

IMPACT OF THE MIFIR VOLUME CAP MECHANISM ON THE MICROSTRUCTURE OF EUROPEAN EQUITY MARKETS

Amongst the multiple changes brought by MiFID 2 / MiFIR on the functioning of financial markets, the Double Volume Cap (DVC), defined as Volume Cap Mechanism in article 5 of MiFIR initially aimed at limiting the share of dark trading and at reinforcing the reliability of the price formation process in the equity space. Since its inception, the mechanism has been questioned and sometimes criticized, for its design, its calibration, its effectiveness and its possible unintended effects¹.

In order to bring as much clarity and objectivity as possible in this debate, AMAFI, together with one of its members, led a study on the observable impacts of the DVC on the microstructure of European equity markets. This study is by nature limited in scope, and we would welcome wider assessments of the DVC's impacts by other stakeholders. Still, we are confident that the conclusions drawn from this study are sound and reliable.

Executive Summary

Our study focused on the first wave of suspensions under the Double Volume Cap, implemented from 12 March to 12 September 2018. For the shares suspended under the DVC, we analyzed the impact on the market micro-structure, through the evolution of the bid-offer spread and of the size of the available interest at the best limit on the main lit market for each share, keeping in mind that the suspension period was also a period a lower volatility in 2018. We then analyzed a sample of orders provided by an individual member, to assess whether the suspension under the DVC has an effect on the market impact of such orders.

Our study tends to indicate that **the DVC statistically has a positive but very limited impact on the lit market micro-structure for the targeted shares**, through the decrease of the bid-offer spreads and the increase of size of the available interest at the best limit. This effect however is of a secondary order relative to the impact of the general level of volatility in the market during the observation period.

For an "average" user of dark trading (eg for whom the use of dark pools is in line with their global market share), there is **no obvious effect of the DVC on the market impact of orders**, which appears to be mostly driven, again, by the level of volatility in the market.

¹ See for instance the position paper issued by the German Ministry of Finance end of August 2019, summarizing the findings of its public consultation: "*Recent developments in equity markets show that the double volume cap, as currently calibrated, leads to a shifting of trading volumes from order-book trading towards auction-based trading, thereby calling into question the original purpose of the DVC mechanism to ensure price formation.*"

I. Scope, aim and methodology

1. Constitution of “suspended” and “control” samples

The study focused on 2018 data, building
The first step of the study was to determine:

- (i) a population of shares subject to a DVC suspension in 2018 that would be large enough to be statistically significant and;
- (ii) a population of shares that was not subject to such suspension in 2018, serving as a control sample.

The DVC provision includes a “specific” mechanism (under which the suspension hits a given venue, when its dark trading market share exceeds a 4% cap) and a “general” mechanism (under which the suspension applies to all EU venues, when EU dark trading exceeds an 8% share for the relevant share). Considering the low number of suspensions pronounced under the “specific” mechanism, the study was focused on the “general” mechanism. The following table shows the number of shares captured under the different suspension waves of the general mechanism in 2018, according to ESMA DVC files:

Suspension period	Number of shares
From 12/03 to 12/09	540
From 12/03, revoked on 16/04	86
From 12/03, prolonged after 12/09	5
From 13/04	55
From 14/05	40
From 12/06	20
From 11/07	45
From 10/08	30
From 12/09	5
From 11/10	2
From 14/11	10
From 12/12	13

Table 1: Number of shares subject to a suspension under the general Volume Cap Mechanism

To ensure the study could rely on statistically significant samples, the “suspended” sample was built from the list of 540 shares that were suspended from 12/03 until 12/09, while the “control” sample was built from the list of EU shares that were never suspended under the DVC mechanism in 2018.

Last, both samples were refined to (i) integrate a classification by market capitalization and (ii) to focus on shares for which sufficient data was available on microstructure data. This led to remove from both samples shares with a market capitalization below € 200m, considering the low number of shares of this size that were subject to a suspension, and the difference in behavior of such shares.

Finally, the samples were determined as follows:

	Market capitalisation			Total sample size ²
	Between € 200m and € 1bn	Between € 1bn and € 5bn	Above € 5bn	
« Suspended » sample	62	277	194	533
« Control » sample	594	227	197	1018

Table 2: Samples' sizes by market capitalization

2. Controls performed

The study aims at highlighting the impact of the DVC mechanism for market users, and especially for investors. The question was investigated under two different but complementary angles:

- **What is the impact of the DVC on market microstructure, and particularly on (i) the bid-offer spread of targeted shares and (ii) the size of available interest at the best limit?**
- **The bid-offer spread³** gives an indication of the investment (and disinvestment) cost for the investor.
- **The size of interests at the best limit** gives an indication of the available liquidity in the lit order books.

The combination of these two variables informs on the stability of the price formation process for the concerned instrument:

- a low spread with deep interests will result in a more stable price formation process;
- a high spread with limited interests is likely to result in erratic prices being formed.

In this study, we used **daily averages** observed on the main listing market for both the bid-offer spread and the size of interests at the best limit.

- **Do the suspensions of dark trading applied under the DVC modify the orders' market impact?**

The notion of **market impact** is well documented: on average, a buying order will push prices up, while a selling order will push them down. This is because of the information disclosed to the public, indicating a change in the supply and demand balance.

The use of dark trading limits the information leakage, and hence results in lower average impacts compared to the execution of similar orders on venues subject to pre-trade transparency.

In this study, we simply measured the impact of an order as the relative price movement between the first execution and the last execution attached to this order.

² The sample sizes do not include shares with a market capitalization below € 200m.

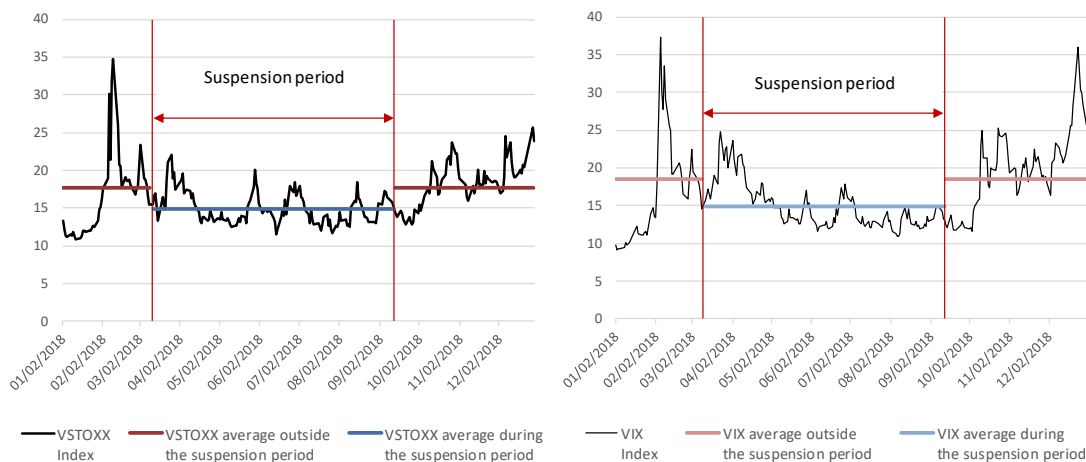
³ Eg the difference in price between the orders at the best bid and those at the best offer, divided by the price at the midpoint between best bid and best offer.

3. Context

The global market context – and specifically the level of volatility – has an effect on the microstructure of lit markets, and on the market impact of orders alike.

Accordingly, it is important to keep in mind that, in 2018, the level of volatility of European markets (as measured through the VSTOXX index) was significantly lower during the “suspension period” (eg between the 12 March and the 12 September) compared to the “non-suspension period”.

Chart 1: Evolution of equity volatility in 2018⁴.



Nota: The observation that the volatility on European equity markets was lower during the suspension period could raise the question of correlation vs causation: could the suspension have led to lower volatility? The similarity in the evolution of the VSTOXX and of the VIX indexes in 2018 answers this question: the decrease of volatility of European markets in 2018 was not linked to the DVC suspension decisions.

II. Impact of the DVC on market microstructure

1. Double Volume Cap and bid-offer spread

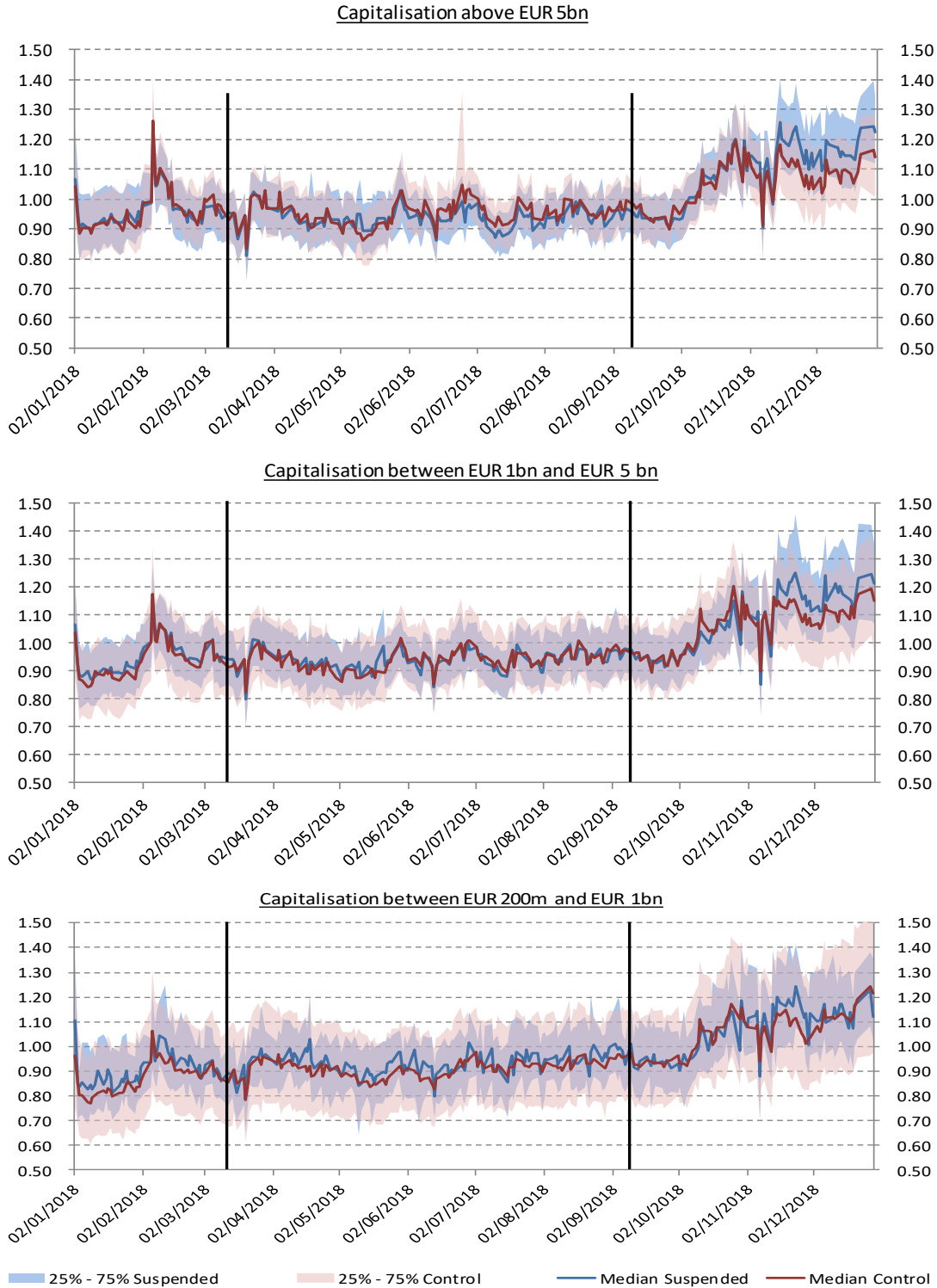
1.1. Comparison of bid-offer spread evolution between the two samples

In order to assess the impact of the DVC on the bid-offer spread of European shares, (i) the daily average spread was recovered for each instrument in each of the market capitalization categories in both samples, and (ii) the data for each instrument were then normalized, by dividing each daily figure by its average over 2018.

This simple approach makes possible a first rough comparison of the median, 1st and 3rd quartiles of the yearly normalized spreads for each of the “control” and “suspended” buckets.

⁴ The x-axis represents time (monthly), while the y-axis represents the level of volatility.

Chart 2: Median, 1st and 3rd quartile of the bid-offer spread of shares subject to the DVC suspension between the 12 March and 12 Sept 2018, compared to shares in the control sample.⁵



⁵ The x-axis represents time (monthly), while the y-axis represents the levels of bid-offer spread. The extremities of the bright blue and bright pink filled curves represent the 3rd quartile (high extremity) and 1st quartile (low extremity) of respectively the suspended sample and the control sample.

This basic approach tends to indicate that:

- (i) unsurprisingly, bid-offer spreads are highly correlated to the level of volatility in the market and;
- (ii) there is no clear difference in the bid-offer trends between shares subject to the DVC and shares in the control sample, apart maybe for shares with a market capitalization above € 1bn, during the period with the higher market volatility (November and December 2018).

1.2. Analysis of the distribution of shares according to a ratio of average spreads

So as to check whether a behavioral difference could be detected between the shares subject to the DVC and the shares in the control sample, we then analyzed the distribution of shares, on the ground of the ratio between $\frac{\text{Average spread during the suspension period}}{\text{Average spread outside the suspension period}}$ ⁶.

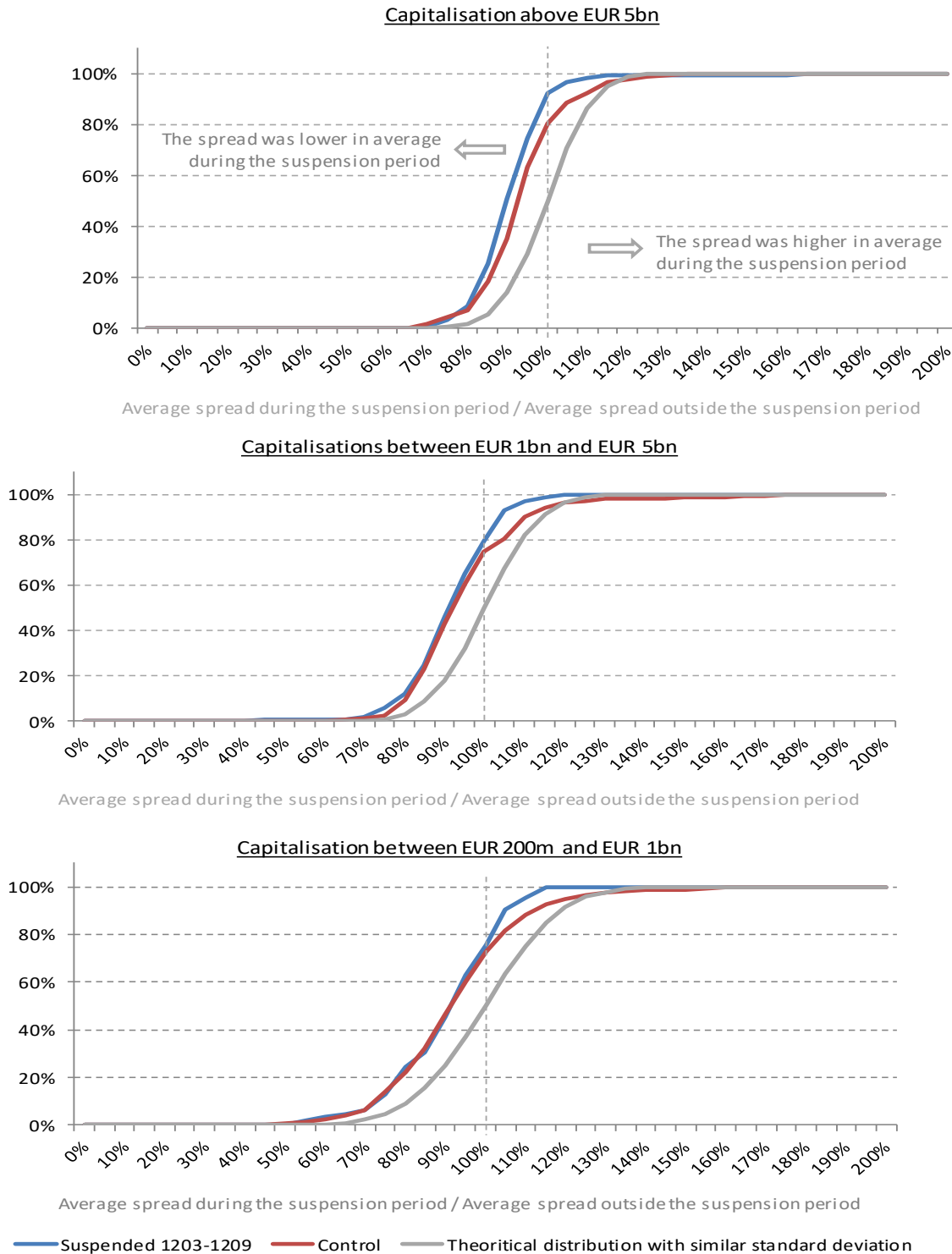
For each capitalization bucket, we compared the distribution for:

- (i) the shares subject to the DVC and;
- (ii) the shares in the control sample.

To highlight the effects of factors outside the DVC suspension, we added a curve corresponding to a theoretical sample built using a Poisson distribution centered on 100% (eg the median that would be expected with no external effect on the sample), and with a standard deviation similar to the ones observed for the “Suspended” and the “Control” samples.

⁶ The average spread during the suspension period is calculated from [12 March to 12 September], while the average spread outside the suspension period is calculated from [1 January to 11 March] & [13 September to 31 December].

Chart 3: Distribution of shares (i) subject to the DVC, (ii) in the control sample and (iii) in a theoretical centered sample, according to the ratio between the average spread during the suspension period and the average spread outside of the suspension period.⁷



Analyzing the evolution of the bid-offer spread under this angle tends to confirm that:

⁷ The x-axis represents the ratio $\frac{\text{Average spread during the suspension period}}{\text{Average spread outside the suspension period}}$ while the y-axis represents the distribution of shares.

- **the bid-offer strongly reacts to the level of market volatility, which appears to be the main driver of spread variation.** For both shares subject to the DVC and shares in the control sample, the spread was in average lower during the suspension period compared to the rest of the year, in line with the market volatility (distance of the blue and red curves to the grey curve),
- **the DVC suspension seems to contribute to a tightening of the spread, but this effect is secondary to the impact of volatility.** This effect seems a bit more marked for shares with a higher market capitalization (distance of the blue curve to the red curve).

2. Double Volume Cap and interests at the best limit

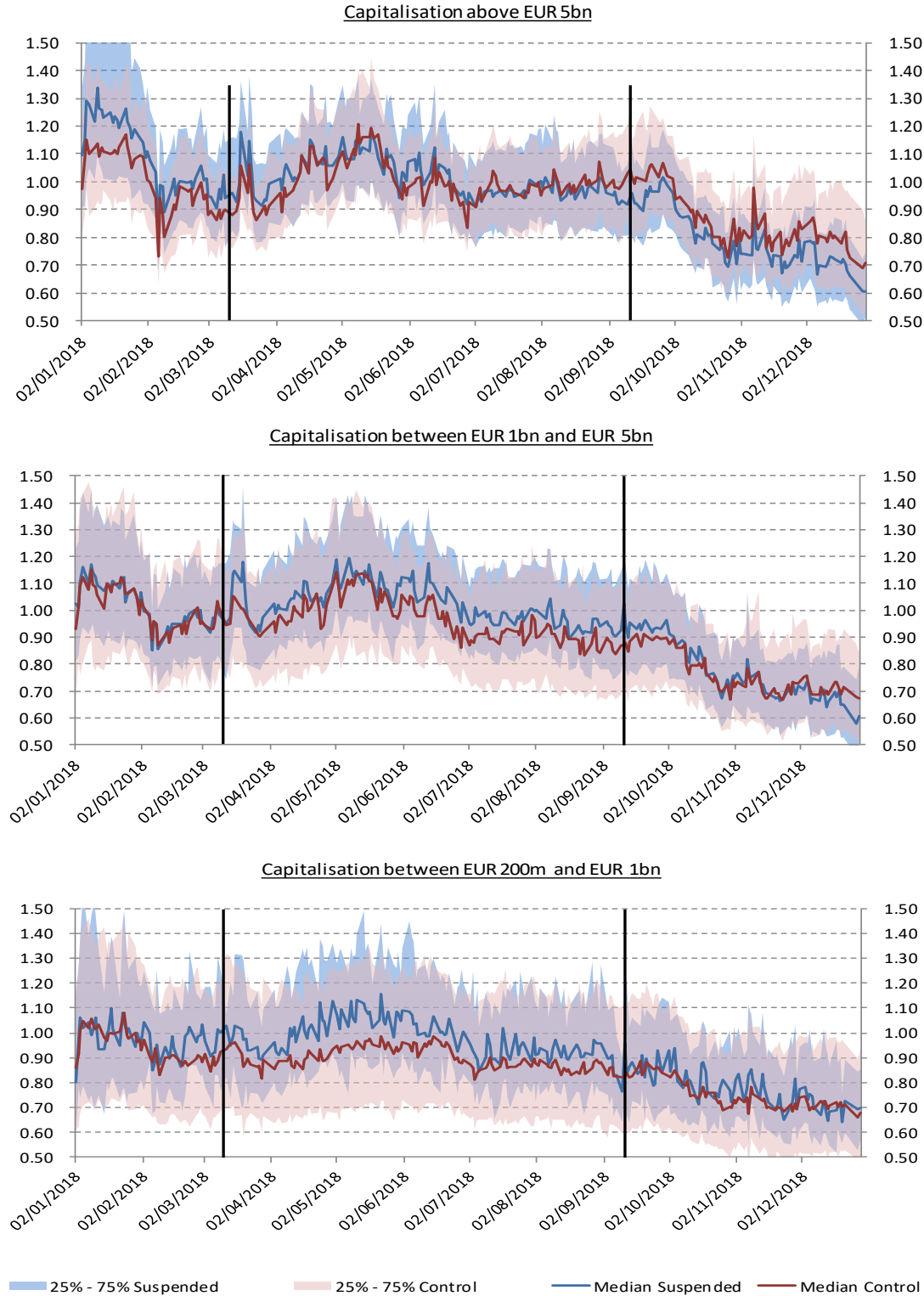
2.1. Comparison of interests at best limit between the two samples

So as to assess the impact of the DVC on the available interest at the best limit, we conducted a similar analysis: (i) the daily average size of interests was recovered for each instrument in one on the “control” / “suspended” buckets, and (ii) the data for each instrument were then normalized, by dividing each daily figure by its average over 2018.

We then compared the median, 1st and 3rd quartiles of the normalized sizes for each of the “control” and “suspended” buckets.

The graphic is read as follows: Take the blue curve, in the second graphic, it can be read as that 20% of the shares have an $\frac{\text{Average spread during the suspension period}}{\text{Average spread outside the suspension period}} > 100\%$ and 80% of the shares have a ratio inferior to 100%, meaning that the average spread during the suspension period was higher than the average spread outside the suspension period only for 20% of the shares.

Chart 4: Median, 1st et 3rd quartile for the normalized size of the interests at the best limit for the shares subject to the DVC suspension and for the shares in the control sample.



This basic approach tends to indicate that:

- (i) the size of available interest at the best limit tends to decrease when the volatility in the market increases – which is consistent with an increase in risk aversion amongst market members in such context – and;

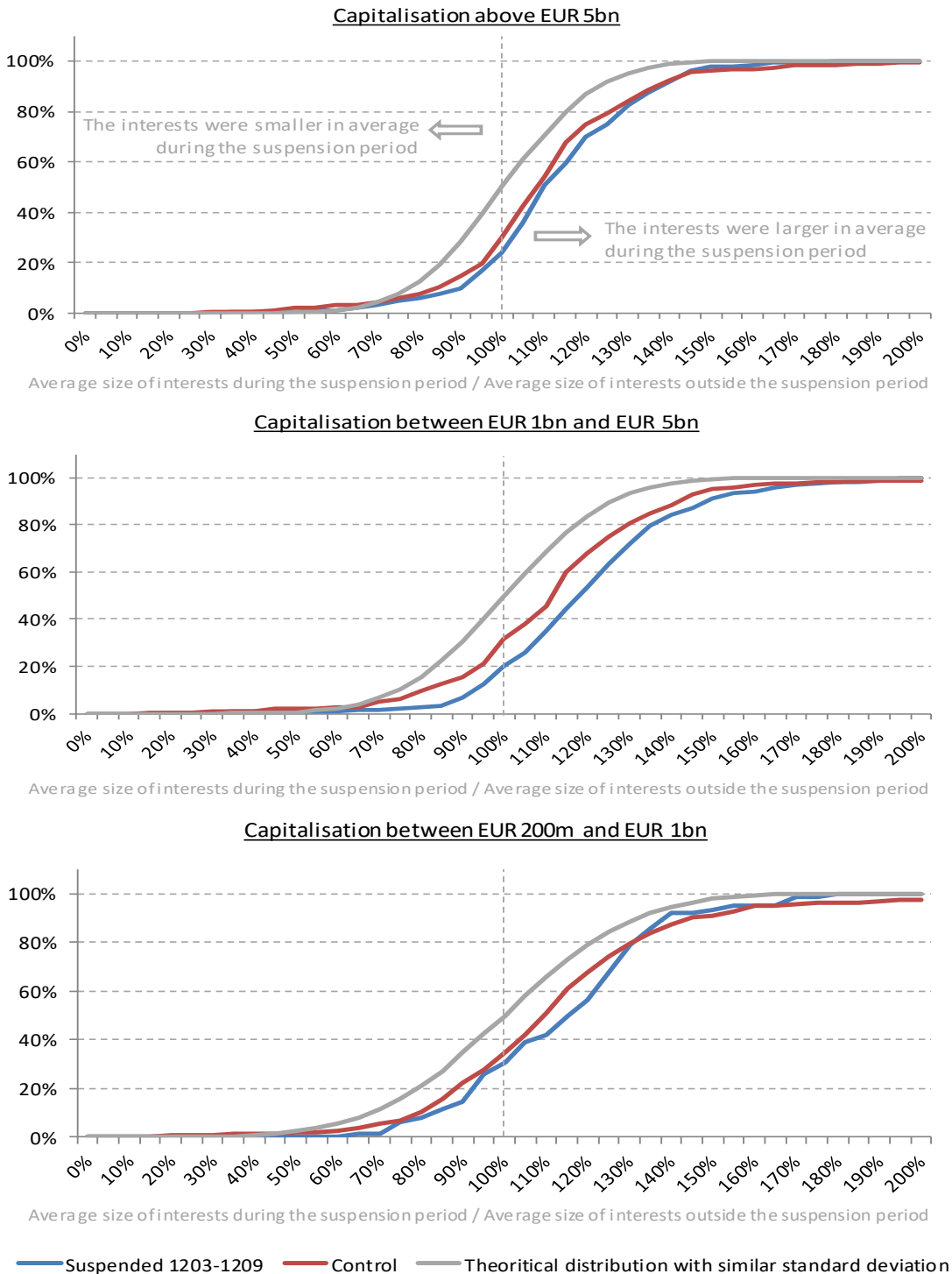
- (ii) there may be an increase of the size of available interests in the lit order book when dark trading is prohibited under the DVC.

2.2. Analysis of the distribution of shares according to a ratio of average sizes of interests

With a view to confirming these first findings, we then analyzed the distribution of shares, on the ground of the ratio between $\frac{\text{Average size of interests during the suspension period}}{\text{Average size of interests outside the suspension period}}$ ⁸. For each capitalization bucket, we compared the distribution for (i) the shares subject to the DVC and (ii) the shares in the control sample. Again, to highlight the impact of factors outside the DVC suspension, we added a curve representing a theoretical sample built with a Poisson distribution centered on 1 and a standard deviation similar to the one observed for two previous populations.

⁸ The average size of interests during the suspension period is calculated from [12 March to 12 September], while the average size of interests outside the suspension period is calculated from [1 January to 11 March] & [13 September to 31 December].

Chart 5: Distribution of shares (i) subject to the DVC, (ii) in the control sample and (iii) in a theoretical centered sample, according to the ratio between the average size of interests during the suspension period and the average size of interests outside of the suspension period.



As with the bid-offer spread (see above), analyzing the evolution of the available interests at the best limit tends to confirm that:

- **the size of available interest at the best limit is mostly driven by the level of market volatility.** For both shares subject to the DVC and shares in the control sample, the size of available interests increases when the volatility decreases, and vice-versa (distance of the blue and red curves to the grey curve),
- **the DVC suspension seems to contribute to an increase in the size of available interests, but, again, this effect is secondary to the impact of volatility.** This effect seems a bit more marked for shares with market capitalization below EUR 5bn (distance of the blue curve to the red curve).

3. Impact of the DVC on the execution of orders

The second part of the study was aimed at assessing whether the suspension of dark trading under the DVC has had a significant effect on the impact of orders for the relevant shares.

As a matter of fact, one of the rationales behind the development of dark trading is that investors seek to reduce the signal that they send into the market when their orders are executed, by limiting the information sent through the pre-trade transparency process.

Symmetrically, one could expect that the suspension of dark trading for certain shares may result in an increase of the market impact of orders in the targeted shares, compared with periods during which dark trading is authorized. Still, a reverse argument could be that, since the suspension would be expected to send more liquidity back in the lit markets, it also increases the ability of these venues to absorb larger orders (eg including the part that would else be directed to dark pools), with unchanged impact.

In order to shed light on this topic, we studied a sample of 350,000 orders executed in 2018 by a member of AMAFI. This member being an “average” user of dark pools (eg its use of dark pools is globally in line with their market share), the conclusions drawn from the analysis of its orders should be a fair representation of the broader market.

More precisely, the study focused on the orders (i) on shares in the “suspended” and in the “control” sample, (ii) for which the execution lasted more than 5 minutes, making the measurement of an impact relevant, and (iii) with a market participation⁹ between 5% and 30%. This left us with a bit less than 75,000 orders.

Orders were then shared between buckets, depending on:

- whether the underlying share belonged to the “Suspended” or to the “Control” samples,
- the day of execution, split between the “Suspension period” and the “Non-suspension period”,
- the market capitalization of the underlying share, according to the buckets defined in Table 1,
- the level of market participation, sorted between “5% - 10%”, “10% - 20%” and “20% - 30%”.

Finally, the results on buckets containing less than 1,000 orders were not considered as sufficiently representative.

Three alternative presentations of our results are proposed below:

- the average and median market impact for each bucket, together with its standard deviation,
- the distribution curve of impacts for shares, comparing the “Suspension period” with the “Non-suspension period”,
- the cumulative curve of impacts for shares, comparing the “Suspension period” with the “Non-suspension period” and the shares in the “Suspended” sample with those in the “Control” sample.

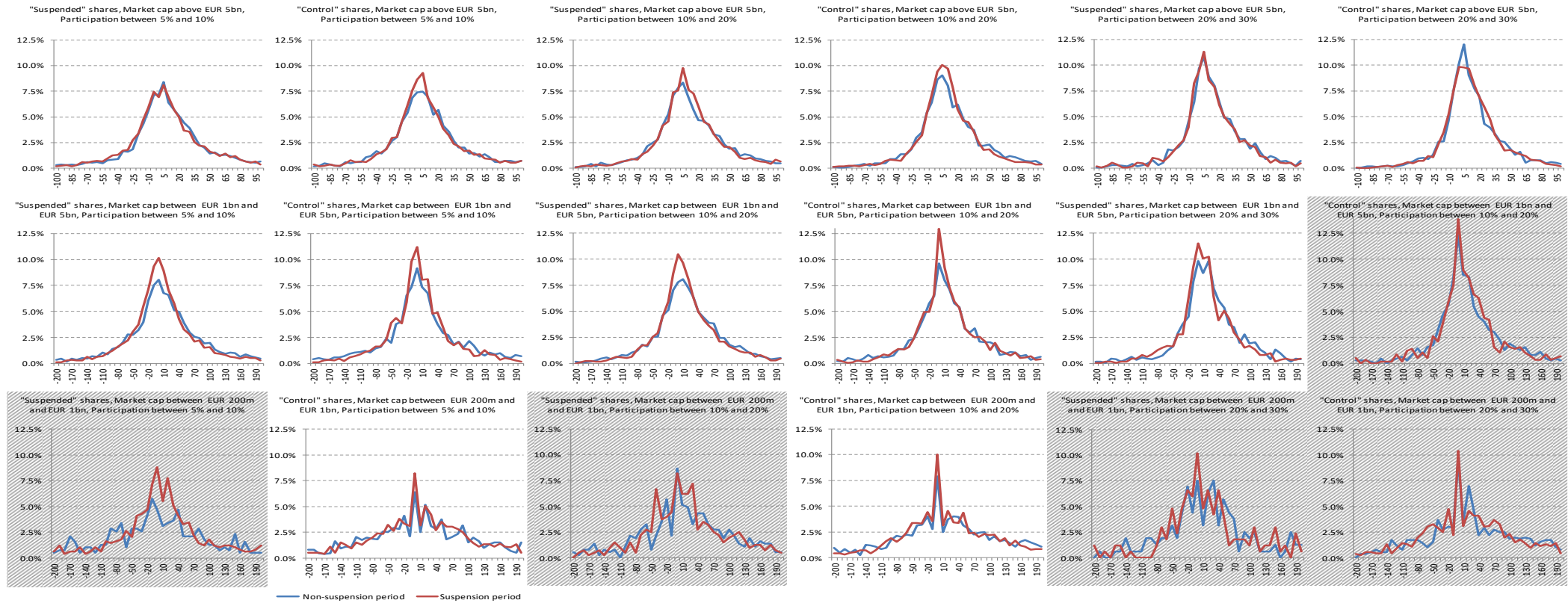
⁹ Eg the weight of the order in the market volumes during the execution period.

Chart 6: Market impact average, median and standard deviation for each bucket¹⁰.

		Market cap above EUR 5bn				Market cap between EUR 1bn and EUR 5bn				Market cap between EUR 200m and 1bn			
		Stocks suspended under the DVC		Stocks in the control sample		Stocks suspended under the DVC		Stocks in the control sample		Stocks suspended under the DVC		Stocks in the control sample	
		During the suspension period	Outside the suspension period	During the suspension period	Outside the suspension period	During the suspension period	Outside the suspension period	During the suspension period	Outside the suspension period	During the suspension period	Outside the suspension period	During the suspension period	Outside the suspension period
Participation between 5% and 10%	Sample size	3,692	3,486	4,188	3,662	3,923	3,153	2,011	1,578	489	384	1,755	1,324
	Impact Average	9.4	12.9	10.1	10.6	9.8	15.5	8.8	13.1	9.0	2.8	19.7	22.4
	Impact Standard Deviation	56.5	62.2	53.8	63.8	84.3	106.2	88.8	111.5	107.6	176.4	152.5	186.4
	Impact Median	5.3	7.0	5.0	6.4	-	8.4	-	5.0	3.0	-	11.9	13.7
Participation between 10% and 20%	Sample size	3,796	3,781	4,867	4,762	3,385	3,595	1,639	1,767	404	369	1,953	1,538
	Impact Average	13.5	14.6	12.4	14.6	18.9	25.4	19.1	19.9	28.0	35.6	35.5	35.3
	Impact Standard Deviation	46.2	51.3	41.7	50.5	75.3	95.8	85.6	102.1	120.1	138.6	143.3	158.9
	Impact Median	8.8	8.4	8.6	9.3	9.7	15.8	8.6	11.3	13.3	17.1	15.4	19.9
Participation between 20% and 30%	Sample size	1,112	1,272	1,680	1,668	1,111	1,209	570	622	167	159	1,123	761
	Impact Average	12.7	14.9	14.3	14.5	18.8	23.9	19.8	24.8	28.4	24.9	28.7	41.9
	Impact Standard Deviation	37.7	37.7	45.5	37.9	68.5	78.2	80.3	97.1	121.3	112.2	142.0	145.1
	Impact Median	9.1	10.7	9.4	8.9	11.5	17.5	11.2	11.5	12.0	20.7	16.9	23.4

¹⁰ Green cells indicate lower levels compared to red cells. Darker colors indicate higher differences. Dashed cells indicate buckets with a sample of less than 1,000 orders, for which the results are not considered statistically reliable.

Chart 7: For each bucket, distribution of orders during the “Suspension” and the “Non-suspension” periods, according to their market impact¹¹.

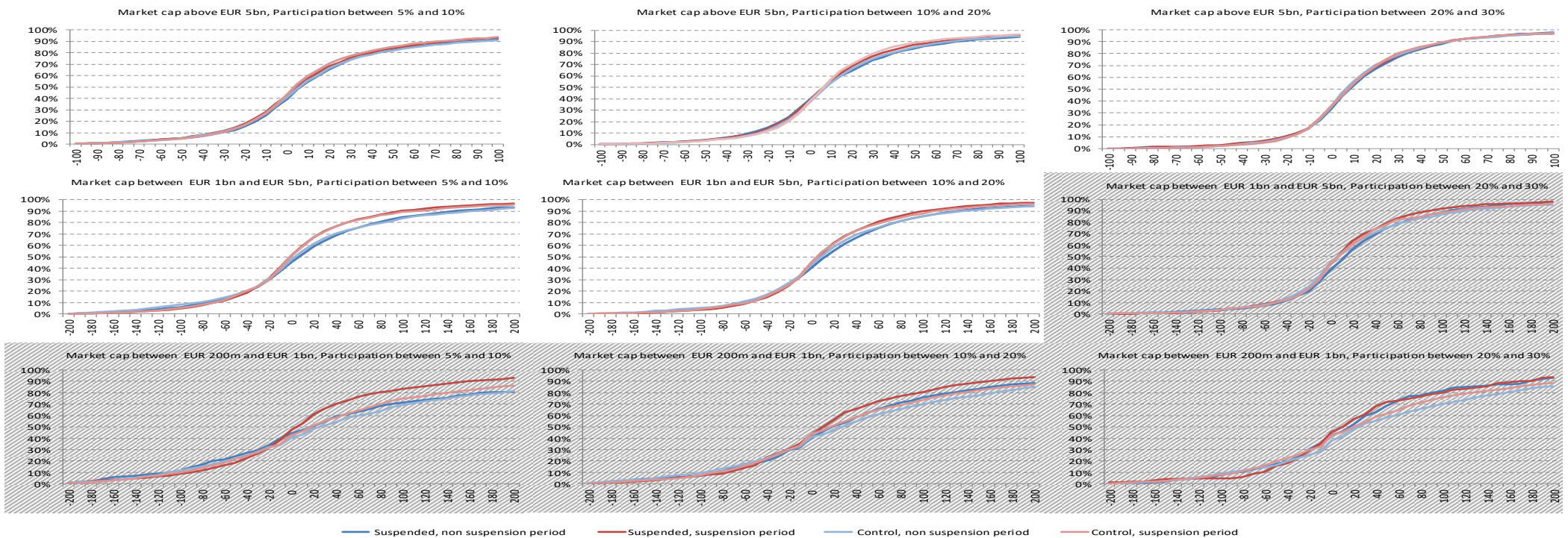


¹¹ The blue line is for the “Non-suspension” period, the red line for the “Suspension” period.

The scale is not the same for the shares with a market cap above EUR 5bn and the other buckets.

Dashed charts indicate buckets with a sample of less than 1,000 orders, for which the results are not considered statistically reliable.

Chart 8: For each bucket, cumulative distribution of orders during the “Suspension” and the “Non-suspension” periods, according to their market impact¹².



¹² The dark blue line is for the “Suspended shares” during the “Non-suspension” period, the light blue line is for the “Control shares” during the “Non-suspension” period, the dark red line is for the “Suspended shares” during the “Suspension” period, and the light red line is for the “Control shares” during the “Suspension” period. The scale is not the same for the shares with a market cap above EUR 5bn and the other buckets.

Dashed charts indicate buckets with a sample of less than 1,000 orders, for which the results are not considered statistically reliable.

The analysis of the data tends to indicate that:

- **The market impact is higher in average and shows a larger dispersion when market volatility increases, regardless of the DVC.**
This is evidenced by the fact that, in chart 6, higher values for the impact average, the impact median and the impact standard deviation are quasi systematically associated with the “Non-suspension” period for both the “Suspended” and the “Control” samples, eg with the period of higher volatility in 2018.
This finding is visually confirmed by the graphs of chart 7, where the red curve (distribution during the suspension period, eg when volatility was lower) reaches higher maximum values than the blue curve (distribution during the suspension period, eg when volatility was higher), regardless of the selected sample. This is the graphic translation of a lower dispersion during periods of lower volatility.
- **There is no obvious effect of dark trading suspension on the market impact of orders.**
See notably chart 8, where the curves for the “Control” and the “Suspended” samples remain blended during the “Suspension” period, but may show some divergences with the curves for the “Non-suspension” period. This suggests that, for the orders analyzed, the suspension of dark trading has been secondary, in terms of market impact, to the changes in the general level of volatility in the market.

