

# The Effect of Short-selling Restrictions on Liquidity: Evidence from the London Stock Exchange

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## Executive Summary

This report examines liquidity on the London Stock Exchange following the FSA's move to ban short-selling in selected financial and insurance stocks on the 19<sup>th</sup> of September 2008. We survey measures of liquidity in two pre-ban periods of 30 trading days prior to the implementation of the ban (23 June 2008 – 5 August 2008 and 6 August 2008 – 18 September 2008) compared to a 30 trading day post-ban period (19 September 2008 – 30 October 2008). The key findings include:

- The average spread over the pre-sample period is steady for both samples. However, after the ban is introduced the spread in banned stocks increases by 140% from 15 basis points (bps) to 36bps. This compares to a rise of 56% from 13 bps to 20 bps in control stocks. The increase in spreads in the banned stocks was 150% greater than the increase in spreads in control stocks.
- Depth deteriorated in both control and banned stocks, though more drastically in the latter. It declined by approximately 59% for banned stocks and to a lesser extent in control stocks, where depth decreased by approximately 43%. The deterioration in depth in banned stocks was 37% greater than the deterioration in depth in control stocks.
- Trades and volume fell by approximately 10% in banned stocks subsequent to the ban, while in control stocks the number of trades and share volume actually increased by 50%.
- Turnover in banned stocks fell by 21% after the ban compared to a rise in turnover of 42% in the control stocks.
- Results of two separate regression analyses show that the observed decline in liquidity occurs independently of market-wide changes and increased volatility, respectively. The models are economically and statistically significant and suggest that banned stocks in the post-ban period have lower liquidity compared to the control sample and after controlling for market-wide variables.

These findings indicate that spreads increased significantly, and most notably this occurred following the FSA's decision to implement short-selling restrictions on selected stocks. Significant declines in depth, trades, volume and turnover were also observed. Following the ban, stocks restricted from short-selling exhibited a statistically significant deterioration in liquidity, which is not explainable by market-wide changes such as increased volatility.

## 1. Introduction

Due to the breakdown of credit markets and the worldwide global downturn in 2008, the U.K equity market experienced profound losses and a significant increase in volatility. On the 18<sup>th</sup> of September these conditions, along with uncertainty in the banking and insurance sector resulted in the FSA's decision to ban short-selling in 34<sup>2</sup> individual stocks. These measures came into effect on the 19<sup>th</sup> of September, 2008.

As of the date, it has not been possible to establish *new* short positions (both naked and covered) on the list of restricted stocks. The effect of these restrictions on market liquidity is uncertain. This report examines market liquidity surrounding the FSA's ban on short-selling in selected stocks.

Figure 1  
Daily time-weighted average spreads

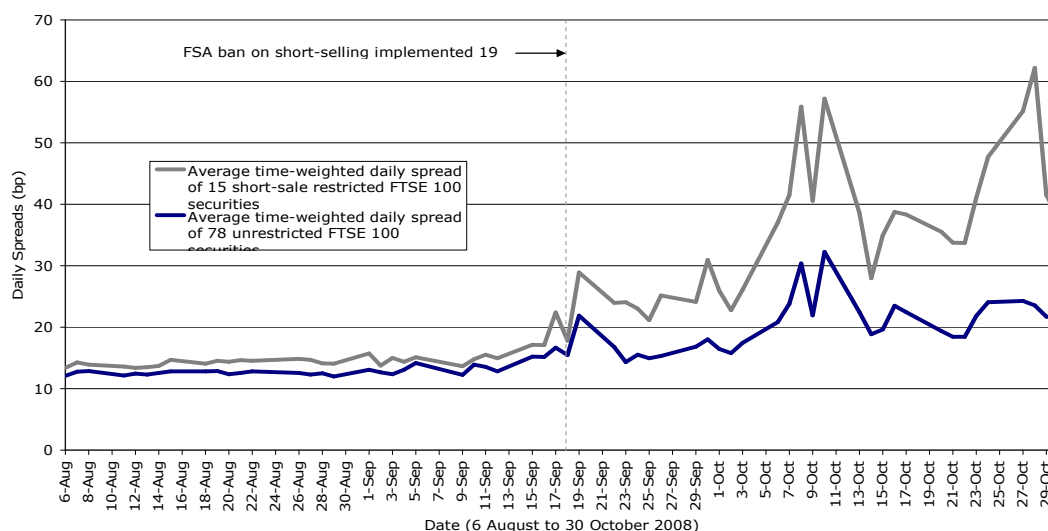


Figure 1 models the spread in banned stocks relative to the control sample between the 6<sup>th</sup> of August and the 30<sup>th</sup> of October 2008. It is apparent that spreads are roughly equal for the two samples leading up to the ban. Both series then increase after the ban is implemented. It does appear that they decouple after this point and spreads in banned stocks worsen to a greater extent than control stocks.

Causality however, is hard to prove. The conditions around the ban on short selling are far from normal and include numerous corporate and regulatory events and substantial volatility. The remainder of the paper samples other measures of liquidity and performs tests to test the effect of short-selling bans on liquidity.

## 2. Daily results

Although the term liquidity is widespread, there is no agreement on its precise measurement. A common definition of liquidity is the ability to buy or sell significant quantities of a security quickly, at low cost and with relatively low price impact. As such,

<sup>2</sup> The ban originally covered 28 stocks but was extended on 23 September to cover 34 stocks.

effective measures of liquidity include turnover, trades and volume (significant quantities), the bid-ask spread (at low cost) and a measure of depth (immediacy, price impact). Table 1 reports the aggregate value for the five measures of liquidity for each of three sample periods (see Appendix).

Table 1

The table reports the aggregate daily liquidity measures for banned and control stocks over the three sample periods. The percentage changes between Pre<sub>2</sub>/Pre<sub>1</sub> and Post/Pre<sub>2</sub> are reported in parenthesis.

	Banned stocks			Control stocks		
	Pre <sub>1</sub>	Pre <sub>2</sub>	Post	Pre <sub>1</sub>	Pre <sub>2</sub>	Post
Spreads	14.88	14.89	35.49	13.20	13.03	20.24
	-	(0%)	(138%)	-	(-1%)	(55%)
Bid depth	348,000	246,000	104,000	154,000	121,000	68,000
	-	(-29%)	(-58%)	-	(-21%)	(-44%)
Ask depth	328,000	233,000	96,000	143,000	116,000	67,000
	-	(-29%)	(-59%)	-	(-19%)	(-42%)
Trades	7,200	7,900	7,200	4,800	4,800	7,200
	-	(10%)	(-9%)	-	(0%)	(50%)
Volume (m)	40,328	38,474	33,270	10,764	9,475	14,253
	-	(-5%)	(-13%)	-	(-12%)	(50%)
Turnover	0.0068	0.0068	0.0054	0.0062	0.0057	0.0081
	-	(0%)	(-21%)	-	(-8%)	(42%)

Prior to the ban, the time-weighted daily average spread of banned stocks averaged approximately 0.149 percent. After the ban this increased to 0.35 percent, representing an increase of 138 percent from the pre ban periods. Spreads for the control sample also increased by 56 percent, this figure is significantly less than the increase in banned stocks.

Table 1 also shows that market depth decreased throughout the sample period. The average volume required to move a banned stock's price by 1% fell by 29 percent in-between the pre ban periods and another 58 percent between the two test periods. This compares with an approximate 20 (43) percent decrease in the bid and ask depths of control stocks in the pre (post) ban period. This indicates a thinner market, especially for those stocks that were banned.

Trades remain steady throughout the sample periods for banned stocks and volume declines steadily throughout. This compares to large increases in trades and volume in the post ban period for control stocks, suggesting some liquidity may have migrated. Prior to the ban, the average daily turnover of banned stocks was 0.68 percent. After the ban turnover was 0.54 percent, a fall of 21 percent, while turnover for the control sample increased by 42 percent in the post ban sample period. This finding could indicate that liquidity was transferred from the banned to non-restricted stocks.

### 3. Regression analyses

#### 3.1 Market-wide regressions

The deterioration of liquidity in banned stocks to a greater level than that of the control sample (noted in the daily results) could be explained by banned stocks having higher sensitivity to broad market movements. As such, the first step is to ensure that the observations are not attributable to market-wide changes in liquidity. This is achievable by estimating the following regressions:

$$y_{it} = \alpha_0 + \beta_0 X(\text{Control\_mean})_t + \beta_1 \text{Post\_Period} + \varepsilon_i \quad [1]$$

where  $y_{it}$  is the value of the liquidity measure for the banned stock  $i$  on day  $t$ ,  $X(\text{control\_mean})_t$  is the average value of the liquidity measure for control stocks on day  $t$  and  $\text{Post\_period}$  is a dummy variable taking the value of 1 if the observation is in the post ban period.  $\alpha_0$  is the intercept and  $\varepsilon_i$  represents the error term. This model is estimated separately for each liquidity measure over the entire sample period. The estimates generated by these regressions are reported in Table 2.

Table 2

Estimates for the market wide regression model specified above with t-statistics reported below parameter estimates and where \* (\*\*) represents statistical significance at the 1% (5%) level

Model	$\alpha_0$	$\beta_0$	$\beta_1$	R-square	F-test
Spread	-14.66 -7.06*	2.25 14.66*	4.55 3.28*	0.39	403.66*
Bid depth	87,162 2.06**	1.51 4.99*	-85,673 -3.36*	0.14	99.02*
Ask depth	95,086 2.74*	1.42 5.42*	-94,844 -4.48*	0.14	102.21*
Trades	-758 -1.14	1.72 13.27*	-4,439 -9.14*	0.12	88.50*
Volume (m)	-81.70 -0.17	3.98 9.19*	-226.60 -6.36*	0.06	44.19*
Turnover	-0.00 -1.80	1.30 15.53*	-0.004 -11.48*	0.17	130.25*

The coefficient  $\beta_0$  measures the market wide movements in the control sample and the banned stocks and for all models suggests that both the size of the measures are greater for banned stocks and the magnitude of changes in the banned stocks in relation to the control stocks are larger. Our variable of interest,  $\beta_1$  is positive for spreads and negative for depths, trades, volume and turnover. This suggests that after accounting for market wide changes, there is an increase in spreads, and falls in depths, trades, volume and turnover. Each one of these variables is significant at the 1% level.

### 3.2 Volatility regression

The results so far indicate that market liquidity declined in banned stocks compared to control stocks in the period after 18 September 2008. Specifically, spreads increased for the cross-section of LSE stocks on the banned list in comparison to the remainder of the FTSE 100. However, the effect of the short-selling ban on spreads may differ across stocks depending on factors such as price, trading activity, volatility and information asymmetry. It is possible that a systematic increase in volatility caused spreads to widen. A cross-sectional regression similar to Harris (1994)<sup>3</sup> is estimated to control for this. The model specification is:

<sup>3</sup> Harris, L. (1994). Minimum price variations, discrete bid-ask spreads, and quotation sizes. *Review of Financial Studies* 7, 149–178.

$$y_{ij} = \beta_0 + \beta_1 \frac{1}{P_{ij}} + \beta_2 \frac{1}{\sqrt{N_{ij}}} + \beta_3 \ln(DolVol_{ij}) + \beta_4 \sigma_{ij} + \beta_5 \ln(MktValue_{ij}) + \beta_6 (Pre\_Banned) + \beta_7 (Post\_Control) + \beta_8 (Post\_Banned) + \varepsilon_i \quad [2]$$

Here,  $i$  denotes the  $i$ th stock on day  $j$ ,  $y_i$  is the average time weighted spread,  $P_i$  is the close price as a proxy for the average price,  $N_i$  is the daily number of transactions,  $DolVol_i$  is the daily dollar volume,  $\sigma_i$  measures volatility and is the log of the daily high divided by the daily low price,  $MktValue_i$  is the market value of equity, and  $\ln$  denotes the natural logarithm. The dummy variable *Pre\_Banned* takes the value of 1 if the observation is in the pre-ban period and is on a to-be-banned stock, *Post\_Control* takes the value of 1 if the observation is in the post-ban period and is a control stock and *Post\_Banned* takes the value of 1 if the observation is in the post-ban period and a banned stock. These variables are 0 otherwise and thus, the pre-ban control stocks are represented by three zeros for the variables.

The variable of interest is *Post\_Banned*. A decline in market liquidity (measured through spreads) with statistical power would be witnessed if this variable is positive and significant. That is, spreads are higher (after controlling for price, trading activity, risk, information asymmetry, period and stock sample) in banned stocks after the ban than they are before the ban and compared to the control stocks. The results of the ordinary least squares (OLS) regression are reported in Table 3.

Table 3

Estimates for the ordinary least squares regression model specified above where \* (\*\*) represents statistical significance at the 1% (5%) level

Parameter	Estimate	t-statistic	P-value
Intercept	11.69	1.76	0.0789
Price	296.75	6.41*	<.0001
Transactions	370.96	15.78*	<.0001
Value traded	-1.45	-5.37*	<.0001
Volatility	119.14	44.76*	<.0001
Market value	-1.02	-7.88*	<.0001
Pre_Banned	0.81	1.97**	0.0492
Post_Control	4.48	18.40*	<.0001
<i>Post_Banned</i>	12.15	25.55**	<.0001
R-square			0.6248
F-test		1151.51*	<.0001

The regression model estimated fits the data well as evidenced by the R-square value (0.6248) and the f-test (p-value <.0001). The variable of interest *Post\_Banned* (12.15 bps) is positive as well as economically and statistically significant. The cross sectional regression suggests that in the post-ban period and for banned stocks, the spread is significantly higher than in the pre-ban period, after controlling a number of factors. Further, it suggests that the spread for banned stocks increases to a greater extent than the spread of the control stocks, which only increase by 4.48 bps in comparison.

## **Appendix**

### **a. Data**

The analysis surveys market liquidity in banned stocks against a control sample of stocks not subjected to the ban. The stocks in the banned sample are the stocks that are both constituents of the FTSE 100 and also short-selling restricted. In total there are 15 stocks in the FTSE 100 that were original subjects of the FSA ban. To account for market-wide changes, a control sample of 78 stocks is also analysed over the same period. The control sample comprises the remaining FTSE 100 stocks not included in the ban, net of mid-sample changes that occurred in the index during the period of study.

To measure specific dimensions of market liquidity, three benchmark periods are formed using two pre-ban periods of the 30 trading days prior to the announcement date (23 June 2008 – 5 August 2008 and 6 August 2008 – 18 September 2008). Variables are measured a third time during the period following the short-sale restrictions (19 September 2008 – 30 October 2008).

For these stocks and within these periods, trade and quote data is provided by the London Stock Exchange. The data is extracted from the exchange's surveillance system, SMARTS™. From this system, complete order book replications are available and the time-series of measures are collated by querying this system.

### **b. Method**

Several liquidity measures are calculated. For each stock the spread is the time-weighted difference between the best bid and ask prices relative to the midpoint price and is calculated continuously. Bid and ask depths are calculated as the volume required to move the bid and ask price by one percent for each stock and is also calculated continuously as a time weighted average over the trading day.

Trades and volume are simple counts of the number of trades and number of shares traded during continuous trading. Turnover is calculated as the number of shares transacted on a day for each security divided by the number of shares on issue for the security at the start of the sample period.