LUISS Guido Carli
LIBERA UNIVERSITÀ INTERNAZIONALE DEGLI STUDI SOCIALI

Department of Economics and Finance
Chair of Capital Markets

Short selling ban

The impacts on the equity market after 2008 financial crisis

SUPERVISOR
Prof. Paolo Vitale

CANDIDATE
Francesco Guidi
Matr. 234681

ACADEMIC YEAR 2020-2021

Acknowledgements

Before proceeding with this dissertation, I would like to thank the Professor Vitale Paolo for his guidance and support during the writing of this thesis.
This project would not have been possible without his help.

Also, I would like to thank my parents who supported me financially.

Finally, I thank myself for the determination and commitment to achieve this goal, for challenging myself, for trying and succeeding.

INDEX:

INTRODUCTION

In 2008, several American financial institutions, most notably the Lehman Brothers Holding Inc., went into a default condition. This event wavered not only American but also European Banks causing a fall in their stock prices and a decrease in overall stability. The Securities and Exchange Commission (SEC) was the first to react to the collapse of the financial system by introducing a ban on the short sales of all the stocks of financial companies and institutions.

The Securities and Exchange Commission introduced the short selling ban with the purpose of trying to reduce the pressure on banks. In their opinion, the short selling ban should have increased the market liquidity and decrease the falling of stock prices.

The actions undertaken by the Securities and Exchange Commission (SEC) were subsequently followed by most of the countries affected by the financial crisis.

The intention of this dissertation is to analyze the measure introduced and review the effects it has produced.

1. SHORT-SELLING

1.1 Definition of short selling and its mechanisms

The definition of short sales, according to the Cambridge English dictionary, is *"the activity of selling shares that you have borrowed, hoping that their price will fall before you buy them back and return them to their owner, so that you make a profit."*

In other words, short selling is a method by which it is possible to make a profit even when the prices of securities are decreasing or are expected to decrease.

There are a number of controversies about the short sales as it is considered to be an unethical technique, the reason for this being that through the short selling of securities the prices suffer from a further negative pressure. These controversies increase further over the course of financial crises.

In 2005, as shown by Dieter, Lee, and Werner (2009), short sales represented a volume of 24% for operations in the New York Stock Exchange (NYSE) and 31% for operations in the Nasdaq. The greatest number of short sales comes from market maker, options market makers or even high frequency traders. On the one hand, in the case of market makers and high frequency traders, they obtain a profit by cater short-term liquidity to the market. On the other hand, options market makers use short sales to hedge their positions.

First of all, in order to better understand the short selling mechanism, it is important to understand the basic transactions of the market.

We will start by analyzing the *buy long* transaction.

In this transaction we buy a security, and we sell it at a later date. In order to generate a profit from this transaction the price at which we purchase the security must be lower than the price at which we sell the security. If this does not happen, we incur in a loss.

This operation is said to be a *cash transaction.*

Cash transactions do not require any type of collateral or loan. Usually, the collateral required for U.S equities is 102% of the stock's value.

There is also a type of transaction called a *margin transaction* in which a third party is usually involved. The third party is termed the *security lender*.

The transactions which involve margin are called *buying on margin* and *short selling.*

The former requires the investor to borrow cash in order to execute the transaction while the latter requires the investor to borrow the security.

Focalizing on the short selling operation, we will now analyze this functioning in more detail.

For the sake of clarity, we will assume a hedge fund is willing to sell short a number of securities. Short selling is usually intended as a single operation even though in reality it consists of several operations.

Firstly, the hedge fund starts to sell securities which are not in its possession. The investor who buys these securities has no knowledge of the fact that this is a short sale. This happens because anyone selling short needs to cover his delivery obligation before it expires. In some cases, there are no delivery arrangements and short sellers let the short position run as long as allowed by market regulations.

Secondly, the same amount of securities sold by the hedge fund are borrowed by the same hedge fund from a security lender underwriting a contract in which the hedge fund must return the securities borrowed at a precise date in the future. (Figure 1)

By lending the securities, the securities lender obtains a daily fee. Moreover, the hedge fund needs to define a collateral, which needs to be at a minimum the same value of the securities borrowed, as a guarantee to the lender.

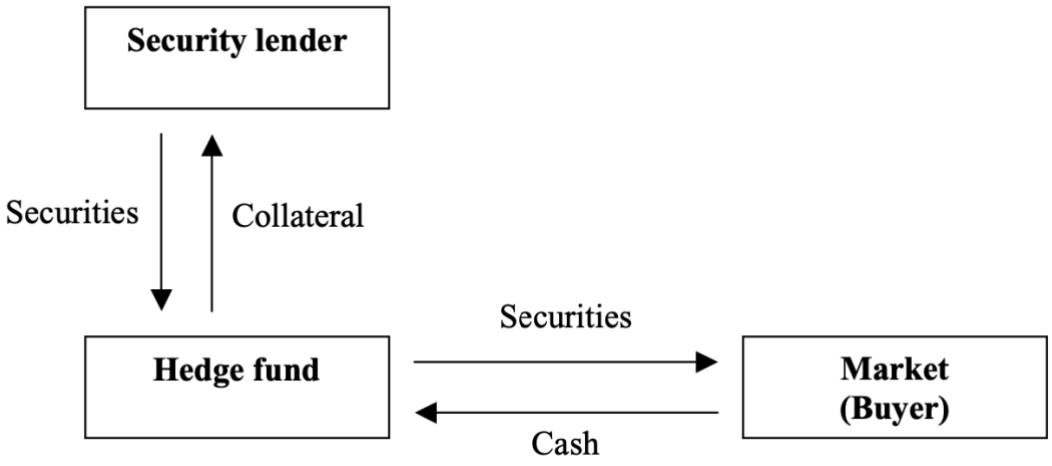

Figure 1. Flows at the beginning of a short sale transaction

Thirdly, the hedge fund can finally hand over the securities to the buyer inclusive of legal ownership, which means that the buyer has even voting rights.

Lastly, the hedge fund repurchases the securities from the market after which these will be returned to the lender and the short position is finally closed. (Figure 2)

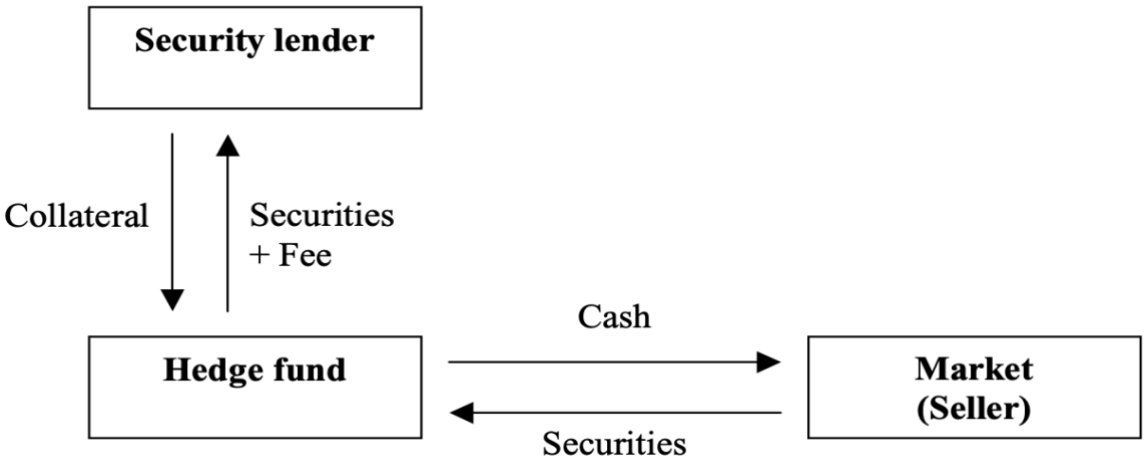

Figure 2. Flows when closing a short sale transaction

Furthermore, short sales can be divided in turn into *covered short sales* and *naked short sales.* When covered short sales occur, anyone who wants to sell borrows the amount of securities which he wants to sell as a guarantee from a lender and he gives them to the buyer. At a later time, the seller buys the same amount of securities from the market to give them back to the lender. In exchange for the securities, the lender can ask for either money or financial instruments to the seller as a guarantee. If money is given as a collateral, the lender accommodates the interest of the buyer at a rate that is lower than the market rate, and if the collateral is given under the shape of financial instruments the lender receives a fee from the seller.

In the case of a naked short sale, the seller cannot count on a security lender to borrow the securities needed. In this type of transaction, the seller does not own the securities he sells to the buyer. For this reason, the seller needs to find a coverage. If it happens that the seller fails to hand over the securities to the buyer on the delivery date, a condition called *failure to deliver* occurs.

One of the criticisms of short selling, in particular of naked short selling, is the fact that brokers comply with the stock price manipulation allowing naked short sales to take place even when there is no possibility of handing over the stocks to the buyers.

On the other hand, naked short sale is also a very useful tool to defend from high levels of price manipulation. In fact, when there are numerous buy orders on a stock without a precise reason, naked short sales are used to level off the market.

To conclude, when we analyze a short sale, we have to take into account that there are two positions, namely a *real* position and a *phantom* position. The former is a position held by the buyer and the latter is the position held by the securities lender.

1.2 Short selling goals

Investors decide to use short selling for three main purposes.

The first is the *speculative purpose.*

If an investor believes that a stock is overvalued, he expects that the price of that stock will go back to its fundamental value, and so in order to generate a profit the investor sells that stock.

The second is the *hedging purpose.*

Hedging has as its primary goal the protection of the investment, unlike speculation.

Hedging is used to cover the losses or to protect the profits. In our case, if an investor is exposed in a long position, he can add a short position with the right size to cover the long one. By doing that, if the price of that stock decreases in the long term the long position is covered by the short position. The same happens if the price increases.

The third is the *arbitrage purpose.*

In this case the investor takes advantage of the temporary mismatch of some stock prices across different markets by opening short and long positions.

1.3 Risks and benefits of short selling

When discussing risks regarding the short selling we must take into consideration the fact that stock prices could potentially go up towards infinity, but they cannot decrease to below zero. This means that when an investor opens a short position, he must be aware of the fact that the risks and losses could, theoretically speaking, be higher than the benefits. To avoid this situation, the seller should consider the positioning of a *stop-loss.* The stop-loss is a useful tool used to contain losses and is triggered as soon as the price reaches a level previously set by the seller.

With that being said, we can now list and analyze the main risks.

First, there is the *market risk.*

Usually, short sales occur because the investor believes that the price of a certain security might decrease. Since sellers borrow the securities which they want to sell, eventually they will have to buy them back. However, if the price of the security has increased instead of decreased the seller will incur in losses.

Another risk is the *recall risk.*

As mentioned above, the seller needs to borrow the securities he wants to sell from a security lender. However, sometimes the security lender needs the securities lent before the delivery date. If the seller cannot find another security lender, he will have to close his short position and buy back the securities at the current market price. When this happens, we are in a *short squeeze* or *market corner*.
The last important risk analyzed is the *liquidity risk.*
This happens when the market is not liquid enough, and so the seller struggles to buy back the shares and close his short position since no one is willing to sell his shares.

Another type of risk occurs when investors are discouraged from buying long by a large number of short positions. This type of risk is more pronounced in periods of market instability when investors are full of tension. This is also one of the criticisms for banning short sales should be according to the opposition.
Furthermore, naked short sales are considered to be very dangerous in periods of market instability since they can be executed very quickly, with a larger size and no coverage required.

Hedge funds, on the contrary, do not want their short position to be known publicly. This condition is explained by a paradox, which states that: "the securities lending market works well, except when everybody wants to use it to sell short, in which case it works very badly".
In other words, hedge funds do not want to divulge their short positions because the costs of borrowing shares increases if everyone is trying to open a short position.

1.4 Positive effects of short selling

Despite negative criticism, there are also benefits arising from short selling activities.
First of all, thanks to short sales, prices of securities are less subject to overpricing and so their market value is much closer to their true value. So, short selling helps to discount prices.
Short selling is also used against unfounded financial bubbles. These financial bubbles are caused by news released, false press leaks, and they can cause in turn an increase in stock prices. Without short selling the emphasis and the length of those events will be greater.
Another important positive aspect that short sales bring to the market is liquidity. In fact, a seller going short on a stock can meet a buy order of a buyer. So, it is possible to say that short selling provides liquidity and makes trading run smoothly.
Lastly, another important benefit of short selling is the fact that it enables numerous arbitrage strategies.

2 SHORT SELLING REGULATIONS

2.1 Introduction of restrictions

After the insolvency of the Lehman Brothers Holding Inc. in 2008 the financial market was fraught with uncertainty and volatility, and investors were starting to panic.
The SEC thought that short sales could exacerbate the situation by increasing the downward pressure on prices causing a further drop. For this reason, on July 2008, the SEC introduced a short selling ban on nineteen stocks to try to stabilize the market.
On September 2008, the SEC introduced the *Temporary Rule 204T* which demands increased delivery requirements on the sales of all US stocks. The introduction of this rule also affected the United Kingdom to the point where the Financial Service Authority (FSA) started a temporary ban on short sales.
In October 2008, the only ban that was still in place is that on naked short sales.
These restrictions were aimed at reducing the issuing or increasing of all types of short sales in financial companies which were publicly quoted. Moreover, every short position which was in excess of 0.25% of the company's standard share capital had to be stated.

2.2 Short selling restrictions across countries

The common assumption is that short sale restrictions can help to decrease the intensity of price downfall, and, for this reason, the current financial systems favor buy long operations rather than short sales.
However, it is also true that short sales help to increase the liquidity in the market, therefore, many regulators decided to introduce regulations aimed at controlling short sales operations rather than completely limit them.
Of course, every market reacts in different ways to short sales and therefore every country imposed different types of regulations as shown in figures 3,4 below.

Country	Short selling permitted?	Short selling practised?	Short selling details and restrictions	Tick rule
Albania	No	No		
Argentina	Yes	No	Only allowed for 16 stocks and cannot last more than 360 days in a row. Securities lending is rare and occurs only between brokers	
Australia	Yes	Yes	Liquid securities only, and maximum 10% of the capital issued may be sold short. Not allowed during takeovers. Disclosure is required	Yes
Austria	Yes	Yes		
Belgium	Yes	No	No organized market for securities lending	
Brazil	Yes	Yes	Disclosure on securities lending	
Bulgaria	No	No	Short selling is prohibited	
Canada	Yes	Yes	Disclosure is required	Yes
Chile	Yes	No	Not market practice for tax reasons and cannot last more than 360 days in a row	Yes
China	No	No	Short selling is not permitted	
Colombia	No	No	Securities lending is not permitted	
Czech Republic	Yes	Yes	Possible but the securities must be bought or borrowed in the market before the settlement	
Denmark	Yes	Yes		
Ecuador	Yes	No	Not market practice for tax reasons	
Egypt	No	No	Short selling is not permitted	
Estonia	No	No	Short selling is not permitted	
Finland	Yes	No	The transfer tax laws place a serious burden on the activity	
France	Yes	Yes		
Germany	Yes	Yes		
Greece	Yes	Yes	Short selling has recently been introduced as part of the ADEX securities lending programme	Yes
Hong Kong	Yes	Yes	Liquid securities and underlying securities of a derivative or an approved exchange-traded fund. Extensive disclosure	Yes
Hungary	No	No	Short selling is not recognized market practice	
India	No	No	Not allowed for foreign investors, but local investors (i.e. retail investors and broker/dealers on proprietary books) are permitted to short sell in the market	
Indonesia	Yes	No		
Ireland	Yes	No	Securities lending is limited	
Israel	Yes	No	Short selling in the market is permitted only under certain conditions and circumstances	
Italy	Yes	Yes		
Japan	Yes	Yes	Disclosure is required	Yes
Jordan	No	No		
Lithuania	No	No		
Luxembourg	Yes	Yes		
Malaysia	No	No	Short selling and securities lending were suspended during the Asian crisis of 1997	
Mexico	Yes	Yes	Liquid equities only, with restrictions for foreign investors. Disclosure required	Yes

Figure 3: Short selling practice in various countries

Country	Short selling permitted?	Short selling practised?	Short selling details and restrictions	Tick rule
Morocco	No	No		
Netherlands	Yes	No	Although permitted, short selling is rarely practised. Disclosure required	
New Zealand	Yes	No	Not market practice for tax reasons	
Norway	Yes	Yes	Reporting required	
Pakistan	No	No	Short selling is not allowed	
Peru	Yes	No	Reporting required	
Philippines	Yes	No	Rules are not clearly defined	
Poland	Yes	No	Although permitted, short selling is rarely practised	
Portugal	No	No		
Russia	Yes	No	Short selling is not a recognized market practice	
Singapore	Yes	No	No restriction, but the exchange may declare a security ineligible for short selling if speculative activity is excessive	
Slovakia	No	No		
South Africa	Yes	Yes		
South Korea	Yes	No	Prohibited to insiders and available only for designated securities. Naked short sales are not permitted	Yes
Spain	Yes	No	Reporting required	
Sri Lanka	No	No	Short selling is prohibited	
Sweden	Yes	Yes	Disclosure required	
Switzerland	Yes	Yes		
Taiwan	No	No		
Thailand	Yes	No	Short selling is allowed only for securities listed in the SET 50 index. Disclosure required	
Turkey	Yes	No	Short selling is allowed only for securities listed in the ISE-100 Index. Disclosure required	
United Kingdom	Yes	Yes		
United States	Yes	Yes	Short selling is permitted	Yes
Venezuela	No	No		
Zimbabwe	No	No		

Figure 4: Short selling practice in various countries

Oftentimes, exchanges allow short sales only in a *plus tick* or a *zero-plus tick* situation.

The plus tick rule, which is also known as *up-tick*, requires the short sale to take place at a price which is higher than the previous transaction in the same security. The zero plus tick rule instead requires the short sale to happen only when the price at which the operation can takes place is equal to the price of the last previous transaction, but at the same time higher than the price of the second previous transaction.

These rules are intended not to allow to sell short a stock which price is already going down thereby preventing a severe downfall in the price of that stock.

3. EFFECTS ON EQUITY MARKETS

3.1 Theoretical predictions

We are now going to review and analyze the different theoretical predictions developed regarding the effects of the short sales restricitons.

After the introduction of the short selling bans, the most common question raised by economists and theoreticians was that on the effect on prices. In fact, there are a number of theories to answer this question.
In 1977, Miller drafted a model in which he foretold that the introduction of a short selling ban would induce prices above their equilibrium level. This is because a short selling ban will also cause stock prices to reflect only the bullish and bearish investors who already own the stocks, while all the bearish investors who do not have the stocks have not the possibility to trade.
In 1987, this model has been refuted by Diamond and Verrecchia. In their model, risk neutral investors are aware of the fact that with a short sale ban the investors with adverse information cannot trade, and so they adapt their valuation. Moreover, this model shows that a short sale ban decreases price discovery and build uncertainties in investments.

According to Bai, Chang, and Wang (2006), when a short selling ban is introduced, the price discovery is delayed and the perceived risk is higher, so risk-averse investors require lower prices in order to have greater expected returns. Therefore, this prediction supports the idea that a short sales ban worsens the drop of prices. This prediction is also supported by the model by Hong and Stein (2003). According to their model, due to the short sales ban all the negative information is accumulated and only when the price of stock starts to decrease the information are revealed causing a further drop in prices.
All of the models explained so far rely on the fact that short sales restrictions could impact the price formation but not the fundamentals of the stocks.

The model developed by Brunnermeier and Oehmke (2013) makes it clear that there is a mechanism which connects bank's insolvency with stock prices declines. This link is the possibility that a bank infringes a leverage constraint. For this reason, in their model predatory pricing is possible because financial institutions are prone to leverage constraints. When the constraints are breached, predatory short sellers can force the bank to sell long term assets with the aim of repaying creditors and prevent a bank run.

In addition, thanks to the model by Bris, Goetzmann and Zhu (2007) we discovered that in countries where the short sale ban is not in force, the negative information is received faster in prices rather than in countries

where the short sale ban is active. In other words, they showed that the introduction of a short sale ban causes a slower price discovery.

Furthermore, according to the analysis of Brunnermeier and Oehmke in 2013 and Liu in 2014, the short sale ban creates a further drop in prices and an increase in volatility. This occurs because investors believe that regulators have better information than them and so they interpret the imposition of a short sale ban as a sign that the stock is overvalued or, in general, close to a decline.

3.2 Empirical analysis

Most regulators reacted to the 2008 financial crisis by enforcing bans on short sales practices.
Restrictions on short sales were imposed and removed in different countries, at different dates and on different sets of stocks with different degrees of sternness.
We will now focus on investigating the effects of the short sales restrictions on the equity markets during the 2008 financial crisis. To do so, we will consider the study conducted by Beber and Pagano in 2011. The sample analyzed consisted of daily data of 16,491 stocks in 30 different countries. These stocks were analyzed from January 2008 to June 2009.
Our attention will be mainly on three different aspects of the market.

The first is the effects on market liquidity. To assess the impact of short sales restrictions on market liquidity we must take into consideration the fact that bid-ask spread could be affected by the different characteristics of the stocks.
The *bid-ask spread* can be used to measure liquidity and it is the difference between the highest price that the buyer is willing to pay for a certain security, namely *bid*, and the lowest price that the seller is willing to receive for a certain security, namely *ask.*
The result of the study on market liquidity during the short sales bans show that there is a correlation between the introduction of the ban and a subsequent decrease in market liquidity, and an increase in the bid-ask spread. Moreover, an increase in market liquidity was recorded when there was the obligation to communicate every short sale. These negative effects on liquidity are more severe for stocks with a small market capitalization.

The second aspect of the market analyzed is price discovery.
As we saw earlier, thanks to the theoretical prediction of Diamond and Verrecchia (1987), when traders with negative information cannot trade because of short sales restrictions, price discovery is slowed down. Beber

and Pagano also confirm this thesis in their study. They came to the conclusion that restrictions on short sales slows price discovery down, particularly when negative news is ignored.
They also discovered that price performance is not increased when short sales bans are imposed.

The third aspect analyzed is overpricing. If we take into account the long-term growth, the overpricing of stocks turns out to be a problem because, while the market corrects itself, resources are wrongly allocated towards overpriced securities or industries.
According to Miller (1977), short selling restrictions cause a condition called overpricing. Overpricing occurs when prices rise over the equilibrium level. The prediction by Miller takes in consideration the fact that when short selling bans are imposed, the stocks prices will reflect only the sentiment of bearish or bullish investors. The investors who do not own the stocks are barred from trading.
On the contrary, a study conducted by Diamond and Verrecchia (1987) does not support the model developed by Miller. In Diamond and Verrecchia's model, investors know that investors with negative information are excluded from trading. For this reason, they adjust their view of the market leading stocks prices to maintain the equilibrium level.
Therefore, when dealing with risk-averse investors it is not possible to identify a precise consequence of short selling bans. In fact, it is possible to state that the effect of a short selling ban on stock prices is ambiguous.

We can now go into more detail of the empirical analysis based on the study conducted by Beber and Pagano (2011).
The data taken into consideration comes from 16,491 stocks during the period that goes from January 2008 to June 2009. The data set derived from these stocks includes a sample of 5,143,173 stock-day observations, and the parameters considered are the volumes, short sale bans features, bid and ask prices observed at the closing of the market, and imposing and lifting dates of the bans.

Thanks to the use of Figure 5 and 5 bis we can better understand the structure of the data set used.
As we can see, in October 2008, most of the bans, both on naked and covered short sales, were in force, corresponding to 31.5% of the sample stocks. It is also possible to see that some countries set disclosure regulations along with short sales bans. In other countries, instead, information was disclosed only if the short position represented more than 0.25% of a share.

Figure 5: Structure of the data set

Structure of the Data Set

This table describes the main characteristics of the short-selling bans for our international sample of countries.

Country	Ban Start Date	Partial Ban Lift Date	Ban Lift Date	Scope of Ban	Disclosure	Duration[a] (Days)	Day/ Stock Observations	Day/ Stock Observations with Ban	Fraction of Day/ Stock Obs. with Ban	Number of Stocks on October 1, 2008	Number of Stocks with Ban on October 1, 2008
Australia	September 22, 2008	November 18, 2008	May 25, 2009	All stocks	All stocks	245	357,003	58,594	16.4%	956	956
Austria	October 26, 2008			Financials	Financials	240	31,094	660	2.1%	89	
Belgium	September 22, 2008			Financials	Financials	274	47,479	1,084	2.3%	120	6
Canada	September 19, 2008		October 8, 2008	Financials	All stocks	19	385,912	154	0.0%	1,136	11
Czech Rep.				No ban			9,113		0.0%	25	
Denmark	October 13, 2008			Financials		253	60,408	7,099	11.8%	171	–
Finland				No ban			52,343		0.0%	145	
France	September 22, 2008			Financials	Financials	274	269,636	3,454	1.3%	719	19
Germany	September 20, 2008			Financials		276	318,318	2,124	0.7%	845	12
Greece	October 10, 2008		June 1, 2009	All stocks	All stocks	234	102,822	41,217	40.1%	273	
Hong Kong				No ban			403,900		0.0%	1,058	
Hungary				No ban	All stocks		11,283		0.0%	31	
Ireland	September 19, 2008			Financials	Financials	277	17,343	736	4.2%	50	4

Figure 5 bis: Structure of the data set

Israel				No ban			55,858		0.0%	170	
Italy	September 22, 2008[b]	January 1, 2009	June 1, 2009	Financials, then all		252	138,240	63,704	46.1%	360	53
Japan	October 30, 2008			All stocks	All stocks	236	776,840	362,625	46.7%	2,294	2,294
Luxembourg	September 19, 2008			Financials		277	11,588	2,231	19.3%	41	18
Netherlands	September 22, 2008		June 1, 2009	Financials	Financials	252	32,546	1,242	3.8%	117	8
New Zealand				No ban			30,382		0.0%	102	
Norway	October 8, 2008			Financials		257	73,303	1,945	2.7%	227	
Poland				No ban			24,485		0.0%	79	
Portugal	September 22, 2008			Financials	All stocks	274	17,277	1,311	7.6%	53	9
Singapore				No ban			144,116		0.0%	426	
Slovenia				No ban			7,044		0.0%	21	
South Korea	October 1, 2008	June 1, 2009		All stocks		265	208,199	98,592	47.4%	616	616
Spain	September 24, 2008			All stocks	Financials	272	64,112	30,137	47.0%	173	173
Sweden				No ban			98,102		0.0%	309	
Switzerland	September 19, 2008		January 16, 2009	Financials		119	128,907	56,181	43.6%	381	381
United Kingdom	September 19, 2008		January 16, 2009	Financials	Financials	119	575,811	2,188	0.4%	1,826	33
United States	September 19, 2008		October 8, 2008	Financials	All stocks	19	1,539,215	10,015	0.7%	4,253	776
Totals							5,992,679	745,293	12.4%	17,066	5,369

[a] As of June 23, 2009.

In the analysis conducted and to better understand the effects of short sales restrictions, a regression has been made in which short sales restrictions are measured by way of two main dummy variables, called *Naked Ban* and *Covered Ban.* The former is a mild variable while the latter is a strict variable. When the naked short sales are prohibited and the covered bans are in force, the Naked Ban variable is equal to one. Instead, other than these restrictions, the Covered Ban variable is equal to one also when the covered short sales are prohibited. There is also a third dummy variable called *Disclosure.* This variable equals one when investors who take short positions are required to report their trades and 0 when they do not have to.

We are now going to continue our analysis by investigating on the correlation between bid-ask spreads and short sales bans. In particular, we will check if the correlation exists when controlling different types of bans, different stock characteristics and other aggregate factors. In Figure 6, we can see that the dependent variable is represented by the percentage quoted bid-ask spread while the above-mentioned dummy variables are used to measure the short sales restrictions.
In column 1 of Figure 6 it is possible to see that as soon as the naked short sales were banned, the bid-ask spread increased by 1.28 percentage points. Almost the same happened when the covered short sales were banned, causing an increase of 1.98 percentage points in the bid-ask spread. Moreover, it is possible to state that there is a negative correlation between the bid-ask spread and the requirement to disclose the short positions. In fact, we can notice a 0.65 percentage points decrease in bid-ask spread when disclosure is required.

Thanks to the regression, we find that the coefficients of the dummy variables Naked Ban and Covered Ban are positive at the 1% level, while the coefficient of the dummy variable Disclosure is negative. In general, all the coefficients of these dummy variables are different from zero at the 1% level.

Column 1 of Figure 6 has been estimated through an Ordinary Least Square estimator (OLS), robust standard errors which have been clustered at the stock level, and stock-level fixed effect.
In column 2 the regression has been estimated for a subset of only financial stocks using the same method used to estimate column 1.
If we analyze the results of column 2, we can notice, on the one hand, that the coefficient of the dummy variable Covered Ban estimated on the subset of financial stocks only is not statistically different from the coefficient resulting from the estimation on the overall sample for the same dummy variable. On the other hand, the coefficient of the dummy variable Naked Ban calculated on the subset of financial stocks only is significantly smaller than the coefficient estimated on the overall sample. This is further evidence of the fact that short selling restrictions cause an increase in bid-ask spread.
In column 3 the estimation has been made with the same method used in column 1 but with an AR (1) correction for the error term.

If we compare the results of column 3 with those of column 1, we can see that the coefficients of the dummy variables are smaller in absolute value even if they maintain their coefficient different from zero at the 1% level.
Estimates for volatility among the explanatory variables are shown in column 4. In this particular case, volatility has been calculated on 20 trading days as the rolling standard deviation of returns. As in column 3, the coefficients of the dummy variables are smaller in absolute values, and different from zero at the 1% level. Also, the coefficient of volatility is positive, which confirms the idea that an increase in risk also increases the bid-ask spread.

Since the countries taken into consideration in the first four columns include countries that impose short sales bans on stocks and countries that do not have restrictions on short sales, the coefficient estimated could be affected by the changing differentials between bid-ask spread across countries.
In columns from 5 to 7, they have tried to solve this matter by adding 12 countries which imposed short sales restrictions only on financial stocks.
By comparing the estimates of column 4 with those of column 5, we notice that with a smaller sample the effects recorded are greater compared to a larger sample. Moreover, short selling restrictions cause an increase in bid-ask spread and a decrease in disclosure when considering a smaller sample.

Given the same subsample, if we add day dummies variables, it is possible to scan for market developments which are related to the financial crisis. In order to facilitate the calculation of the estimate of both fixed effects and day effects, first we have to consider zero mean variables at the stock level and thereafter carry out a panel regression with day fixed effects.
The result is that the estimated variables' coefficients of column 6 are significantly smaller than those in column 5, even if the statistical significance and their signs remain unchanged.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Countries	All	All	All	All	Partial Bans	Partial Bans	Partial Bans
Constant	3.93***	3.76***	4.97***	4.90***	4.20***	0.0005***	0.71***
	(1993.65)	(749.94)	(3290.72)	(3092.86)	(997.52)	(3.71)	(42.76)
Naked ban	1.28***	0.86***	0.89***	0.90***	2.43***	0.23***	0.56***
	(76.04)	(6.50)	(29.31)	(29.60)	(20.06)	(3.99)	(2.82)
Covered ban	1.98***	2.14***	1.63***	1.63***	2.75***	0.46***	1.19***
	(150.74)	(14.84)	(57.44)	(57.61)	(24.75)	(2.39)	(3.66)
Disclosure	−0.65***	−0.27**	−0.37***	−0.37***	−1.79***	−0.50***	−0.55*
	(−37.84)	(−1.84)	(−11.54)	(−11.59)	(−15.10)	(−2.25)	(−1.75)
Volatility				0.99***	−0.36***		
				(35.84)	(−14.65)		
Day fixed effects	No	No	No	No	No	Yes	Yes
Stock-level or pair-level(+) fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes+
AR(1) disturbances	No	No	Yes	Yes	No	No	No
Methodology	Panel	Panel	Panel	Panel	Panel	Panel	Matching
Number of observations	5,143,173	878,279	5,126,682	5,124,349	3,188,903	3,188,903	45,588
Included stocks	All	Financials	All	All	All	All	All
Number of stocks (pairs in column 7)	16,491	2,718	16,456	16,452	10,253	10,253	1,566

Figure 6: Regression analysis. Bid-ask spreads and short selling bans

Analyzing the results obtained from column 1 to 6, we can come to the conclusion that the inclusion in the study of observations distant from the imposition date of restrictions can impair the effects of short sales bans. This does not happen in column 7, which shows studies taking into account the 50 days before and after the imposition of the short sales regulations, and also features fixed effects for every pair of matched stocks and day effects. In this column, the results obtained are in line with the results obtained by the panel regression. The difference is that in this column the impact of restrictions on short sales is greater. Also, the coefficient estimated in column 7 are doubly larger than column 6. At the same time, the coefficient to the dummy variable Disclosure is almost the same in both column 6 and 7.

Beber and Pagano decided to follow Boehmer, Jones, and Zhang (2009) to do the regression. They matched each stock subject to restrictions with the stocks exempted from the restrictions which are traded in the same country. These two elements are also matched with the option listing status, which has almost the same stock price and market capitalization.

Another aspect to which we must pay attention is the potential endogeneity of short sales bans. This condition occurs when policy makers impose restrictions when the stocks are in a condition of low liquidity, making it seems like the correlation between illiquidity and short sales bans is not a causal relationship.
To give an estimation of this condition, Beber and Pagano used an instrumental value (IV) regression. The first stage of this regression is a linear probability model which helps to determine the likelihood of the restrictions, and the second stage is used to measure the effects of the restrictions on liquidity.
We will concentrate on two short sales restrictions imposed on financial sectors experiencing different conditions and at different points in time. It is now very important to identify the right set of variables to be included in the first stage. These variables should be correlated with the imposition of the ban, but at the same time they should not be correlated with the residuals of the bid-ask spread regression. The instruments chosen must be market-wide variables and they must vary over time to evade the condition of collinearity with the stock-level fixed effects.

The instrument identified for this analysis is the lagged values of the country-level credit default swap (CDS) spreads for financial stocks and of the financial stress index proposed by Balakrishnan, Danninger, Elekdag and Tytell (2009). The country-level credit default swap (CDS) spread is a market-based and timely assessment of insolvency risk for the financial sector, while the financial stress index is focused on the systematic risk derived from financial institutions.
It is known that countries which have a greater risk are more prone to impose restrictions on short sales as a protection. Moreover, we expect countries in which banks are subject to systematic risk to impose short sale bans.
In the first stage of the analysis, both the variables make register a strong explanatory power. Furthermore, when the variables are used in the instrumental value (IV) panel regression as instruments, the coefficients are positive and again, short sales restrictions are correlated with illiquidity.

During the financial crisis regulators imposed a short sales ban with the purpose of trying to prevent the condition of underpriced stocks and also to reduce the effects of the panic created by the default of financial institutions. According to the model developed by Miller (1977), when optimistic investors are contained by restrictions on operations, uncontrolled short sales will provoke a collapse in stock prices.
We will now analyze the effects of short selling regulations on stock prices by comparing stocks affected by short sales bans with stocks which are not subject to any limitation.

It is possible to observe the first evidence by confronting countries in which the restrictions were not imposed on every financial security, and the post-ban median cumulative excess returns for stocks affected by restrictions with stocks not affected by restrictions. In this case, stock's excess returns are calculated as the

difference between stock returns and their respective country equally weighted market indices. As a result, the median cumulative excess returns of stocks subject to a covered ban were higher than the median cumulative excess returns of stocks which were not affected by the bans. This result happened only in U.S., where the effects of the ban on stocks prices could have been altered by the TARP announcement. In fact, when comparing the same data in other countries, we notice that the value of the median cumulative effect for stocks affected by the ban is very similar to the median cumulative excess return for stocks exempted from restrictions.

To further support these implications, we can refer to Figure 7. As this figure shows, there is a regression on the above-mentioned dummy variables Naked Ban, Covered Ban and Disclosure. Also, there is the addition of stock-level fixed effects to control the characteristics of risks of individual stocks.
As far as the dataset in figure 7 is concerned, we know that columns 1 and 2 relate to the U.S. while columns 3 and 4 relate to other countries. In this case, the excess returns are estimated as the difference between raw returns and the respective equally weighted market indices.
In this figure, there are two distinct methods used to estimate the effects of short sales bans. On the one hand, columns 1 and 3 report the standard panel estimates for U.S. stocks that were not affected by short sales restrictions and for stocks with partial restrictions in other countries. On the other hand, in columns 2 and 4, the method used to estimate the effects of the short sales bans is an event-study method with a period of observation of 50 days before and after the imposition of the ban, both for U.S. stocks and other countries' stocks.

	(1)	(2)	(3)	(4)
Constant	0.0583***	0.0022***	–0.0017***	–0.0008***
	(29.82)	(10.78)	(–58.50)	(–1.77)
Naked Ban			–0.0026	–0.0081***
			(–0.67)	(–3.13)
Covered Ban	0.0611***	0.0041***	–0.0004	–0.0025
	(18.82)	(3.77)	(–0.12)	(–0.67)
Disclosure			0.0066	–0.0006
			(1.17)	(0.17)
Stock-Level Fixed Effects	Yes	Yes	Yes	Yes
Weekly Fixed Effects	Yes	Yes	Yes	Yes
Countries in the sample	U.S.	U.S.	Countries with partial ban except U.S.	Countries with partial ban except U.S.
Methodology	Panel data	Event study	Panel data	Event study
Number of observations	245,631	43,973	299,980	7,695
Number of stocks	3,717	1,354	5,369	240

Figure 7: Stock returns and short sales bans

In particular, each stock which is affected by the ban is compared with the stocks not affected by the ban in the same country and also with the same option listing status which has almost the same market capitalization and stock price.

As a result, we notice that in this analysis the U.S. stock market gave positive and substantial feedback.

The results are different for other countries in which the partial ban was in force. In fact, in the panel estimates of column 3, the ban's coefficients are not considerably different from zero. Moreover, as shown in column 4, the covered ban coefficient is not meaningfully different from zero and the naked ban coefficient is substantial and negative.

4. SUMMARY

The purpose of this dissertation was to analyze the effects of short selling bans on the equity markets during the financial recession of 2008. To do so, we used daily data of 16,491 stocks to analyze mainly the effects on liquidity and stock prices.

From the research, we can conclude that stock price decline is slowed only for U.S. stocks while for other countries the restrictions on short sales even worsen the decline of stock prices.
To confirm these results, an econometric analysis has been made on the entire sample. From this analysis, it turned out that naked short sales bans did not have any considerable effect on the stock prices performances after the imposition. Moreover, evidence suggests that covered short sales bans make the situation worse.
For these reasons, it appears that short sales bans do not support stock prices, failing to comply with the intentions of regulators.

Furthermore, the analysis shows that the restrictions on short sales enforced throughout the financial crisis substantially reduced the market liquidity.
The restrictions caused an increase in the transactions costs which was measured by the bid-ask spread.
When talking about low capitalization stocks, we observed that the negative effects of short sales restrictions are higher for these, especially for low capitalization stocks with high volatility. Additionally, the bid-ask spread is increased in markets in which these low capitalization stocks are present.
The reduction of liquidity due to the imposition of the short sales restrictions caused additional damage owing to the fact that, in those times, there was already a lack of liquidity.

In conclusion, in addition to all the negative effects produced and analyzed of the short selling bans, the upside is that a large amount of data has been collected that will definitely be useful in the future in order to avoid making the same mistakes as in the past.

REFERENCES

Battalio R., Mehran H. & Schultz P. (2011). Market Declines: Is Banning Short Selling the Solution?. Federal Reserve Bank of New York Staff Report. 1-18

Battalio R. & Schultz P. (2011). Regulatory Uncertainty and Market Liquidity: The 2008 Short Sale Ban's Impact on Equity Option Markets. *The Journal of Finance*. 2013-2053

Beber A., Fabbri D. & Pagano M. (2014). Short-Selling Bans and Bank Stability: Evidence from two Crises. *CSEF Working Papers*. 1-35

Beber A. & Pagano M. (2013). Short-selling bans around the World: Evidence from the 2007-2009 Crisis. *The Journal of Finance*. 343-381

Boehmer E., Jones C. M. & Zhang X. (2013). Shackling Short Sellers: The 2008 Shorting Ban. *The Review of Financial Studies*. 1363-1400

Cambridge Dictionary. https://dictionary.cambridge.org/it/dizionario/inglese/short-selling , last access July 10 2021

Lhabitant S. (2012). Understanding the Tools Used by Hedge Funds. *Handbook of Hedge Funds.* 121-142

Marsh I.W. & Payne R. (2012). Banning short sales and market quality: The UK's experience. *Journal of Banking and Finance*. 1975-1986