Short-sales constraints and market quality: Evidence from the 2008 short-sales bans

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Abstract

Using data from fourteen equity markets, this study empirically examines the impact of the 2008 short-selling bans on market quality. Evidence indicates that restrictions on short-selling lead to artificially inflated prices, indicated by positive abnormal returns. This is consistent with Miller's (1977) overvaluation theory and suggests the bans are effective in temporarily stabilizing prices in struggling financial stocks. Market quality is reduced during the restrictions, as evidenced by wider bid-ask spreads, increased price volatility and reduced trading activity. While these effects are strong, regulators may view the deterioration in market quality as a necessary by-product of the bans to maintain prices and protect investors.

Keywords: Short-sale constraints, Short-selling

JEL classification: G10, G14

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1. Introduction

Beginning 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. Globally, governments responded by announcing drastic rescue plans for distressed financial institutions. As the financial crisis worsened and with share prices falling sharply, financial market regulators turned to a familiar scapegoat, imposing tight new restrictions on the short-selling of financial stocks. The restrictions commenced on September 19, 2008, with regulators in the United Kingdom banning short-selling (both covered and naked)[1] on leading financial stocks. 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 markets soon followed and announced their own bans: Australia and Korea banning short-selling on all stocks; Canada, Norway, Ireland, Denmark, Russia, Pakistan and Greece banning short-selling on leading financial stocks; France, Italy, Portugal, Luxembourg, The Netherlands, Austria and Belgium banning naked short-selling on leading financial stocks; and Japan banning naked short-selling on all stocks (See Appendix and Table A-1 for details of changes worldwide).

The view of regulators is homogenous with respect to the rationale behind the restrictions. For example the Financial Services Authority (FSA) CEO Hector Sants notes that action was taken to "protect the fundamental integrity and quality of markets and to

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[1] A naked short-sale is where the participant, either proprietary or on behalf of a client, enters an order in the market and does not have in place arrangements for delivery of the securities. The other form of a short-sale, covered short-sale, differs in that arrangements are in place, at the time of sale, for delivery of the securities.

guard against further instability in the financial sector".[2] Callum McCarthy, Chairman of the FSA, notes "(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."[3] The SEC had similar concerns noting "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".[4] Overall the comments of regulators suggest that the bans are intended to maintain fair and orderly markets by preventing speculators from placing excessive downward pressure on troubled financial firms.

The purpose of this study is to empirically examine the impact of the 2008 short-selling bans on the market quality of stocks subject to the bans. Thus, in doing so we also examine whether short-selling bans achieve their desired outcome. We use data from fourteen equity markets around the world to examine market quality in terms of abnormal returns, stock price volatility, bid-ask spreads and trading volume. To control for market wide factors or different shocks affecting the market, we compare banned stocks to a group of non-banned stocks. We also examine statistics for similar stocks in markets where short-selling restrictions were not imposed.

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[2] FSA statement on short positions in financial stocks, September 18, 2008, FSA/PN/102/2008.
[3] Callum McCarthy: Comments on short positions in financial stocks, September 18, 2008, FSA/PN/103/2008.
[4] SEC RELEASE NO. 34-58592 / September 18, 2008.

While short-selling has long been a contentious issue (see Chancellor, 2001), relatively little or no empirical evidence is available on the impact of short-sale restrictions on market quality. The 2008 short-sale bans provide an ideal setting for these tests because it provides a binding constraint. Thus, we do not rely on proxies for short-sale constraints, as in previous research. The remainder of this paper is organized as follows. Section 2 reviews the literature on short-sale constraints and Section 3 develops a set of testable hypotheses. Section 4 describes the data and methodology used in this study. Section 5 reports the empirical analysis of the impact of the bans on returns, liquidity and stock price volatility. Section 6 provides a summary of the main results and conclusions.

2. Literature Review

The literature on short-sales constraints 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 the beliefs of only optimistic investors. Diamond and Verrecchia (1987) model the effects of short-sale constraints and speed of adjustment, to private information, on prices. An important implication of this model is short-sale constraints do not bias prices upwards if investors are rational. Rather, this model predicts short-sale constraints will reduce the speed of adjustment to negative information. Isaka (2007) provides empirical support for this hypothesis.

Consistent with Miller's (1977) hypothesis, the empirical evidence which utilizes proxies of short-sale constraints uniformly indicates that implementing short-sale

constraints leads to overvaluation.[5] Chang et al. (2007) offer the only direct examination (without the need for a proxy) of the relationship between *covered* short-sale constraints and stock price overvaluation on the Hong Kong Stock Exchange (HKEx). Consistent with Miller (1977), significant negative cumulative abnormal returns are reported after stocks are added to the list of designated securities for covered short-sales.

An implication of these studies is that short sellers remove the upward bias from stock prices. Diamond and Verrecchia (1987) suggest that, since short sellers do not have the use of sale proceeds, market participant's never short for liquidity reasons, which *ceteris paribus* implies relatively few uninformed short sellers. Empirical studies confirm heavily shorted stocks under-perform, implying short sellers are informed (see *inter alia* Desai, Ramesh, Thiagarajan and Balachandran, 2002, Jones and Lamont, 2002, Asquith, Pathak and Ritter, 2004, Boehme, Danielson and Sorescu, 2004, Diether Lee and Werner, 2008, Boehmer, Jones and Zhang, 2008,).

The relationship between short-sales and stock return volatility is a contentious issue and receives limited academic attention. Scheinkman and Xiong (2003) develop a behavioral model with heterogeneous investors that exhibit overconfidence to private information. Contrary to the common belief that short-sale constraints de-stabilize the market, Scheinkman and Xiong (2003) predict a significant decrease in trading volume and price volatility when short-sale constraints are lifted. This is consistent with Diether, Lee, and Werner (2008), who document that short sellers tend to be contrarian traders, with a stabilizing effect on the market. Zheng (2008) samples intraday short-sales

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[5] Examples of proxies include Figlewski (1981) and Senchack and Starks (1990) who use changes in short interest, Chen, Hong and Stein (2002) employ declines in breadth of ownership, Danielsen and Sorescu (2001) utilize option introductions, Ofek and Richardson (2003) use stock option lockups, Jones and Lamont (2002) employ the cost of short-selling and Haruvy and Noussair (2006) use experimental markets.

transaction data from the NYSE to examine short-selling around company earnings announcements and finds that where the earnings announcement is above expectations, short sellers act as contrarians.

Ho (1996) documents that the daily volatility of stock returns increases when short-sale constraints are imposed. Chang et al. (2007) however, using a direct measure of short-sale constraints, find the volatility of stock returns increases when the constraints are lifted.[6] Consistently, Henry and McKenzie (2006) find that the Hong Kong market exhibits greater price volatility following a period of short-selling and that volatility asymmetry is exacerbated by short-selling. Alexander and Peterson (2008) and Diether, Lee and Werner (2009) both examine the removal of price tests (short-sale constraint) and observe insignificant or weak increases in daily and intraday return volatility.

Evidence on short-sale constraints and liquidity is relatively unexplored. Alexander and Peterson (2008) and Diether, Lee and Werner (2009) are the only exceptions, and find that short-sale constraints have a limited effect on market liquidity. A reduction in constraints increases short-sale activity, but both find that the restriction results in only slightly wider bid-ask spreads.

3. Hypotheses

The disagreement models (e.g. Miller 1977) predict that short-selling bans prevent at least some pessimists from taking a bearish position in a financial stock. Thus, short-selling bans should cause prices of affected stocks to rise, leading to overvaluation

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[6]   Ho (1996) utilizes an event where the Stock Exchange of Singapore suspended trading for three days from December 2, 1985 to December 4, 1985. When trading was resumed on December 5, 1985, contracts could only be executed on an immediate delivery basis (i.e., delivery and settlement within 24 hours) which implies that short-selling was severely restricted.

relative to fundamentals. Empirical evidence is consistent with this notion and suggests a high level of short-selling is followed by negative abnormal returns and short-selling restrictions are related to positive abnormal returns. However, while the empirical evidence is unambiguous, there are various conflicting factors that could affect the magnitude of the results surrounding the 2008 short-selling bans. Therefore we test the following hypothesis:

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

Theoretical models also attempt to explain the volatility of stock returns when short-sales constraints are imposed. Abreu and Brunnermeier (2002, 2003) and Scheinkman and Xiong (2003) document short-sales constraints can be a direct cause of, or at least a necessary condition for, bubbles and excessive volatility. Hong and Stein (2003) develop a heterogeneous agent model linking short-sales constraints to market crashes. In their model, if certain investors are constrained from selling short, their accumulated un-revealed negative information will not be impounded until the market begins to drop, which further aggravates a market decline and leads to a crash. Bai, Chang and Wang (2006) predict higher price volatility when short-selling is restricted as better informed investors are held out of the market and less informed investors perceive the risk as considerably higher. 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 are willing to trade on their negative views but are prevented due to short-selling constraints. The evidence in Diether, Lee, and Werner (2008) indicates that short-sales are extremely prevalent and in late 2007 approximately 40% of trading volume involves a short seller. Intuitively this suggests that a short-selling ban could worsen market liquidity in terms of both trading activity and bid-ask spreads. Therefore we test the following two hypotheses:

Hypothesis 3: Bid-ask spreads widen in the banned stocks when the short-selling ban is imposed.

Hypothesis 4: Trading volume decreases in the banned stocks when the short-selling ban is imposed.

4. Data and Method

To examine the impact of the 2008 short-selling bans on the market quality of banned stocks we obtain Reuters data provided by the Securities Industry Research Centre of Asia Pacific (SIRCA). We use daily level data over the period January 1, 2007 to December 31, 2008. Table A-1 in the appendix documents twenty-five markets that experienced some form of short-selling ban during 2008. Due to data limitations certain markets are excluded from our analysis including Austria, Denmark, Iceland, Ireland and

Luxembourg. Other markets are removed because short-selling bans applied to all listed stocks leaving no suitable control sample (Australia, Greece, Russia, Korea, Pakistan and Switzerland (SWX and SFBC)). This left eleven markets that imposed a ban on the short-selling of a restricted group of stocks (usually financial stocks). Of these eleven markets, five imposed a covered short-selling ban (U.S., UK, Canada, Switzerland (SWX Europe) and Norway) and the remaining six markets imposed a ban on naked short-selling (The Netherlands, Belgium, France, Germany, Italy and Portugal).

For robustness we also collect data from Japan, Sweden and Hong-Kong. These markets are used as there were no bans placed on stocks over the same period as the U.S. short-selling bans. We examine financial stocks in these markets as our treatment sample over the same period as the U.S. ban to provide an indication of changes in market quality in markets with no bans imposed. Therefore we have three distinct groups representing different levels of short-selling constraints. The first group with tight restrictions imposed (short-selling ban on financials), the second group with less restrictive bans imposed (naked short-selling ban on financials) and the third group with no bans imposed.

To test for changes in abnormal returns we calculate cumulative abnormal returns for each market around their respective event dates. Brown and Warner (1985) find that the market model and market-adjusted model perform well under a number of circumstances and perform better than more complex methods. Thus, cumulative abnormal returns (CARs) are calculated using the market-adjusted model and the market model, defined as:

$$CAR_i^a(t_1, t_2) = \sum_{t=t_1}^{t_2} (R_{it} - R_{Mt}), \tag{1}$$

$$CAR_i^m(t_1, t_2) = \sum_{t=t1}^{t2} \left[R_{it} - \left(\hat{\alpha}_i + \hat{\beta}_i R_{Mt} \right) \right],$$ (2)

where R_{it} is stock i's return on day t, and R_{Mt} is the equal weighted return on a portfolio of stocks in the control sample (described below) from the corresponding market on day t (see Table A-2 in the Appendix for a list of control samples). The coefficients $\hat{\alpha}_i$ and $\hat{\beta}_i$ are estimates of the intercept and slope coefficients in the OLS market model when R_{it} is regressed on R_{Mt} in the pre-event estimation window. The estimation window begins July, 2007 and ends in August, 2008. We test for significance using both a parametric t-test and non-parametric Wilcoxon sign-rank test.

To examine changes in market quality measures before and during the short-selling ban, we first select 30-trading days prior (subsequent) to the short-selling ban as the pre-event period (post-event period). If the ban was in place for less than 30-trading days we use the duration of the ban as the post-event window. Any changes documented could be driven by market wide factors or different shocks affecting the market. To control for these effects we construct a control sample which includes stocks from a major index in the corresponding market not affected by the short-selling restrictions. Table A-2 in the appendix lists each market and the corresponding control sample used. For example, in the U.S., we use the NYSE composite index which covers all stocks listed on the NYSE. We remove any stocks subject to the ban and take the largest 300 remaining stocks by market capitalization.

To examine whether market quality measures change for treatment stocks relative to control stocks, we first provide summary statistics of the pre- and post-event averages for each variable. We calculate the percentage difference between the pre- and post-event

averages for each variable (labelled Difference) in both the treatment and control sample.
We then take the difference of the difference between the treatment and control sample
(labelled Difference-in-difference). To test for statistical significance and to control for
other possible confounding factors we pool together the treatment and control sample to
estimate the following cross-sectional regressions for each market for each day in the pre-
and post-event period surrounding each event:

$$Y_{it} = \beta_{0t} + \beta_{1t} \, Period_i + \beta_{2t} \, Sample_i + \beta_{3t} \, Ban_i + \varepsilon_{it} \qquad (3)$$

where Y_{it} is the average measure of interest for stock i during interval t.[7] Ban_i is a dummy
variable equal to one if the stocks are subject to a short-selling ban, and zero otherwise.
$Period_i$ is a control dummy variable equal to one if the observation lies in the post-event
period, and zero otherwise. $Sample_i$ is a control dummy variable equal to one if the
observation belongs to the treatment sample, and zero otherwise. To control for variation
between stocks and dates we include calendar day- and stock-fixed effects in the pooled
regressions (Diether, Lee and Werner, 2008). To address concerns over serial correlation
and cross-correlation we estimate standard errors that cluster by both calendar date and
stock (Thompson, 2009).

To test the impact of the bans on market quality we examine price volatility and
liquidity. We measure price volatility (denoted H-L) as ln (daily high / daily low).[8] To
examine the impact on liquidity three measures of liquidity are examined. The first is the
relative bid-ask spread, calculated as the quoted closing bid-ask spread (difference
between prevailing best bid and ask quotes), divided by the prevailing quoted closing

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[7] Initial tests on the dependent variables indicate the variables are not normally distributed. To rectify we
     take the natural logarithm of each variable and use this as the dependent variable.
[8] We also calculate volatility as [ln (closing price on day t / closing price on day t-1)]^2. Results lead to
     identical conclusions, and are thus omitted for brevity. These results are available upon request from the
     authors.

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midpoint. Relative bid-ask spreads are used as they control for stock price variation, both over time and across stocks. We also examine volume, measured as total volume traded; and turnover value, measured as the currency value of traded volume.

5. Results

5.1 Abnormal Returns

Table 1 reports ARs and CARs, calculated using the market model and market-adjusted model, around the event date (denoted day 1) for various windows before and after all events. Figures 1-6 represent the results graphically and separated by the level of short-selling constraint imposed (based on the market model).[9] Figure 1 presents daily AR's for the markets subject to a *covered* short-selling ban. During the pre-event period (10-trading days), abnormal returns are mixed with several strong negative abnormal returns leading into the restrictions. Surprisingly, on the day preceding the bans (-1) there are positive abnormal returns in Canada and the U.S., which are significant at the 5% level. We attribute this to the market-wide naked short-selling ban which is announced and implemented on this day in the U.S.[10] On the event day, prices impound the implementation of the short-selling bans with the U.S., Canada, UK and Switzerland all experiencing positive abnormal returns of at least 2%. On the following days, the majority of abnormal returns are positive for all markets. This is highlighted in Figure 2 which plots the CAR's. Table 1 documents that four of the five markets subject to the covered ban experience positive abnormal returns over the post-event (10 trading days)

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[9] The results from the market-adjusted model are qualitatively similar to the market model, thus only the results of the market model are discussed and presented in Figures 1-6.

[10] The SEC naked short-selling ban was implemented 17 September, 2008, and restricted naked short-selling of all U.S. stocks, effective 18 September, 2008.

period. Over this period, abnormal returns are 5.43%, 9.37%, -2.28%, 12.71% and 11.33% respectively in the U.K, U.S, Norway, Canada and Switzerland. These returns are significantly different from zero, at the 5% level using a *t*-test and 10% level using a sign-rank test, in all markets except Norway. The positive abnormal returns when covered short-selling is restricted are consistent with the disagreement models and the first hypothesis.

<Insert Table 1>

<Insert Figure 1>

<Insert Figure 2>

Figure 3 presents the daily AR's for the markets subject to a *naked* short-selling ban. Miller (1977) suggests that the magnitude of abnormal returns could be affected by the level of short-selling constraint. If restricting naked short-selling is not an economically meaningful constraint then we may not expect any abnormal returns. Similar to stocks subject to the covered short-selling ban, Figure 3 shows that the pre-event period is dominated by negative abnormal returns. However on the two trading days preceding the bans there are positive abnormal returns in the majority of markets. We attribute these returns to the timing of the naked short-selling bans. The naked bans were enforced on 22 and 23 September, 2008, while the covered bans in the U.K. and U.S. were enforced on 19 September, 2008. The positive abnormal returns can be attributed to the expectation of a similar ban being enforced or the strong correlation between the returns of global financial markets. Similar to the covered ban sample, all six markets experience positive abnormal returns in the post-event period (four are significant at the 10% level). While not as significant as for covered short-selling bans,

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naked short-selling bans exhibit similar stock price reactions to covered short-selling bans.

<Insert Figure 3>

<Insert Figure 4>

The results in Table 1 provide support for the first hypothesis with positive abnormal returns when short-selling is restricted. To provide further evidence, we examine markets were no short-selling ban was announced over the same period as the U.S. ban. Figure 5 presents AR's for markets without short-selling bans. In the pre-event period, stocks experience a mixture of returns similar to the covered sample. On the event date, stocks experience positive abnormal returns which persist over the post-event window. Figure 6 highlights the magnitude of these results and Table 1 documents Sweden, Japan and Hong-Kong experience abnormal returns of 12.01%, 11.77% and 2.54% in the post event period, respectively.

<Insert Figure 5>

<Insert Figure 6>

The similar returns on markets with no bans and covered bans indicate that *either* the results are not directly attributable to the short-selling restrictions *or* the short-selling restrictions in major markets (i.e. U.S.) affect global markets. Evidence in Table 1 suggests the latter is more likely. All three markets not subject to a ban experience positive abnormal returns on the same day as the U.S. bans. If the result was attributable to other factors (e.g. various government stimulus packages), it is unlikely that all three markets would react on the same day as the U.S. bans. Further evidence exists in markets where naked short-selling is prohibited. In these markets, strong positive abnormal

returns occur on the two trading-days preceding the bans, coinciding with the U.K. and U.S. bans. The notion of interdependence between global stock price movements is extensively documented (see Forbes and Rigobon, 2002) and appears to be the most likely explanation of the results.

Overall, the results in Table 1 support the first hypothesis with positive abnormal returns when short-selling is restricted. This is expected given the theory (Miller, 1977) and previous studies that document positive abnormal returns when short-sales are constrained. It appears that the regulations were successful, given the unofficial purpose of the bans was to sustain the prices of struggling financial stocks. The bans have successfully, albeit possibly temporarily, inflated the prices of financial companies.

5.2 Market Quality - Descriptive Statistics

Table 2 provides descriptive statistics for the control and treatment sample in the pre- and post-event windows for each of the markets subject to a covered short-selling ban. Difference captures the percentage change in each sample when the short-selling restrictions are enforced. Diff-diff captures the difference in the percentage change between the stocks affected by the ban and the stocks not affected. The descriptive statistics indicate that trading volume and value is reduced, controlling for market-wide changes in trading activity, when covered short-selling is restricted. Across all five markets, with the exception of turnover value in Canada, the Diff-diff results are homogenous with both volume and value reduced by a minimum of 11.6%. Relative bid-ask spreads widen by a minimum of 18.1% during the bans, after controlling for market-wide changes. At the same time stock price volatility increases in the U.S., U.K. and

Norway, while falling in Switzerland. Overall the descriptive statistics suggest that market quality deteriorates when covered short-selling is restricted.

<Insert Table 2>

Table 3 provides descriptive statistics for the control and treatment samples in the pre- and post-event windows for each of the markets subject to a naked short-selling ban. The descriptive statistics suggest that trading volume and turnover value is reduced, controlling for market-wide changes in trading activity, when naked short-selling is restricted. Across five of the six markets the Diff-diff results show both volume and value is reduced, consistent with the covered short-selling ban results. However, the effect on bid-ask spreads and stock price volatility is mixed across markets. For example Portugal, Italy experience a reduction in spreads, while the Netherlands, Belgium, France and Germany experience an increase. Overall the descriptive statistics provide inconclusive evidence of the impact of the naked short-selling ban on market quality.

<Insert Table 3>

Table 4 provides descriptive statistics for the control (non-financial stocks) and treatment (financial stocks) samples in the pre- and post-event windows for the three markets not subject to a short-selling ban. Similar to the naked ban sample, the descriptive statistics provide mixed results, with no consistent result across markets. The only measure which changes in the same direction across the three markets is turnover value (which increases).

<Insert Table 4>

5.3 Market Quality - Pooled cross-sectional regressions

The descriptive statistics provide an indication of the impact of the short-selling bans on market quality. To provide formal statistical testing and to control for other factors, the results of the cross-sectional pooled regressions are presented in Tables 5, 6 and 7. The key variable, Ban_i, captures the marginal impact of the short-selling ban on the market quality variable of interest.

Table 5 presents the results for the markets where a covered ban was imposed. The results are similar to the descriptive statistics across the five markets. Consistent with the second hypothesis, stock price volatility (H-L) increases significantly in four of the five markets with the coefficient, Ban_i, positive and statistically significant at the 1% level. Consistent with the third hypothesis, relative bid-ask spreads increase in four of the five markets with the coefficient, Ban_i, positive and statistically significant at the 1% level. Consistent with fourth hypothesis, volume and value decrease significantly in four of the five markets with the coefficient, Ban_i, negative and statistically significant at the 5% level. Consistent with univariate results, banning covered short-sales has a negative impact on market quality.

<center><Insert Table 5></center>

Table 6 presents the results from the six markets where a naked ban was imposed. The results are similar to the descriptive statistics with inconsistent results across the six markets. Unlike markets where a covered ban was in place, no clear pattern exists across the markets subject to a naked ban. This suggests that the naked ban does not significantly impact on market quality.

<center><Insert Table 6></center>

<center>17</center>

Table 7 presents the results from the three markets without short-selling bans. Results documented are similar to the descriptive statistics, with largely insignificant and inconsistent results. Trading volume, turnover value and relative bid-ask spreads do not change significantly, with the coefficient, Ban_i, statistically insignificant. Price volatility results are mixed across markets and suggest no clear impact from the U.S. short-selling bans. These results suggest the U.S. bans had no significant impact on market quality measures in markets without short-selling bans.

<Insert Table 7>

Overall, results indicate that market quality is markedly worse for markets with more stringent short-selling restrictions. Markets with covered short-selling bans on financial stocks experience a significant decline in market quality (for stocks subject to the ban). This is possibly driven by the temporary exclusion of certain market participants, including hedge funds and proprietary trading desks, which typically provide substantial amounts of liquidity via short-selling. This result does not extend to markets with less stringent (or no) restrictions in place for financial stocks. While regulators have been successful in temporarily inflating prices, there is evidence that this has come at the cost of increased volatility and reduced liquidity.

6. Conclusion

In this study, we empirically examine the impact of the 2008 short-selling bans on the market quality of stocks subject to the bans. Thus, in doing so we also examine whether the short-selling bans have achieved their desired outcomes. Using data from fourteen equity markets we examine the market quality of financial stocks subject to the bans by comparing to stocks not subject to the bans. Evidence indicates that restrictions

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on short-selling lead to artificially inflated prices, indicated by positive abnormal returns. This is consistent with Miller's (1977) overvaluation theory and suggests the bans have been effective in temporarily stabilizing prices in struggling financial stocks.

Market quality is reduced during the restrictions, as evidenced by wider bid-ask spreads, increased price volatility and reduced trading activity. While these effects are strong, regulators may have seen the deterioration in market quality as a necessary by-product of the bans to maintain prices and protect investors. Regulators feared the possibility of manipulative short-selling in financial stocks and felt it was necessary to undertake extreme measures. Perhaps the regulatory intervention was designed to boost investor outlook and confidence to provide positive externalities through the economy. Overall, whether the net effect of the short-selling bans is positive (higher prices vs. lower market quality) is open to debate.

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Appendix

In this section we provide a brief review of regulations implemented by regulators in response to the actions of the UK FSA and US SEC. On September 18, 2008, the FSA banned short-selling (naked and covered) in financial stocks in response to the financial turmoil of the global economy. The temporary ban, effective from September 19, 2008 to January 16, 2009, covered the creation and increase of net short positions in 29 financial stocks on the London Stock Exchange. Later that day, the SEC imposed a similar ban on more than 800 financial stocks in the U.S. market which was later amended on 21 September and was set to expire at 23:59 ET on 2 October, 2008. This was followed in Canada by the Ontario Securities Commission (OSC) prohibiting the short-selling of specified financial issuers listed on the Toronto Stock Exchange (TSX) that are also inter-listed in the U.S. In Switzerland, the Swiss Federal Banking Commission (SFBC), SWX and SWX Europe placed prohibitions on short-selling, coming into effect on 19 September, 2008. The SFBC and SWX prohibition applied to naked short-selling in all securities, while the SWX Europe prohibition applied to covered short-sales in certain financial stocks.

Overnight and over the weekend many other markets worldwide announced bans which came into effect 22 September, 2008 including: Australia where the Australian Securities and Investments Commission (ASIC) banned all forms of short-selling in all stocks; and Belgium, France, Luxembourg, The Netherlands, Portugal and Germany prohibiting naked short-selling for specified financial institutions. The next day, 23 September, 2008, the Italian regulator, Commossione Nazionale per le Società e la Borsa (CONSOB), placed a similar ban on naked short-selling of shares issued by banks and insurance companies. Over the next few days no further bans

were enforced but many regulators clarified and adjusted their stance on short-selling. Russia and Korea were the next markets to make changes, both placing a prohibition on the short-selling of all securities, effective 30 September and 1 October 2008, respectively.

On October 2, 2008, the SEC extended the U.S. ban to the earlier of October 17, 2008 or three business days following enactment of the Troubled Asset Relief Program (TARP, formally known as H.R. 1424, the Emergency Economic Stabilization Act of 2008). TARP was subsequently enacted on October 3, 2008 and the SEC announced that the ban would expire at 11:59pm ET on October 8, 2008. As of October 9, short-selling was again permitted in all stocks provided market participants complied with the requirement to borrow shares in advance, as mandated by the naked short-selling ban (which continued).[11] The Canadian regulators also removed short-selling prohibitions on 8 October, 2008.

While some bans were being lifted other markets were still to enforce bans including: the Financial Supervisory Authority of Iceland prohibiting the short-selling of financial instruments in six banks and insurers on the 6 October, 2008; the Financial Supervisory Authority of Norway, Kredittilsynet, banning short-selling in financial equities on 8 October, 2008; the Danish Financial Supervisory Authority prohibiting short-selling in all Danish banks with effect from 13 October, 2008; and in Greece, the Capital Markets Commission banned short-sales in all stocks on 10 October, 2008.

Other markets began revising bans including Australia where ASIC announced on 21 October, 2008 that it expected to lift the ban on covered short-selling of non-financial stocks from 19 November, 2008. This was followed by further

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[11] The SEC naked short-selling ban was introduced on 17 September, 2008, and restricted the naked short-selling of all U.S. stocks, effective 18 September, 2008.

prohibitions including: Austria where the FMA prohibited naked short-selling of four financial companies with effect from 28 October; Italy where on 10 October, the Italian regulator (Consob) extended its ban on short-selling to cover all stocks; Japan where on 27 October, 2008, the Financial Services Agency of Japan (FSA), announced a ban on naked short-selling of all stocks effective from 29 October, 2008. In Italy, the short-selling prohibition was lifted for non-financials on 30 December, 2008 and remained in place for financials along with the ban on naked short-selling on all stocks.

As markets worldwide began to stabilize, other markets started to lift existing bans including: the UK which lifted its ban on the short-selling of financial stocks on 16 January, 2009; SWX Europe on 16 January, 2009; Australia, where ASIC announced the expiry of its ban on covered short-selling of financial securities as of 25 May, 2009; Italy where on 31 May, 2009 the prohibition was amended to allow covered short-selling in banks and insurance companies; Greece where the Hellenic Capital Market Commission announced that short-selling of stocks listed on the Athens Exchange is permitted again from 1 June, 2009; The Netherlands also lifted its prohibition on short-selling, as of 1 June, 2009; and South Korea lifted its ban on short-selling of non-financial company stocks on 1 June, 2009.

Table A-1
Short-sale bans around the world

For each market the table describes whether the short-sale ban applied to short-sales (covered and naked) or naked short-sales only, the stocks to which the ban applied and the date when the ban was imposed and lifted (if applicable). The data is gathered from regulator websites. ALL indicates the ban applies to all stocks listed. FINS indicates the ban applies to securities issued by financial institutions.

Market	Short-Sale ban			Naked short-sale ban		
	Covers	Start date	End date	Covers	Start date	End date
Australia	ALL	22/09/08	19/11/08	ALL	22/09/08	Indefinite
Australia	FINS	22/09/08	25/05/09			
United States	FINS	19/09/08	08/10/08	ALL	18/07/08	Indefinite
United Kingdom	FINS	19/09/08	16/01/09			
Canada	FINS	19/09/08	08/10/08			
Ireland	FINS	19/09/08	Indefinite			
Greece	ALL	10/10/08	31/05/09			
Switzerland (SWX Europe)	FINS	19/09/08	16/1/09			
Norway	FINS	8/10/08	Indefinite			
Denmark	FINS	13/10/08	Indefinite			
Korea	ALL	01/10/08	1/6/09			
Korea	FINS	01/10/08	Indefinite			
Russia	ALL	30/09/08	Indefinite			
Pakistan	ALL	24/9/08	Indefinite			
Netherlands				FINS	22/09/08	1/6/09
Iceland				FINS	6/10/08	Indefinite
Germany				FINS	20/09/08	1/1/10
Austria				FINS	28/10/08	30/09/09
Portugal				FINS	22/09/08	Indefinite
Italy				FINS	23/09/08	31/07/09
Netherlands				FINS	22/09/08	5/10/08
France				FINS	22/09/08	Indefinite
Belgium				FINS	22/09/08	21/09/09
Switzerland (SWX & SFBC)				ALL	19/09/08	Indefinite
Japan				ALL	28/10/08	Indefinite
Luxembourg				FINS	22/09/08	Indefinite

Table A-2
Control sample selection

For each market this table lists the main market index used to select control stocks. The description of each index is provided and whether any adjustments are made to the index to select the control sample. If not stated in the description, all stocks in the treatment sample (stocks subject to the short-selling bans) are removed from the control sample.

Market	Index	Index description and control sample definition
United States	NYSE Composite	All common stocks listed on NYSE. Use the largest 300 stocks based on market-capitalization
United Kingdom	FTSE 100	Largest 100 stocks on the London Stock Exchange based on market capitalization
Canada	S&P/TSX 60	Largest 60 stocks on the Toronto Stock Exchange based on market capitalization
Switzerland (SWX Europe)	Swiss market	Largest 30 stocks on SWX Europe based on market capitalization
Norway	OBX Index	25 most liquid stocks on the Oslo Stock Exchange based on six-month turnover.
Netherlands	AEX index	25 most actively traded (Euro Turnover) stocks in the Euronext Amsterdam.
Germany	DAX	30 largest stocks on the Frankfurt Stock Exchange based on market capitalization and volume
Portugal	PSI-20	20 largest stocks on the Euronext Lisbon based on market capitalization and volume
Italy	FTSE MIB	40 largest stocks on the Borsa Italiana based on market capitalization and volume
France	CAC 40	40 stocks among the 100 largest stocks on Euronext Paris based on market capitalization and volume
Belgium	BEL20	20 largest stocks on Euronext Brussels based on market capitalization and volume
Sweden	OMX Stockholm 30	30 most liquid stocks on Stockholm Stock Exchange based on six-month turnover.
Japan	S&P/TOPIX 150	150 of the largest stocks on the Tokyo Stock Exchange based on market capitalization and turnover value
Hong-Kong	Hang Seng Index	42 stocks on the Hong Kong Stock Exchange based on market capitalization and turnover

Table 1

Abnormal Returns around 2008 Short-selling Bans

This table reports abnormal returns and cumulative abnormal returns based on the market model (Panel A) and market-adjusted model (Panel B) around short-selling bans. The event date, the day the short-selling ban is imposed, is denoted day 1. The estimation window for the market-model begins July 2007 and ends in August 2008. Results are separated by the type of short-selling ban imposed. *Covered ban* indicates the market had a ban on covered short-selling. *Naked ban* indicates the market had a ban on naked short-selling. *No ban* indicates the market had no ban on short-selling imposed over the same period as the U.S. ban. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively using a parametric *t*-test. $^+$, $^{++}$, and $^{+++}$ denote significance at the 10%, 5%, and 1% levels, respectively using a Wilcoxon sign-rank test.

	Panel A: Market Model				
	CAR	AR	AR	CAR	CAR
Market	(-10,-1)	(-1)	(1)	(-1,10)	(1,10)
Covered Ban					
U.K.	-0.0304	-0.0190^{++}	0.0267***$^{+++}$	0.0353$^+$	0.0543**$^{+++}$
U.S.	0.0607***$^{+++}$	0.0357***$^{+++}$	0.0278***$^{+++}$	0.1313***$^{+++}$	0.0937***$^{+++}$
Norway	-0.0348	-0.0382	0.0034	-0.0610	-0.0228
Canada	-0.0170	0.0436**$^{++}$	0.0214***$^{++}$	0.1707***$^{+++}$	0.1271***$^{+++}$
Switzerland	-0.0775*	0.0018	0.0507	0.1151*$^+$	0.1133**$^+$
Naked Ban					
Netherlands	-0.0439	0.0512	-0.0099	0.0866	0.0354
Belgium	-0.0153	0.0845***	-0.0521	0.1497***$^+$	0.0653*$^+$
Germany	-0.0028	0.0459***$^{+++}$	-0.0021	0.1230**$^{++}$	0.0771*$^+$
Portugal	0.0747**$^{++}$	0.0289	-0.0034	0.1134**$^{++}$	0.0845**$^{++}$
Italy	0.0241*	0.0125***$^{+++}$	-0.0027	0.0234	0.0109
France	0.0164	0.0482***$^{+++}$	0.0038	0.1329***$^{+++}$	0.0847***$^{+++}$
No Ban					
Hong-Kong	-0.0018	-0.0035	0.0387***$^{++}$	0.0255	0.0254
Sweden	0.0124	0.0130	0.0616***	0.1332***	0.1201***
Japan	0.0168	-0.0207***$^{+++}$	0.0302***$^{+++}$	0.0969***$^{+++}$	0.1177***$^{+++}$

Table 1 -Continued

	Panel B: Market-adjusted				
	CAR	AR	AR	CAR	CAR
Market	(-10,-1)	(-1)	(1)	(-1,10)	(1,10)
Covered ban					
U.K.	-0.0516*	-0.0200*++	0.0334**+++	0.0193+	0.0393+++
U.S.	0.0329***+++	0.0331***+++	0.0264***+++	0.1011***+++	0.0656***+++
Norway	0.0506	-0.0299	-0.0054	-0.1149	-0.0850
Canada	-0.0281	0.0413**++	0.0081	0.1648***+++	0.1235***+++
Switzerland	-0.0964***+	0.0005	0.0603***++	0.0963*+	0.0957***+
Naked Ban					
Netherlands	-0.0532	0.0425	-0.0083	0.0880	0.0455
Belgium	-0.0208	0.1013***	-0.0549*	0.1309***	0.0296
Germany	-0.0192	0.0423***++	-0.0012	0.1236***+++	0.0813***+++
Portugal	0.0718**++	0.0141	-0.0055	0.1048**++	0.0906**++
Italy	0.0216*	0.0137***+++	-0.0006	0.0366***+++	0.0228+
France	0.0110	0.0457***+++	0.0040	0.1288***+++	0.0831***+++
No Ban					
Hong-Kong	0.0169	-0.0015	0.0328**+	0.0341	0.0328
Sweden	0.0104	0.0124	0.0570***	0.1269***	0.1145***
Japan	-0.0210	-0.0273***+++	0.0442***+++	0.0606**++	0.0879***+++

Table 2

Descriptive Statistics-Covered Bans

This table reports descriptive statistics for markets with a ban on covered short-selling. The treatment sample includes stocks subject to the short-selling ban. The control sample includes stocks from a major index in the corresponding market not affected by the short-selling restrictions (see Table A-2). Variables include: Spread (Relative bid-ask spread), H-L (daily price volatility), Value (Daily Turnover Value) and Volume (Daily traded volume). The event date, the day the short-selling ban is imposed, is denoted day 1. The Pre and Post columns represent the cross-sectional average of each variable for the pre- (30-trading days prior to event) and post-event (30-trading days subsequent to event) period. If the ban was in place for less than 30-trading days we use the duration of the ban as the post-event window. The Change (%) column reports the percentage difference between the Pre and Post averages for each variable in both the treatment and control sample. The Diff-diff column reports the difference of the difference between the treatment and control sample.

		Treatment			Control			
	Measure	Pre	Post	Change (%)	Pre	Post	Change (%)	Diff-Diff
Canada	Spread	0.0110	0.0199	0.81	0.0037	0.0051	0.40	0.41
	H-L	0.0464	0.0776	0.67	0.0470	0.0708	0.51	0.16
	Value	94,616,460	115,534,207	0.22	89,120,115	106,352,900	0.19	0.03
	Volume	2,138,664	2,495,069	0.17	2,150,575	2,809,973	0.31	-0.14
Norway	Spread	0.0070	0.0155	1.23	0.0036	0.0045	0.25	0.98
	H-L	0.0686	0.1004	0.46	0.0911	0.1175	0.29	0.17
	Value	202,238,369	131,412,381	-0.35	395,076,587	302,640,008	-0.23	-0.12
	Volume	10,553,764	8,791,287	-0.17	6,271,125	7,070,656	0.13	-0.29
Switzerland	Spread	0.0017	0.0032	0.83	0.0017	0.0028	0.65	0.18
	H-L	0.0438	0.0811	0.85	0.0291	0.0552	0.90	-0.04
	Value	323,866,683	353,580,886	0.09	206,561,724	308,806,204	0.49	-0.40
	Volume	8,296,163	9,530,835	0.15	3,693,960	5,990,106	0.62	-0.47
U.K.	Spread	0.0023	0.0053	1.29	0.0017	0.0019	0.11	1.18
	H-L	0.0451	0.1152	1.55	0.0415	0.0724	0.74	0.81
	Value	180,374,676	149,439,043	-0.17	48,689,542	50,933,474	0.05	-0.22
	Volume	13,542,515	16,171,673	0.19	3,192,122	4,257,075	0.33	-0.14
U.S.	Spread	0.0043	0.0150	2.49	0.0017	0.0032	0.93	1.57
	H-L	0.0568	0.0928	0.63	0.0356	0.0561	0.58	0.06
	Value	35,868,769	34,865,404	-0.03	66,214,144	77,925,182	0.18	-0.20
	Volume	1,247,519	1,147,591	-0.08	1,451,731	1,850,830	0.27	-0.36

Table 3

Descriptive Statistics-Naked Bans

This table reports descriptive statistics for markets with a ban on naked short-selling. The treatment sample includes stocks subject to the short-selling ban. The control sample includes stocks from a major index in the corresponding market not affected by the short-selling restrictions (see Table A-2). Variables include: Spread (Relative bid-ask spread), H-L (daily price volatility), Value (Daily Turnover Value) and Volume (Daily traded volume). The event date, the day the short-selling ban is imposed, is denoted day 1. The Pre and Post columns represent the cross-sectional average of each variable for the pre- (30-trading days prior to event) and post-event (30-trading days subsequent to event) period. If the ban was in place for less than 30-trading days we use the duration of the ban as the post-event window. The Change (%) column reports the percentage difference between the Pre and Post averages for each variable in both the treatment and control sample. The Diff-diff column reports the difference of the difference between the treatment and control sample.

		Treatment			Control			
	Measure	Pre	Post	Change (%)	Pre	Post	Change (%)	Diff-Diff
Netherlands	Spread	0.0023	0.0053	1.29	0.0017	0.0019	0.11	1.18
	H-L	0.0451	0.1152	1.55	0.0415	0.0724	0.74	0.81
	Value	180,374,676	149,439,043	-0.17	48,689,542	50,933,474	0.05	-0.22
	Volume	13,542,515	16,171,673	0.19	3,192,122	4,257,075	0.33	-0.14
Belgium	Spread	0.0022	0.0047	1.12	0.0051	0.0063	0.22	0.90
	H-L	0.0553	0.1206	1.18	0.0328	0.0588	0.79	0.39
	Value	58,258,378	49,153,465	-0.16	12,433,809	14,616,580	0.18	-0.33
	Volume	4,474,789	5,475,175	0.22	253,584	362,267	0.43	-0.21
Germany	Spread	0.0038	0.0070	0.85	0.0032	0.0042	0.32	0.52
	H-L	0.0374	0.0879	1.35	0.0305	0.0639	1.09	0.26
	Value	12,618,064	27,678,527	1.19	12,589,129	19,660,480	0.56	0.63
	Volume	426,177	1,528,809	2.59	218,740	387,072	0.77	1.82
Portugal	Spread	0.0200	0.0204	0.02	0.0042	0.0065	0.56	-0.54
	H-L	0.0329	0.0554	0.68	0.0371	0.0661	0.78	-0.10
	Value	2,724,731	2,845,976	0.04	9,664,562	10,522,949	0.09	-0.04
	Volume	611,871	703,314	0.15	1,977,560	2,431,432	0.23	-0.08
Italy	Spread	0.0064	0.0090	0.40	0.0017	0.0028	0.59	-0.19
	H-L	0.0349	0.0562	0.61	0.0366	0.0632	0.73	-0.12
	Value	58,645,381	50,389,008	-0.14	83,991,619	74,807,017	-0.11	-0.03
	Volume	16,061,754	17,207,044	0.07	12,939,133	14,471,229	0.12	-0.05
France	Spread	0.0048	0.0099	1.08	0.0008	0.0008	0.03	1.05
	H-L	0.0474	0.0742	0.56	0.0376	0.0671	0.79	-0.22
	Value	122,691,686	105,670,112	-0.14	122,509,660	148,606,834	0.21	-0.35
	Volume	5,634,349	4,914,412	-0.13	4,201,602	5,628,709	0.34	-0.47

Table 4

Descriptive Statistics-No Ban

This table reports descriptive statistics for markets with no ban on short-selling. The treatment sample includes financial stocks. The control sample includes stocks from a major index in the corresponding market; excluding stocks in the treatment sample (see Table A-2). Variables include: Spread (Relative bid-ask spread), H-L (daily price volatility), Value (Daily Turnover Value) and Volume (Daily traded volume). The event date, the day the short-selling ban is imposed, is denoted day 1. The Pre and Post columns represent the cross-sectional average of each variable for the pre- (30-trading days prior to event) and post-event (30-trading days subsequent to event) period. If the ban was in place for less than 30-trading days we use the duration of the ban as the post-event window. The Change (%) column reports the percentage difference between the Pre and Post averages for each variable in both the treatment and control sample. The Diff-diff column reports the difference of the difference between the treatment and control sample.

		Treatment			Control			
	Measure	Pre	Post	Change (%)	Pre	Post	Change (%)	Diff-Diff
Hong-Kong	Spread	0.0038	0.0068	76.85%	0.0025	0.0036	41.65%	35.20%
	H-L	0.0412	0.0536	30.17%	0.0461	0.0637	38.20%	-8.03%
	Value	1,260,957,391	1,418,314,229	12.48%	503,558,295	529,395,175	5.13%	7.35%
	Volume	120,725,912	124,808,746	3.38%	28,952,215	33,680,747	16.33%	-12.95%
Japan	Spread	0.0030	0.0036	19.02%	0.0030	0.0036	18.10%	0.92%
	H-L	0.0397	0.0530	33.58%	0.0292	0.0438	50.02%	-16.44%
	Value	16,726,433,719	21,566,516,226	28.94%	7,748,624,072	8,720,299,346	12.54%	16.40%
	Volume	8,087,073	11,522,280	42.48%	5,788,440	7,236,714	25.02%	17.46%
Sweden	Spread	0.0022	0.0025	12.02%	0.0028	0.0032	14.87%	-2.85%
	H-L	0.0411	0.0691	68.26%	0.0380	0.0532	39.96%	28.29%
	Value	817,957,682	1,083,384,174	32.45%	445,342,584	533,260,198	19.74%	12.71%
	Volume	7,652,489	10,635,257	38.98%	5,106,250	6,253,921	22.48%	16.50%

Table 5

Pooled cross-sectional regressions - Covered Bans

This table reports pooled cross-sectional regression results from markets with a ban on covered short-selling for the following regression:

$$Y_{it} = \beta_{0t} + \beta_{1t}\, Period_i + \beta_{2t}\, Sample_i + \beta_{3t}\, Ban_i + \varepsilon_{it}$$

The pooled data includes: both the treatment and control sample over the pre- (30-trading days prior to event) and post-event (30-trading days subsequent to event) period. If the ban was in place for less than 30-trading days we use the duration of the ban as the post-event window. The treatment sample includes stocks subject to the short-selling ban. The control sample includes stocks from a major index in the corresponding market not affected by the short-selling restrictions (see Table A-2). Y_{it} is the market quality measure of interest for stock i during interval t. Market quality measures include: Spread (Relative bid-ask spread), H-L (daily price volatility), Value (Daily Turnover Value) and Volume (Daily traded volume). Ban_i is a dummy variable equal to one if the stocks are subject to a short-selling ban, and zero otherwise. $Period_i$ is a control dummy variable equal to one if the observation lies in the post-event period, and zero otherwise. $Sample_i$ is a control dummy variable equal to one if the observation belongs to the treatment sample, and zero otherwise. The regressions include calendar-day dummies and stock dummies, and the standard errors take into account clustering by calendar date and clustering by stock (Thompson, 2009). *, **, and *** denote significance at the 10%, 5%, and 1% levels.

Market	Measure	Intercept	Period	Sample	Ban	R^2
U.K.	Spread	-7.126***	0.243***	4.106***	0.301***	0.60
	H-L	0.121***	0.052***	-0.094***	0.018***	0.62
	Value	24.121***	0.453***	-10.784***	-0.303***	0.95
	Volume	16.544***	0.599***	-7.537***	-0.329***	0.95
U.S.	Spread	-6.611***	0.628***	1.113***	0.783***	0.59
	H-L	0.037***	0.033***	0.012**	0.017***	0.66
	Value	17.632***	0.476***	-2.055***	-0.440***	0.96
	Volume	13.479***	0.619***	-1.447***	-0.510***	0.95
Norway	Spread	-5.669***	0.716***	0.455***	0.332***	0.40
	H-L	0.118***	-0.016	0.010	0.009	0.53
	Value	20.591***	-0.530***	-2.623***	-0.246***	0.91
	Volume	15.704***	-0.134	-0.679***	-0.284***	0.88
Canada	Spread	-5.513***	-0.117	-1.179***	0.438***	0.43
	H-L	0.096***	0.039***	-0.043***	0.007***	0.64
	Value	18.384***	0.643***	-0.070	0.094*	0.94
	Volume	16.179***	0.801***	-1.426***	0.018	0.91
Switzerland	Spread	-5.550***	0.703***	-0.590***	0.001	0.38
	H-L	0.068***	0.035***	-0.016***	0.011***	0.64
	Value	18.230***	0.214*	1.501***	-0.437***	0.88
	Volume	13.123***	0.603***	1.368***	-0.366***	0.96

Table 5

Pooled cross-sectional regressions - Naked Bans

This table reports pooled cross-sectional regression results from markets with a ban on naked short-selling for the following regression:

$$Y_{it} = \beta_{0t} + \beta_{1t}\, Period_i + \beta_{2t}\, Sample_i + \beta_{3t}\, Ban_i + \varepsilon_{it}$$

The pooled data includes: both the treatment and control sample over the pre- (30-trading days prior to event) and post-event (30-trading days subsequent to event) period. If the ban was in place for less than 30-trading days we use the duration of the ban as the post-event window. The treatment sample includes stocks subject to the short-selling ban. The control sample includes stocks from a major index in the corresponding market not affected by the short-selling restrictions (see Table A-2). Y_{it} is the market quality measure of interest for stock i during interval t. Market quality measures include: Spread (Relative bid-ask spread), H-L (daily price volatility), Value (Daily Turnover Value) and Volume (Daily traded volume). Ban_i is a dummy variable equal to one if the stocks are subject to a short-selling ban, and zero otherwise. $Period_i$ is a control dummy variable equal to one if the observation lies in the post-event period, and zero otherwise. $Sample_i$ is a control dummy variable equal to one if the observation belongs to the treatment sample, and zero otherwise. The regressions include calendar-day dummies and stock dummies, and the standard errors take into account clustering by calendar date and clustering by stock (Thompson, 2009). *, **, and *** denote significance at the 10%, 5%, and 1% levels.

Market	Measure	Intercept	Period	Sample	Ban	R^2
Netherlands	Spread	-6.397***	-0.249	0.445**	0.561***	0.42
	H-L	0.100***	0.089***	0.014**	0.045***	0.69
	Value	16.710***	0.530***	-0.421***	-0.095	0.95
	Volume	11.824***	0.739***	2.240***	0.128**	0.97
Belgium	Spread	-6.157***	0.740**	0.592**	0.493**	0.44
	H-L	0.110***	0.070***	-0.005	0.045***	0.64
	Value	17.360***	0.598***	-0.925***	-0.340***	0.91
	Volume	14.251***	0.692***	-1.687***	-0.042	0.95
Germany	Spread	-6.784***	0.078	0.372***	0.200***	0.76
	H-L	0.093***	0.055***	-0.032***	0.018***	0.64
	Value	17.576***	0.606**	-2.151***	0.215*	0.73
	Volume	12.135***	0.780***	-1.338***	0.347***	0.73
Portugal	Spread	-5.226***	0.320	1.934***	-0.005	0.47
	H-L	0.081***	0.050***	-0.001	-0.006**	0.59
	Value	15.645***	0.383**	-3.523***	0.033	0.91
	Volume	14.040***	0.484**	-4.235***	-0.063	0.91
Italy	Spread	-6.558***	0.604***	2.035***	-0.088	0.63
	H-L	0.067***	0.046***	-0.002	-0.005***	0.60
	Value	17.786***	0.512***	-6.341***	0.026	0.97
	Volume	15.125***	0.640***	-5.958***	-0.013	0.97
France	Spread	-7.639***	0.175	-0.383*	0.577***	0.60
	H-L	0.086***	0.042***	0.009*	-0.002	0.62
	Value	18.842***	0.595***	1.359***	-0.285***	0.97
	Volume	13.896***	0.756***	2.266***	-0.337***	0.97

Table 6

## Pooled cross-sectional regressions - No Ban

This table reports pooled cross-sectional regression results from markets with no ban on short-selling for the following regression:

$$Y_{it} = \beta_{0t} + \beta_{1t} Period_i + \beta_{2t} Sample_i + \beta_{3t} Ban_i + \varepsilon_{it}$$

The pooled data includes: both the treatment and control sample over the pre- (30-trading days prior to event) and post-event (30-trading days subsequent to event) period. If the ban was in place for less than 30-trading days we use the duration of the ban as the post-event window. The treatment sample includes financial stocks. The control sample includes stocks from a major index in the corresponding market, excluding stocks in the treatment sample (see Table A-2). Y_{it} is the market quality measure of interest for stock i during interval t. Market quality measures include: Spread (Relative bid-ask spread), H-L (daily price volatility), Value (Daily Turnover Value) and Volume (Daily traded volume). Ban_i is a dummy variable equal to one if the stocks are subject to a short-selling ban, and zero otherwise. $Period_i$ is a control dummy variable equal to one if the observation lies in the post-event period, and zero otherwise. $Sample_i$ is a control dummy variable equal to one if the observation belongs to the treatment sample, and zero otherwise. The regressions include calendar-day dummies and stock dummies, and the standard errors take into account clustering by calendar date and clustering by stock (Thompson, 2009). *, **, and *** denote significance at the 10%, 5%, and 1% levels.

| Market	Measure	Intercept	Period	Sample	Ban	R^2
Hong-Kong	Spread	-5.962***	0.469***	0.609***	-0.073	0.51
	H-L	0.118***	0.069***	-0.022***	-0.006**	0.59
	Value	19.755***	0.131*	1.331***	0.100**	0.96
	Volume	18.164***	0.400***	1.921***	0.066	0.95
Sweden	Spread	-5.495***	0.180***	-0.405***	-0.018	0.61
	H-L	0.077***	0.048***	0.020***	0.013***	0.59
	Value	20.842***	0.497***	0.159**	0.183***	0.89
	Volume	16.714***	0.654***	-0.276***	0.131**	0.92
Japan	Spread	-5.481***	0.664***	0.484***	-0.028	0.39
	H-L	0.048***	0.024***	0.011***	-0.001	0.50
	Value	23.468***	0.011	0.148*	0.089***	0.92
	Volume	16.162***	0.159***	-0.168**	0.038	0.98

Figure 1 Abnormal Returns-Covered Bans. This figure reports abnormal returns based on the market model around covered short-selling bans. The event date, the day the short-selling ban is imposed, is denoted day 1. The estimation window for the market-model begins July, 2007 and ends August, 2008.
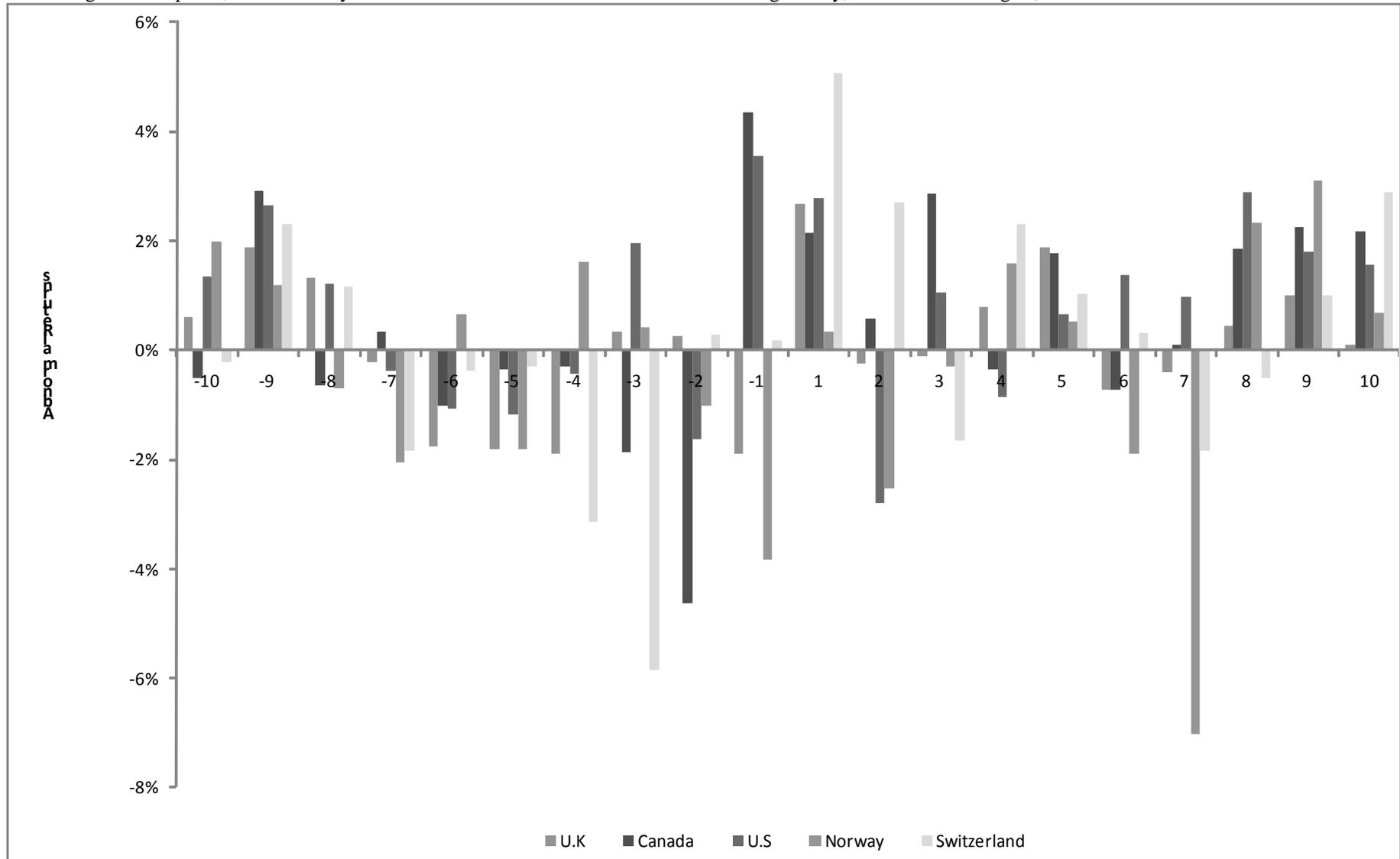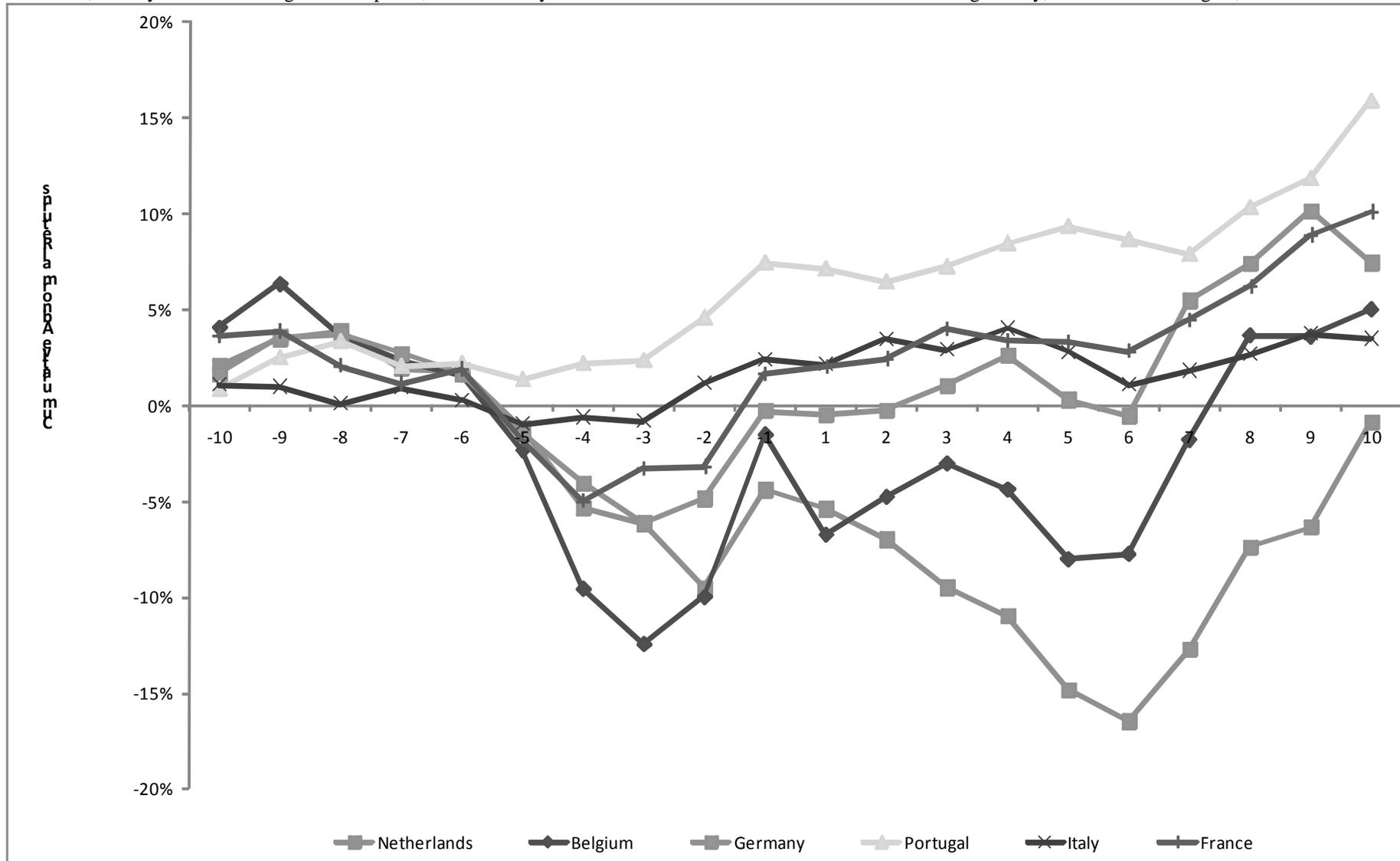
Figure 2 Cumulative Abnormal Returns-Covered Bans. This figure reports cumulative abnormal returns based on the market model around covered short-selling bans. The event date, the day the short-selling ban is imposed, is denoted day 1. The estimation window for the market-model begins July, 2007 and ends August, 2008.
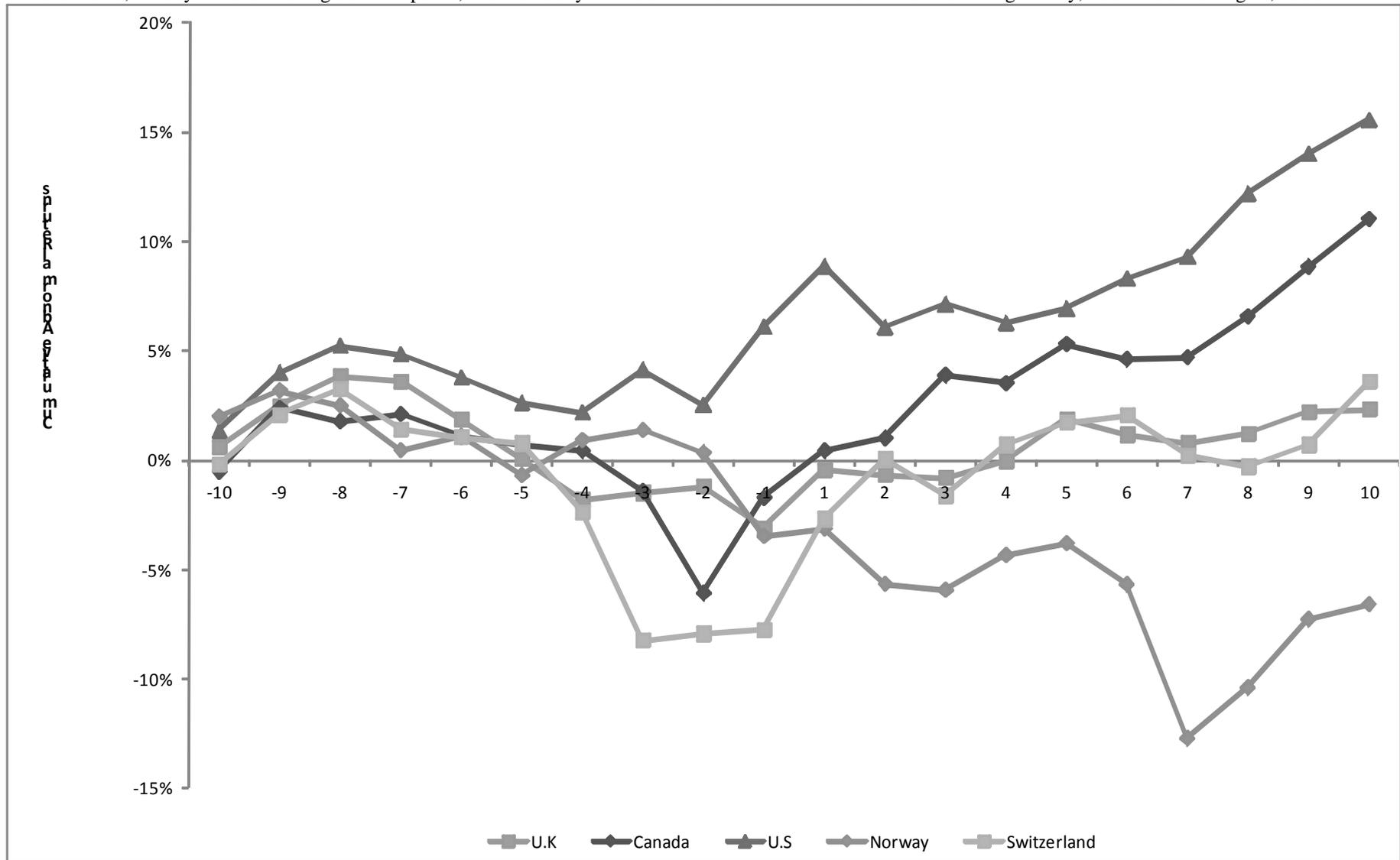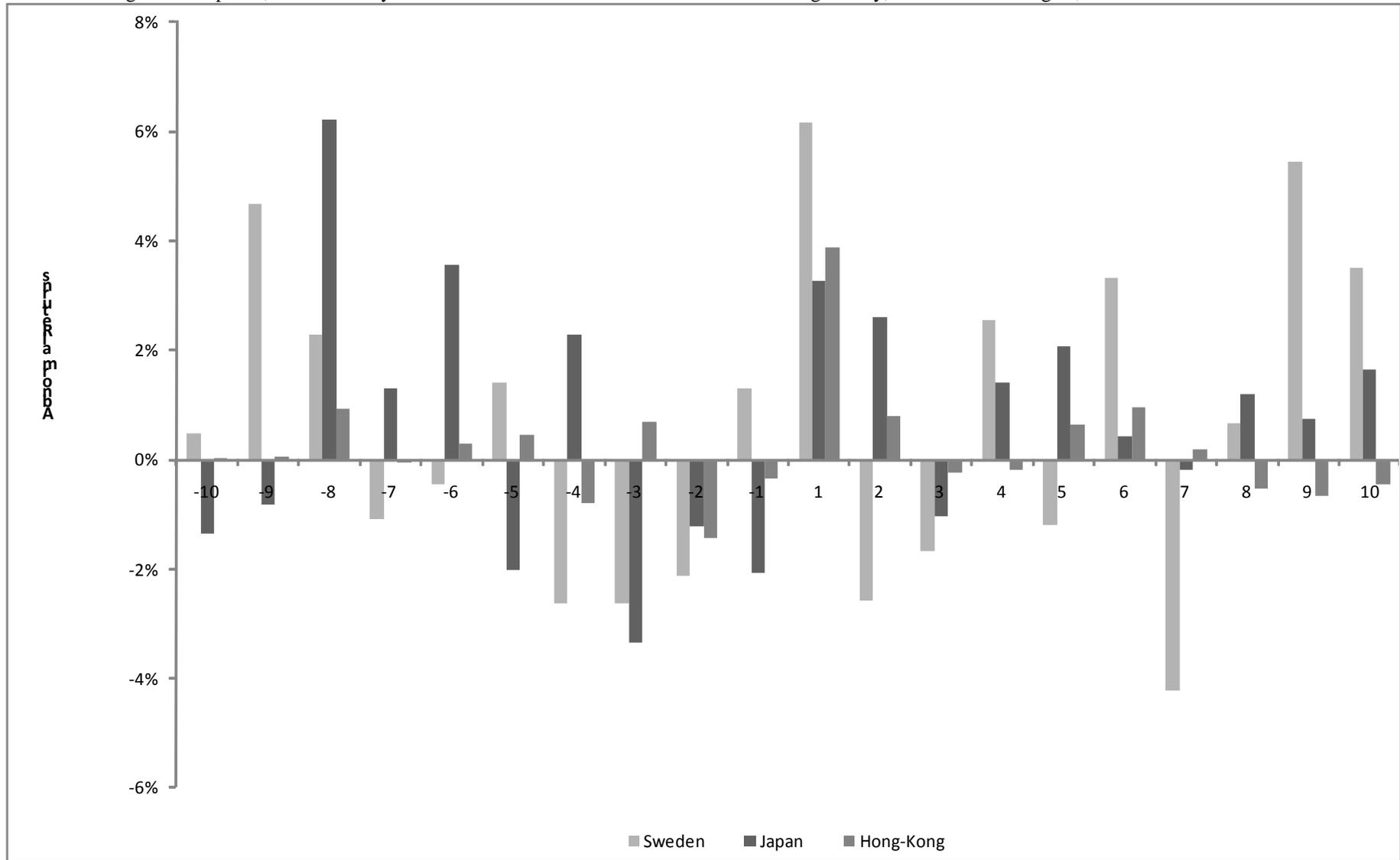
Figure 3 Abnormal Returns-Naked Bans. This figure reports abnormal returns based on the market model around naked short-selling bans. The event date, the day the short-selling ban is imposed, is denoted day 1. The estimation window for the market-model begins July, 2007 and ends August, 2008.
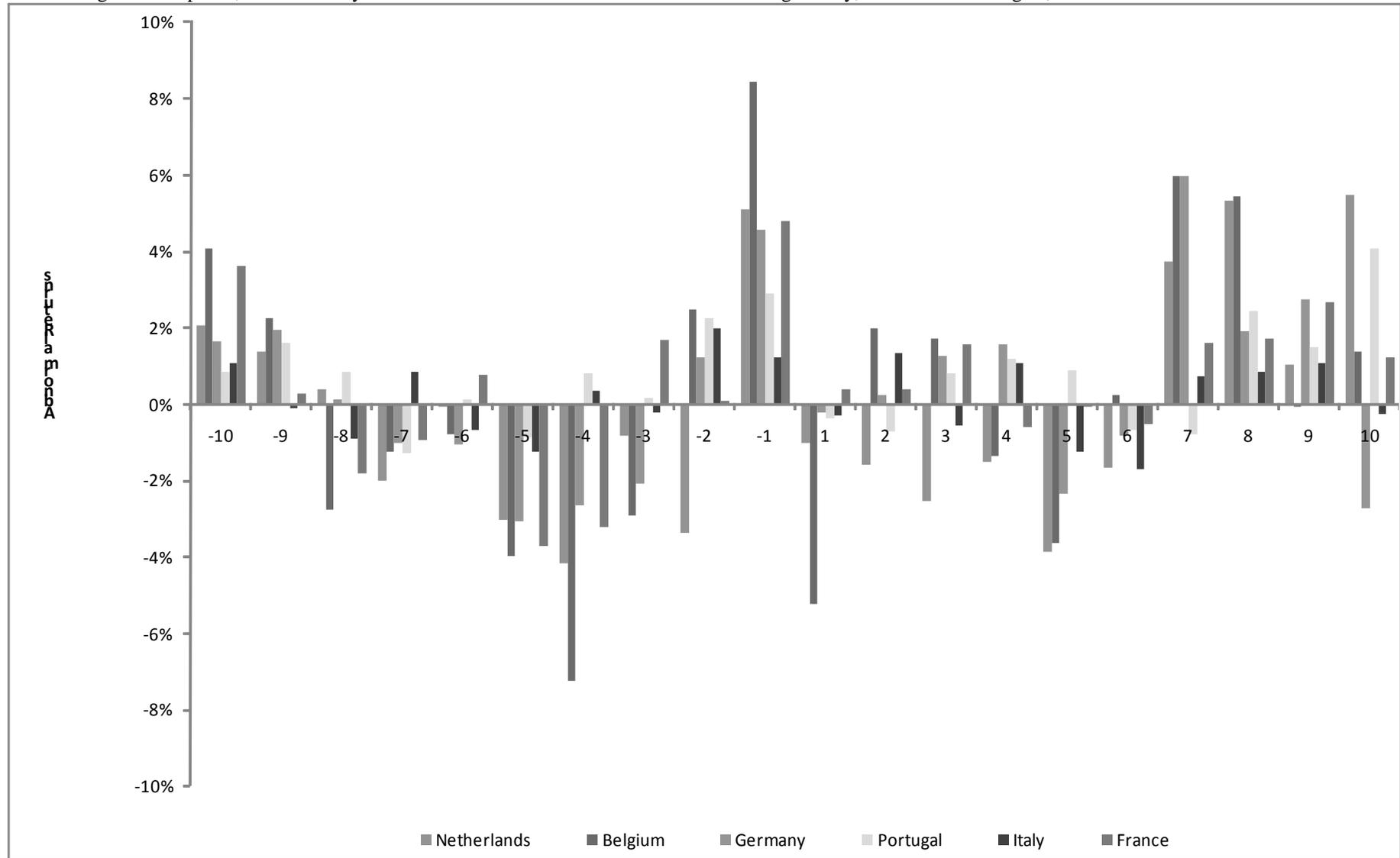
Figure 4 Cumulative Abnormal Returns-Naked Bans. This figure reports cumulative abnormal returns based on the market model around naked short-selling bans. The event date, the day the short-selling ban is imposed, is denoted day 1. The estimation window for the market-model begins July, 2007 and ends August, 2008.

Figure 5 Abnormal Returns-No Bans. This figure reports abnormal returns based on the market model around markets with no short-selling bans. The event date, the day the short-selling ban is imposed, is denoted day 1. The estimation window for the market-model begins July, 2007 and ends August, 2008.

Sweden   Japan   Hong-Kong

Figure 6 Cumulative Abnormal Returns-No Bans. This figure reports abnormal returns based on the market model around markets with no short-selling bans. The event date, the day the short-selling ban is imposed, is denoted day 1. The estimation window for the market-model begins July, 2007 and ends August, 2008.