2000-December 2012. For each country, through pool regression and following Faff and Brooks (1998) and Volis et al. (2011) forthe t ime varying Beta, D1 refers to the Beta Market in "no ban period", D2 refers to the Beta Market in "ban period" in a model where the independent variable is the daily return of the general ind ex, while the dependents variables are the daily returns of the banks which composed the general index. The last column indicates the differences between D2 and D1, that indicate the increase or decrease in systematic risk during the ban period. *, **, *** imply significant levels of 10%, 5%, and 1% respectively

5 Conclusion

Regulators impose short-selling bans primarily because they expect such bans to help stem financial panics. The bans imposed during the 2007 to 2009 financial crisis were no exception in this respect. In terms of Miller's (1977) model, stock market regulators may have regarded the bans as necessary to prevent "underpricing" of stocks: they probably feared that, with optimistic investors largely neutralized by funding constraints, unbridled short sales would trigger an unwarranted collapse in share prices. Empirical results shows that the bans overall failed to support prices, and so are not associated with better stock price performance,: we find that bans are not significantly correlated with excess returns in countries with short-selling bans on Financials, in line with the results in Boulton and Braga-Alves (2010), Saffi and Sigurdsson (2011), Boehmer, Huszar, and Boehmer, et al., (2010), Chen and Rhee (2010), Boehmer and Wu (2010), Tseng (2010) and suggests that the bans are not effective in temporarily stabilizing prices in struggling financial stocks. On the whole regard to volatility, restriction measure is coupled with widen volatility both in terms of High-Low spread and garch analysis according to most of literature. As element of innovation with respect of previous literature, these ban interventions were not able to reduce systematic risk during 2008.

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