Temporary ban on short positions and financial market volatility: Evidence from the Madrid Stock Market[1*]

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Abstract

This paper analyses the effect of the introduction of temporary ban on short positions in the Spanish market on the volatility of both the closing price and the trading volume of the underlying index, as well as in the price of the main financial institutions. Using an econometric procedure for detecting structural breaks in the series, we study the period January 2000- December 2013. Our results do not suggest any significant impact on variance, neither on price nor on trade volume.

Keywords: Short-selling ban, Structural Breaks, GARCH Model

JEL Codes: G18, C22, C59

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1. Introduction

Following the temporary prohibition imposed by the US Securities and Exchange Commission in July and September 2008, and the British FSA between 2008 and 2009, Germany established the prohibition of short selling on bank stocks and euro area countries´ sovereign debt in May 2011.

The Comisión Nacional del Mercado de Valores (CNMV), the agency in charge of supervising and inspecting the Spanish Stock Markets and the activities of all the participants in those markets, also put in place temporary prohibitions of "short sales" from 11 August 2011 to 15 February 2012 and from 23 July 2012 to 31 January 2013. The reason given for these temporary bans were that the European securities markets, and particularly financial stocks, were going through a period of extreme volatility that could influence the stability of markets and might cause their disorderly functioning.

We analyse the effect of the introduction of these temporary bans on short positions on the volatility of the Spanish Stock Exchange. More specifically we study whether the introduction of the measures restricting net short positions in Spanish shares has affected the volatility on the Ibex-35 index and the trading volume of the underlying asset. To that end, we sequentially apply tests for a structural change in variance to a range of possible breakpoints, therefore avoiding us to assume a prior knowledge of its location.

2. Econometric Methodology

Bai and Perron (1998, 2003)[2] consider the following multiple linear regression with m breaks (m+1 regimes):

[2] We are particularly grateful to Bai and Perron for providing us with the GAUSS code for computations.

$$
\begin{aligned}
y_t &= x_t'\beta + z_t'\delta_2 + u_t, \qquad t = T_1 + 1,\ldots,T_2, \qquad (1)\\
&\square\\
y_t &= x_t'\beta + z_t'\delta_{m+1} + u_t, \qquad t = T_m + 1,\ldots,T.
\end{aligned}
$$

In this model, y_t is the observed dependent variable at time *t*; $x_t \quad (p \times 1)$ and z_t $(q \times 1)$ are vectors of covariates and β and $\delta_j \quad (j = 1,\ldots,m+1)$ are the vectors of coefficients, respectively. Finally, u_t is the disturbance at time *t*. The break points $(T_1,\ldots,T_m)$ are unknown. The purpose is to estimate the unknown regression coefficients and the break points using a sample of *T* observations.

We consider a pure structural change model $(p = 0)$, where all the coefficients are subject to change, from the model in equation (1). In this sense, we specify each series as an AR(1) process and then, to detect multiple structural breaks in variance, we use the absolute value of the fitted residuals of the AR(1) models.[3] For this analysis we specify $z_t = \{1\}$.

To detect multiple structural breaks, we use the following set of tests developed by Bai and Perron (1998, 2003)[4]: the sup *F* type test, the double maximum tests and the test for $\square$ versus $\square+1$ breaks. In first place, we consider the sup *F* type test of no structural breaks ($m = 0$) versus the alternative hypothesis that there are $m = k$ breaks. In second place, we employ the double maximum tests, *UD*max and *WD*max. They contrast the null hypothesis of no structural breaks against an unknown number of breaks given some upper bound M. Finally, we use the test for $\square$ versus $\square+1$ breaks, the labelled sup $F_T(\square+1\ \square)$ test. The method involves the application of the $(\square+1)$ test of the null hypothesis of no structural change versus the alternative hypothesis of a single change. The test is applied to each segment containing the observations $\hat{T}_{i-1}$ to $\hat{T}_i$ $i = 1,\square,(\square+1)$. To run these tests it is necessary to decide the minimum distance between two consecutive breaks, *h*, that it, is obtain as the integer part of a trimming

[3] Similarly, Stock and Watson (2002) use the absolute value of the fitted residuals of a VAR model to analyse changes in variance. Alternatively, Valentinyi-Endrész (2004) use the squared errors from a AR(1)-GARCH(1,1) model to compute changes in variance.

[4] For further analysis see Bai and Perron (1998, 2003).

parameter, ε , multiplied by the number of observations T (we use $\varepsilon = 0.15$ and allow up to four breaks).

To select the dimension of the models, we follow the method suggested by Bai and Perron (1998) based on the sequential application of the sup $F_T(\square+1\square)$ test, the sequential procedure.

3. Data and Empirical Results

3.1. Data

We focus on the Ibex-35 index, a capitalisation-weighted index comprising the 35 most liquid Spanish stocks that are traded in the continuous market. We have used the daily closing prices of the Ibex-35 index and the trading volume of this index covering the period 1 January 2000-31 December 2013. The database was kindly provided by Bolsas y Mercados Españoles (BME).

3.2. Empirical Results

Table 1 offers the detected numbers and dates of structural breaks. Recall that these breaks are searched endogenously from the data and our procedure does not rely on pre-test information to determine them, thereby avoiding the possible problem of "data mining".

To facilitate the interpretation of Table 1, we have indicated with an arrow if volatility increases (↑) or decreases (↓) after the detected structural break. As can be seen, we identify five structural breaks in volatility for the closing prices of the Ibex-35 index (being the break point located on 6 July 2001, 21 May 2003, 1 February 2005, 28 July 2006 and 25 July 2008) and two beaks for the trading volume of the Ibex-35 index (found on 18 October 2004 and 16 June 2008). It is worth noting that the detected breaks are associated with country-specific or euro area events, but they do not coincide with the temporary bans on short positions. This could suggest that such bans did not play any significant role on the evolution of the volatility of the Spanish equity market[5].

[5] Additional formal tests to assess the equality variance before and after the introduction of the bans suggest that they are not significantly different.

[Table 1, here]

Table 2 shows the results for the main financial institutions included in the Ibex-35: BBVA, Bankinter (BKT), BME, MAPFRE (MAP), Banco Popular (POP), Banco Sabadell (SAB) and Banco Santander (SAN). As can be seen, only in the case of BKT we detect a structural break in volatility in August 2011 that could be associated with the introduction of the ban on short positions. Nevertheless, we find that volatility increases after that structural break. The rest of structural breaks coincide with notification to the CNMV of relevant events influencing the development of stock exchange prices in a noticeable manner.

[Table 2, here]

Given the evidence, it is not all clear that the CNMV achieved its stated goal of artificially reducing volatility and could have had adverse implications on market liquidity.

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References

Bai, J. and Perron, P. (1998): Estimating and testing linear models with multiple structural changes, *Econometrica,* **66**, 47-78.

Bai, J., and Perron, P. (2003): Computation and analysis of multiple structural change models, *Journal of Applied Econometrics*, **18**, 1-22.

Stock, J. H. and Watson, M.W. (2002): Has the business cycle changed and why? *NBER Macroeconomics Annual*, **17**, 159–218.

Valentinyi-Endrész, M. (2004): Structural breaks and financial risk management. Working Paper 11, Magyar Nemzeti Bank, Budapest.

Table 1. Structural Breaks in Volatility: IBEX35

Specification: $z_t=\{1\}$ q=1 p=0 ε=0.15 m=5

	SP[a]	Estimated Parameters and Dates										
5 Price												
2003/01/03-2013/12/31		$\hat{\delta}_1$	$\hat{\delta}_2$	$\hat{\delta}_3$	$\hat{\delta}_4$	$\hat{\delta}_5$	$\hat{\delta}_6$	$\hat{T}_1$	$\hat{T}_2$	$\hat{T}_3$	$\hat{T}_4$	
	5	0.0087 (0.0005)	0.0048 (0.0004)	0.0074 (0.0005)	0.0167 (0.0005)	0.0111 (0.0004)	0.0144 (0.0005)	2001/07/06↓[c]	2003/05/21↑	2005/02/01↑	2006/07/28↓	2008/
5 Volume												
2003/01/03-2013/12/31												
	2	0.2783 (0.0065)	0.2414 (0.0074)	0.3017 (0.0112)	-	-	-	-	2004/10/18↓	2008/06/16↑	-	-	-

Notes: a. SP: number of structural breaks selected by the sequential procedure by Bai and Perron (1998, 2003).
b. volp: Absolute value of the fitted residual of a GARCH(1,1) model; volv: Absolute value of the fitted residual of a GARCH(1,1) model; vresidual: Absolute value of residuals from price/volume regression.
c. ↑ indicates the volatility increases and ↓ indicates the volatility decreases after the structural break identified.

Table 2. Structural Breaks in Volatility: Financial Components IBEX35

Specification: $z_t=\{1\}$ q=1 p=0 ε=0.15 m=5

	SP[a]	Estimated Parameters and Dates										
		$\hat{\delta}_1$	$\hat{\delta}_2$	$\hat{\delta}_3$	$\hat{\delta}_4$	$\hat{\delta}_5$	$\hat{\delta}_6$	$\hat{T}_1$	$\hat{T}_2$	$\hat{T}_3$	$\hat{T}_4$	
003/01/03-2013/12/31												
	5	0.0157 (0.0009)	0.0081 (0.0005)	0.0123 (0.0009)	0.0267 (0.0009)	0.0166 (0.0006)	0.0208 (0.0007)	2004/01/13↓[c]	2007/06/4↑	2008/06/9↑	2009/05/18↓	2011
	1	0.2720 (0.0051)	0.3537 (0.0118)	-	-	-	-	2011/05/26↑	-	-	-	-
s	4	0.1249 (0.0064)	0.3543 (0.0053)	0.2413 (0.0063)	0.1974 (0.0059)	0.4768 (0.0071)	-	2004/11/17↑	2007/07/23↓	2009/05/20↓	2011/07/5↑	-
007/07/23-2013/12/31												
	3	0.0202 (0.0011)	0.0276 (0.0012)	0.0134 (0.0010)	0.0208 (0.0006)	-	-	2008/06/24↑	2009/04/2↓	2010/04/20↑	-	-
	1	0.3163 (0.008)	0.4090 (0.0150)	-	-	-	-	2011/08/31↑	-	-	-	-
s	4	0.2541 (0.0084)	0.3568 (0.0113)	0.1836 (0.0105)	0.2320 (0.0087)	0.4278 (0.0113)	-	2009/01/27↑	2009/10/26↓	2010/10/12↑	2012/03/2↑	-
008/01/2-2013/12/31												
	1	0.0242 (0.0007)	0.0127 (0.0004)	-	-	-	-	2009/02/13↓	-	-	-	-
	1	0.3092 (0,0015)	0.4063 (0,0007)	-	-	-	-	2009/11/9↑	-	-	-	-
s	2	0.1879 (0.0050)	0.0871 (0.0032)	0.1236 (0.0065)	-	-	-	2009/02/19↓	2012/02/8↑	-	-	-
007/01/9-2013/12/31												
	4	0.0125 (0.0010)	0.0182 (0.0013)	0.0320 (0.0013)	0.0157 (0.0006)	0.0029 (0.0008)	-	2007/12/19↑	2008/08/15↑	2009/03/31↓	2011/07/7↑	-
	1	0.3160 (0.0077)	0.3943 (0.0170)	-	-	-	-	2011/12/15↑	-	-	-	-
s	5	0.2531 (0.0070)	0.1068 (0.0063)	0.1989 (0.0063)	0.1022 (0.0065)	0.0738 (0.0066)	0.2106 (0.0070)	2007/11/26↓	2009/01/16↑	2010/01/27↓	2011/02/3↓	201

Notes: a. SP: number of structural breaks selected by the sequential procedure by Bai and Perron (1998, 2003).
b. volp: Absolute value of the fitted residual of a GARCH(1,1) model; volv: Absolute value of the fitted residual of a GARCH(1,1) model; vresidual: Absolute value of residuals from price/vlume regression.
c. ↑ indicates the volatility increases and ↓ indicates the volatility decreases after the structural break identified.

Table 2. Structural Breaks in Volatility: Financial Components IBEX35 (cont.)

Specification: $z_t=\{1\}$ q=1 p=0 ε=0.15 m=5

	SP[a]	Estimated Parameters and Dates										
		$\hat{\delta}_1$	$\hat{\delta}_2$	$\hat{\delta}_3$	$\hat{\delta}_4$	$\hat{\delta}_5$	$\hat{\delta}_6$	$\hat{T}_1$	$\hat{T}_2$	$\hat{T}_3$	$\hat{T}_4$	
005/06/21-2013/12/31												
	3	0.0064 (0.0010)	0.0089 (0.0012)	0.0255 (0.0011)	0.0183 (0.0006)	-	-	2006/11/17↑	2008/01/15↑	2009/04/2↓	-	-
	1	0.3131 (0.0067)	0.4036 (0.0151)	-	-	-	-	2011/09/28↑	-	-	-	-
s	3	0.5143 (0.0131)	0.2238 (0.0119)	0.2993 (0.0156)	0.6882 (0.0183)	-	-	2007/09/6↓	2010/04/24↑	2011/11/11↑	-	-
007/05/7-2013/12/31												
	4	0.0104 (0.0008)	0.0173 (0.0009)	0.0100 (0.0009)	0.0137 (0.0006)	0.0203 (0.0009)	-	2008/06/23↑	2009/04/21↓	2010/02/26↑	2012/02/14↑	-
	1	0.3133	0.3844	-	-	-	-	2010/12/13↑	-	-	-	-

		(0.0098)	(0.0131)									
s	4	0.4261 (0.0096)	0.2826 (0.0082)	0.1416 (0.0095)	0.2516 (0.0088)	0.6446 (0.0106)	-	2008/05/29↓	2009/10/20↓	2010/11/18↑	2012/02/15↑	-

003/01/2-2013/12/31

	4	0.0137 (0.0007)	0.0066 (0.0007)	0.0099 (0.0007)	0.0236 (0.0007)	0.0181 (0.0005)	-	2004/07/30↓	2006/05/19↓	2008/01/15↑	2009/07/2↓	-
	2	0.2953 (0.0063)	0.2214 (0.0095)	0.2939 (0.0080)	-	-	-	2007/11/19↓	2009/12/14↑	-	-	-
s	3	0.1180 (0.0042)	0.2929 (0.0037)	0.1218 (0.0030)	0.3937 (0.0058)	-	-	2005/11/17↑	2009/06/22↓	2011/07/5↑	-	-

Notes: a. SP: number of structural breaks selected by the sequential procedure by Bai and Perron (1998, 2003).
b. volp: Absolute value of the fitted residual of a GARCH(1,1) model; volv: Absolute value of the fitted residual of a GARCH(1,1) model; vresidual: Absolute value of residuals from price/volume regression.
c. ↑ indicates the volatility increases and ↓ indicates the volatility decreases after the structural break identified.