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The market impact of systemic risk capital surcharges

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Abstract

This paper tests the ‘Too-Big-to-Fail’ hypothesis that whether being designated as a global systemically important bank (G-SIB) has an impact on the credit default swap (CDS) price of the bank, thereby reducing its credit risk. We find surprising evidence that the CDS spreads of a bank increase (decrease) after the announcement of a higher (lower) capital surcharge. However, this effect is temporary, as the mean CDS spreads revert to preannouncement level, dropping sharply after the initial rise. These findings create a puzzle by implying that a higher capital surcharge requirement and more stringent regulation could outweigh the implicit subsidy advantages of being too-big-to-fail.

KEYWORDS

CDS spreads, G-SIB capital surcharges, G-SIBs, systemically important banks, too-big-to-fail

JEL CLASSIFICATION

G21, G28

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1 | INTRODUCTION

The world economy has undergone a major systemic breakdown with the global financial crisis of 2008, which eventually led to heightened concerns about the systemic dependence of large banks. Since then, regulatory authorities have imposed a wide variety of regulations to monitor and reduce the systemic risk due to a failure of so-called ‘Too-Big-to-Fail’ (TBTF) banks. Not only has the newly formed Financial Stability Board (FSB) actively investigated the too-big-to-fail problem, but also the Basel Committee on Banking Supervision’s Macprudential Supervision Group (BCBS-MPG) has reached several milestones in its campaign to regulate systemically important banks (Basel Committee on Banking Supervision, 2011, 2013, 2018).

The FSB has been publishing a list of global systemically important banks (‘G-SIBs’) in consultation with the BCBS and national authorities every year in November since 2012. By identifying and allocating systemically important banks to different levels of additional capital requirement buckets, the G-SIB framework provides incentives for G-SIBs to align their systemic importance by waiving these higher requirements.¹

In this paper, we investigate whether inclusion of a bank in the G-SIB list, or a change in the bucket of an existing G-SIB, results in significant changes in its credit risk, measured in terms of its credit default swap (CDS) spread. We implement a panel analysis based on daily relative CDS spreads and a standard event study approach, in which we primarily use the average CDS spreads of G-SIBs that do not change buckets as a control for the average default risk.

The literature has so far supported the notion that being a G-SIB effectively labels banks as TBTF, indicating the greater insurance due to the reluctance of regulators to close or unwind complex and large banks. This might create excessive risk-taking with the expectation that they will be bailed out with capital and/or liquidity as needed (Farhi & Tirole, 2012). These banks could therefore possibly attract funds at relatively lower interest rates and decrease the banks’ CDS spread. One can argue that this mechanism can also be prevalent within the G-SIB list, although its magnitude can differ between the buckets. Moreover, the additional G-SIB-related capital that the banks have to hold might make banks even safer, and therefore decrease their CDS spreads.

Although being designated as a G-SIB should create advantages, the coin has indeed two sides. On the one hand, the announcement of a reallocation to a higher bucket could simply mean that the bank might have lower projected income in the future since raising new equity for the additional capital surcharges is more costly than debt. Moreover, additional requirements could in turn indicate more intrusive supervision by regulators that entail additional operational and administrative costs for the G-SIBs. In essence, the announcement is an update of information on the systemic importance of the bank and this may result in investors preferring to hedge against this specific increase in perceived systemic risk in their portfolios by purchasing CDS. Thus, the announcement could increase demand for the affected bank’s CDS, pushing its price higher.

Our observation period covers G-SIB designations between 2012 and 2017. Therefore, the results presented are unaffected by the recent introduction of recovery and resolution regimes.

¹For instance, the latest (November 2020) list of G-SIBs provided by the FSB can be found under the following link: <https://www.fsb.org/2020/11/2020-list-of-global-systemically-important-banks-g-sibs/>

This notwithstanding, a significant decrease in bailout expectations may date back as early as just after the global financial crisis. A recent paper by Berndt et al. (2022) document a significant reduction in CDS market-implied probabilities of a TBTF government intervention for postcrisis US G-SIBs. By making use of a structural model, the authors show that the decrease in bailout expectations of six US G-SIBs might as well occur due to the effect of higher capital requirements in force since 2011.

There are five surprising results arising from our analysis. Firstly, contrary to the traditional TBTF subsidy effect documented in the literature, the CDS markets react directly after bucket reallocation to a higher (lower) bucket with significantly positive (negative) abnormal CDS spread changes. This result suggests that a bucket reallocation of a G-SIB is valued by CDS market participants in recognition of the fact that, due to this treatment, the bank's credit risk would deviate from that of the benchmark sample banks. These results are robust to different alternative samples and methodologies. Second, there is also evidence that this pricing of a bucket reallocation immediately after the announcement reverts to its original levels, since we find the abnormal CDS spread changes to be significantly negative between 30 and 60 days after the event. Third, we show that banks that experience this reversal in their CDS spreads are those that are able to raise capital more quickly and have a better income projection after a bucket reallocation than the banks whose CDS spreads do not revert. Fourth, the panel analysis reveals that reallocations to buckets with higher capital surcharge requirements are related to daily positive relative CDS spread increases, whereas reallocations to lower buckets are not. Finally, a new G-SIB status or a G-SIB bucket reallocation has only temporary effects on the credit risk of these banks, as the abnormal CDS spread changes are not significantly different from zero when considered across the entire event window $[-90, 90]$. A possible reason for this is that the CDS market participants could view the effects of a G-SIB bucket reallocation to be fully absorbed by the affected bank.

The main contribution of our paper is the inclusion of the important dimension of required regulatory capital in the TBTF debate, which we measure through the bucket reallocations. Although the recent formation of resolution funds (since 2018) limits the degree of possible implicit TBTF subsidies, our paper points to a regulatory capital effect that potentially rebalances the TBTF subsidy as observed from market spreads. Our results support the notion that the regulatory reform to limit TBTF through a higher capital surcharge and more stringent regulation is effective and succeed in outweighing its implicit advantages.

The systemic risk of banks has been a major cornerstone of research in financial stability in general. Although attention had been given to financial systemic risk even before² the global crisis, the field has attracted high interest not only through papers that suggest measures of systemic risk,³ but also through papers that empirically evaluate the degree of this risk.⁴ In a detailed analysis, Geyfman and Yeager (2009) investigated how universal banks had similar systematic risk but higher unsystematic risk than traditional commercial banks, shortly before the FSB agreed to regulate global banks with an additional measure. This paper intersects with

²See for instance, Bartram et al. (2007), Freixas et al. (2000), Huang et al. (2009), Rochet and Tirole (1996), or Acharya (2009).

³See especially Acharya et al. (2012, 2017), Adrian and Brunnermeier (2016), and Brownlees and Engle (2017).

⁴For instance, Engle et al. (2015), Huang et al. (2012), Pais and Stork (2013), Puzanova and Düllmann (2013), Zhang et al. (2015), Zhou (2010) and Bostandzic and Weiß (2018), among others.

the literature on systemic risk through the dimension of how being designated as a systemically important bank has a market impact.⁵

This paper builds on to the previous literature in two strands. Primarily, it contributes to the debate on how bank capital and TBTF are related. Acharya (2009) models the economy, suggesting that capital adequacy requirements should not only consider a single bank's own risk, but also its correlation with other banks, which yields the degree of systemic risk. The model in Zhou (2013) adds the claim that imposing capital requirements can lower individual risk, yet simultaneously creates systemic risk through linkages. Although there exist varying views on how to achieve a fair capital requirements scheme for systemically important banks, it is mostly agreed that excessively low capital adequacy requirements create incentives to align with implicit TBTF subsidies. Passmore and von Hafften (2019) put forward that the Basel G-SIB surcharges are too low, as they underestimate default probability. Kupiec (2016) additionally claims that the total loss absorbing capacity (TLAC) requirements will also fail to reduce the TBTF problem, since subsidiaries might still have access to supplemental injections. Among other papers that advocate a systemic perspective on bank capital regulation are Gauthier et al. (2012) and Laeven et al. (2016).

Second, this paper contributes to analyses on how banks' CDS spreads respond to possible measures of systemic importance (Ahmed et al., 2015; Araten & Turner, 2013; Barth & Schnabel, 2013; Cetina & Loudis, 2016; Demirgüç-Kunt & Huizinga, 2013; Völz & Wedow, 2011). The study by Moenninghoff et al. (2015) has pioneered the empirical efforts on the effects of G-SIB regulation on international banks, by undertaking a comprehensive analysis on its impacts on their market values. The authors find that the G-SIB regulation negatively affects the market value of global banks, although G-SIB designation itself has an offsetting positive impact. Our choice of CDS spreads as a funding cost metric to measure the effect of capital requirements and TBTF relies on CDS contracts being available as a contract but not as securities, such that they can be arbitrarily set up anytime. The large literature on CDS markets refers to these contracts as highly liquid instruments, which are less prone to market frictions.^{6,7} The fact that our results with CDSs comply with those of Moenninghoff et al. (2015) on the effects on stock markets indicate that additional regulatory measures involve not only costs that are visible through the stock market, but also through the credit risk of the institution, which would yield higher funding costs.

Although the literature agrees that being a TBTF bank is negatively associated with CDS spreads, there has not been any study that particularly looks at the effects of capital requirement bucket changes in the market pricing of credit risk. In this paper, we introduce the additional granular dimension of analyzing bucket reallocations, instead of looking at G-SIB designation as a 0/1 occasion. This enables us to carve out cases in which a marginally higher capital requirement

⁵An extensive literature investigates the impact of being a TBTF bank (Boyd & Gertler, 1994; Kaufman, 2002, 2014; Morrison, 2011; O'Hara & Shaw, 1990; Stern & Feldman, 2004) on their stock returns (Abreu & Gulamhussen, 2013; Bongini et al., 2015; Demirgüç-Kunt & Huizinga, 2013; Kabir & Hassan, 2005; Kleinow et al., 2014; Moenninghoff et al., 2015), business models (Afonso et al., 2014; Favara et al., 2021; Oliveira et al., 2015; Violon et al., 2020), mergers and acquisitions (Brewer & Jagtiani, 2013; Penas & Unal, 2004) or credit risk pricing (more below), whereas a parallel strand of literature analyze adverse incentives due to related government guarantees (Acharya et al., 2016, 2022; Balasubramnian & Cyree, 2014; Flannery & Sorescu, 1996; Freixas et al., 2004; Gropp et al., 2014; Marques et al., 2013; Zhao, 2018).

⁶See especially Blanco et al. (2005), Gehde-Trapp et al. (2015), Longstaff et al. (2005) and Norden and Weber (2009).

⁷Alternative instruments used in the literature to look at the effects of being TBTF have been deposit rates as in Bassett (2016), Jacewitz and Pogach (2018), bond spreads Ahmed et al. (2015), GAO US (2014), Santos (2014) or credit rating uplift Schich and Toader (2017) and Ueda and Di Mauro (2013).

might balance out the TBTF subsidy, which has not been studied in the previous literature. Moreover, earlier studies utilize event study analysis with CDS spreads mostly through effects of credit rating changes,⁸ whereas this paper extends the methodology to TBTF evaluation.

The structure of this paper is as follows: Section 2 develops the main hypotheses, which we will be investigating. Section 3 summarizes the G-SIB data we use. Section 4 introduces the approaches we implement in our analysis. Section 5 provides an overview of our results, while Section 6 checks the robustness of our results to alternative measures. The final section concludes.

2 | HYPOTHESIS DEVELOPMENT

The traditional TBTF hypothesis would support the notion that higher G-SIB buckets label banks as TBTF, which comes with higher implicit insurance that they will be bailed out with capital and liquidity as needed, and thus, lower CDS spreads. They might therefore attract funds at relatively lower interest rates (Farhi & Tirole, 2012). Although the recent formation of resolution funds limits the degree of possible implicit TBTF subsidies, the period between 2012 and 2017, from which our data come, is still prone to this effect. Particularly, the CDS market response to changes in G-SIB surcharges would be negative with a reallocation to a higher bucket. Moreover, the additional G-SIB-related capital that the banks have to hold might make banks even safer, and therefore reduce their CDS spreads.

The structural explanation behind a decrease in CDS spreads could be based on banks' adjustment of risk-weighted assets (RWA). It has been documented in the literature that banks might choose to reduce their RWA in case of additional capital requirements (Gropp et al., 2018), even by shifting their portfolios to zero risk-weight assets (Acharya & Steffen, 2015). This would indicate less perceived credit risk by investors, and thus, reduce the CDS spreads of the bank. Therefore, a possible hypothesis for our analysis would be,

H1: Higher systemic risk surcharges for G-SIBs result in lower CDS spreads.

On the other hand, the announcement of a reallocation to a higher bucket could simply mean that the bank might have lower projected income in the future, since raising new equity is costly. This could, in turn, indicate more intrusive supervision by the authorities and higher perceived risk in markets (Imbierowicz et al., 2018; Moenninghoff et al., 2015). A further possible reverse explanation is that the announcement is an update of information on the systemic importance of the bank, and that, investors would like to hedge against this specific increase in systemic risk in their portfolios by purchasing CDS. Thus, the announcement would increase the demand of the affected bank's CDS, pushing its price higher. As a result, the CDS spreads of banks could increase for those that are reallocated to a higher bucket and decrease for those that are reallocated to a lower bucket more significantly than the benchmarks during the event window.

H2: Higher systemic risk surcharges for G-SIBs result in higher CDS spreads.

The next section introduces the G-SIB data, which we will use to test these hypotheses.

⁸See Afonso et al. (2012), Finnerty et al. (2013), Hull et al. (2004), Norden and Weber (2004) and Ismailescu and Kazemi (2010).

3 | G-SIB LISTS AND DATA

The regulatory methodology that designates banks as G-SIBs necessitates the calculation of a score as outlined in the reports by the Basel Committee on Banking Supervision (2011, 2013, 2018). A large sample of banks are classified by an indicator-based approach based on the scores they receive from five underlying, equally weighted categories: (i) size, (ii) cross-jurisdictional activity, (iii) interconnectedness, (iv) substitutability/financial institution infrastructure and (v) complexity. The score of the banks in the G-SIB list ranges from 130 as a cutoff level to be classified as a G-SIB, up to 530. Currently, there are five buckets, which change with an increment of 100, that is, the highest bucket would be a score more than 530. The lowest G-SIB bucket has the lowest additional capital requirement with 1% of risk-weighted assets, whereas the fifth bucket has the highest capital buffer requirement of 3.5% of risk-weighted assets. In 2017, only JP Morgan Chase is in the fourth bucket with the highest capital requirement for all G-SIBs with 2.5% of risk-weighted assets. Whenever a non-G-SIB bank passes the threshold score of 130, it will be added to the list in the lowest bucket. Overall, the report published in 2017 has classified 29 banks as G-SIBs.

Our data set consists of daily CDS spreads of banks in the G-SIB list from the Markit database and covers the time period from 1 January 2012 to 27 March 2018. Our choice of CDS spreads as a metric relies on CDS contracts being available as a contract but not as securities, such that they can be arbitrarily set up anytime. Thus, the large literature on CDS markets refers to them as highly liquid instruments, which are less prone to market frictions. By choosing CDS spreads as our measure, we refrain from using bond spreads as in GAO US (2014) or Santos (2014), since they may have liquidity premiums or call provision that are priced in, or deposit rates as in Jacewitz and Pogach (2018) or Bassett (2016) for which fees or other cross-bank metrics are in play.

The data set includes CDS spreads for all major currencies and maturities between 6 months and 30 years in all liquid restructuring clause features. We focus only on the most liquid 5-year senior CDS spreads and the restructuring clause prevalent in the region and currency where the headquarters of the bank operates.⁹ Restructuring clauses define the eligible credit events in case of a credit quality deterioration, by accepting restructuring of debt renegotiation as a default event or not. The market practice defines 'No Restructuring' (XR) as the regional standard for North American-based contracts, whereas 'Modified modified Restructuring' (MM) or 'Complete Restructuring' (CR) are standards for European or Asian contracts.¹⁰

We initially consider the full sample for our baseline analysis and make use of the two subsamples depending on the currency choice (USD and EUR) and headquarters location of the bank for robustness. It can be seen in Table 1 that in the first two columns, the USD and EUR samples consist of a restructuring clause selection for the banks independently from the currency choice, but based on the headquarters. In the third column, we opt for creating not only a USD or EUR-based sample, but also a full sample, where the currency and the restructuring clause depends on the location of the bank headquarters. The combined sample

⁹In essence, subordinate CDS spreads reflect bank risk better than senior CDS spreads and they could provide a higher risk-sensitivity due to explicit or implicit government guarantees. Unfortunately, scarcity of subordinate CDS data points prevented a feasible analysis.

¹⁰See the Big Bang and Small Bang Protocol definitions published by Markit (2009a,b). The International Swaps and Derivatives Association (ISDA) 2014 Credit Derivatives Definitions adds CR14, XR14 and MM14 to these restructuring clauses, which include government intervention as a credit event as well.

TABLE 1 The list of G-SIBs in the sample with the respective restructuring clause of their credit default swap prices

This table reports CR/CR14, XR/XR14 and MM/MM14 which refer to complete restructuring, no restructuring and modified restructuring, respectively.

Bank	USD	EUR	FULL
Bank of America	XR	XR	XR (USD)
Bank of New York Mellon	XR	–	XR (USD)
Citigroup	XR	XR	XR (USD)
Goldman Sachs	XR	XR	XR (USD)
JP Morgan Chase	XR	XR	XR (USD)
Morgan Stanley	XR	XR	XR (USD)
Royal Bank of Canada	XR	XR14	XR (USD)
State Street	XR	–	XR (USD)
Wells Fargo	XR	XR	XR (USD)
Barclays	MM	MM	MM (EUR)
BBVA	MM	MM	MM (EUR)
BNP Paribas	MM	MM	MM (EUR)
Credit Suisse	MM	MM	MM (EUR)
Deutsche Bank	MM	MM	MM (EUR)
Group Crédit Agricole	MM	MM	MM (EUR)
Groupe BPCE	MM	MM	MM (EUR)
HSBC	MM	MM	MM (EUR)
ING Bank	MM	MM	MM (EUR)
Nordea	MM	MM	MM (EUR)
Royal Bank of Scotland	MM	MM	MM (EUR)
Santander	MM	MM	MM (EUR)
Société Générale	MM	MM	MM (EUR)
Standard Chartered	MM	MM	MM (EUR)
UBS	MM	MM	MM (EUR)
Unicredit Group	MM	MM	MM (EUR)
Agricultural Bank of China	CR	–	CR (USD)
Bank of China	CR	CR	CR (USD)
China Construction Bank	CR	CR	CR (USD)
Industrial and Commercial Bank of China Limited	CR	–	CR (USD)
Mitsubishi UFJ FG	MR	–	MR (USD)
Mizuho FG	CR14	CR14	CR (USD)

TABLE 2 The list of bucket reallocations in the sample

Event date	Affected banks	Bucket reallocation
11.11.2013	Deutsche Bank	4 to 3
	Citigroup	4 to 3
	Bank of New York Mellon	2 to 1
	Group Crédit Agricole	1 to 2
	ICBC China	0 to 1
06.11.2014	Group Crédit Agricole	2 to 1
	UBS	2 to 1
	Agricultural Bank of China	0 to 1
03.11.2015	Royal Bank of Scotland	2 to 1
	China Construction Bank	0 to 1
21.11.2016	Citigroup	3 to 4
	HSBC	4 to 3
	Barclays	3 to 2
	Bank of America	2 to 3
	ICBC China	1 to 2
	Wells Fargo	1 to 2
	Morgan Stanley	2 to 1
21.11.2017	Citigroup	4 to 3
	BNP Paribas	3 to 2
	Bank of China	1 to 2
	Credit Suisse	2 to 1
	China Construction Bank	1 to 2
	Groupe BPCE	1 to 0
	Royal Bank of Canada	0 to 1

makes use of EUR for European banks and USD for North American and Asian banks as the most dominant currency.

Between 2012 and 2017 there are 16 European, nine North American and six Asian-based banks that appear as G-SIB.¹¹ We define an affected bank as one that has experienced a bucket allocation between 2013 and 2017, where this also includes removing and adding a bank to the G-SIB list. Table 2 shows all 24 bucket reallocations from 2013 to 2017, with each of them being announced on a day in November. Overall, the affected sample includes 13 banks that were reallocated to a lower bucket and 11 banks to a higher bucket by the FSB. The quantity of changes per year ranges from 2 to 7. Our goal is to see if any of these bucket reallocations affected the credit risk, that is, CDS spreads, of the affected bank.

¹¹Although the first G-SIB list was published in November 2011, it did not indicate the breakdown into specific buckets.

We choose event windows to cover 90 trading days before and after the event. As the G-SIB list is published every November, there is no bank with overlapping events in any given year. Among the banks that had their bucket reallocated, seven cases in the EUR sample and one case in the USD sample do not have continuous CDS data available. In total, there are 23, 17 and 23 bucket reallocations for the USD, EUR and full samples respectively.

4 | METHODOLOGY

In this section, we initially define the baseline approach for computing CDS spread changes. Afterwards, in a preanalysis stage, we describe the methodology for a panel exploration. Finally, we propose an event study approach for CDS markets as described in Norden and Weber (2004) and Hull et al. (2004), which is based on computing abnormal CDS spreads of the affected group with respect to the CDS prices of a control group.

4.1 | CDS spread changes

We initially have to define a baseline approach to calculate CDS spread changes. While deciding what type of CDS spread changes to use, we observe the CDS spreads of the banks from Table 1 to be not homogeneous within the buckets. This could lead to banks with high CDS spreads to drive the results. The bias can be illustrated by the following example. Consider the CDS spreads of two affected banks at day t of the event window,

$$\begin{aligned} CDS_{bank1t} &\approx 182 \\ CDS_{bank2t} &\approx 50 \end{aligned}$$

Hence, for a 1% increase in the CDS spreads of both banks we obtain the absolute CDS spread changes of,

$$\begin{aligned} CDS_{increase_{bank1t}} &\approx 1.82 \\ CDS_{increase_{bank2t}} &\approx 0.5 \end{aligned}$$

In this case, the bank with the higher CDS spread would be more influential if we test whether average CDS spread changes across the affected banks for every time interval are significantly different than zero. Therefore, it is reasonable to look at relative changes of CDS spreads of affected banks for our baseline analysis and account for this bias. The daily relative CDS spread changes are calculated as

$$\Delta CDS_{it} = \frac{(CDS_{it} - CDS_{it-1})}{CDS_{it-1}}. \quad (1)$$

4.2 | Market impact

It should be initially discussed whether a market impact is to be expected after an announcement of the G-SIB lists every November since 2011 at all. In particular, the Basel Framework calibrates the G-SIB scores of individual banks by dividing by a denominator that is

computed through the scores of all participating banks. This implies that, although individual banks might estimate the projected new bucket roughly, there is indeed a window for an announcement effect. Since the market may not know the full list of parameters for all participating banks, there is a surprise component attached to each year's announcement.

An initial panel analysis looks at whether the relative CDS spreads in event windows of $[-90, 90]$ of the affected banks are particularly driven by an upwards or downwards bucket reallocation. The specification we use is;

$$\Delta CDS_{it} = \alpha + \beta_1 * I_{up} + \beta_2 * I_{down} + \beta_3 * I_T + \beta_4 * I_{up} * I_T + \beta_5 * I_{down} * I_T + \gamma_i + \epsilon \quad (2)$$

where ΔCDS_{it} is the relative daily CDS spread, and for all banks i on trading day t , with I_{up} being an indicator with value 1 for an upwards bucket reallocation of bank i and I_{down} being an indicator with value 1 for a downwards bucket reallocation of bank i . Indicator I_T has a value of 1 separately in each regression for time intervals of $[-60, -31]$, $[-30, -2]$, $[-1, 1]$, $[2, 30]$, $[31, 60]$, $[-60, 60]$ and $[-90, 90]$ and a value of 0 for the days outside of each year's $[-90, 90]$ interval. This necessitates dropping the observations within the $[-90, 90]$ event window for other intervals than the particular time interval of interest, since otherwise the remaining time intervals in the event window would have confining 0 values that might enter into the regression, which would contaminate the results. As an example, Figure 1 illustrates the specification of indicator I_T for the panel regression in the $[-30, -2]$ interval. Finally, γ_i indicates bank fixed effects.

The next part of the analysis will test the TBTF hypothesis in separate t -tests and Wilcoxon sign-rank tests.

4.3 | Hypothesis testing

4.3.1 | Benchmark selection

For the purpose of the analysis, abnormal CDS spread changes (ASCs) are computed by making use of a baseline benchmark to control for the average default risk of the affected G-SIB and its corresponding bucket. The existing literature constructs the benchmark by averaging cross-sectional CDS spreads across rating classes to control for the average default risk of that class. However, the G-SIB list does not differentiate the buckets based on the credit ratings of the banks. In this regard, creating a benchmark group based on buckets could control for the possible bias due to the large variability observed across buckets.

Figure 2 compares the CDS spreads of all years depending on the bucket and the currency. The CDS spreads of all banks in a bucket in the corresponding year are merged across all years

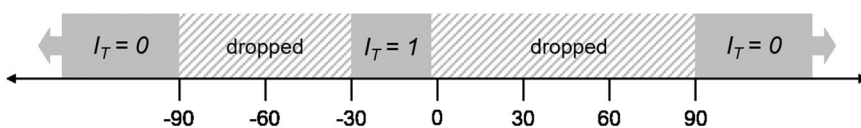


FIGURE 1 Illustration of example indicator values in the panel regression. For the panel regression in the $[-30, -2]$ window with an indicator I_T value of 1, the $[-90, -31]$ and $[-1, 90]$ intervals of every year have to be dropped, and the remaining daily values outside the event window of $[-90, 90]$ received a I_T value of 0.

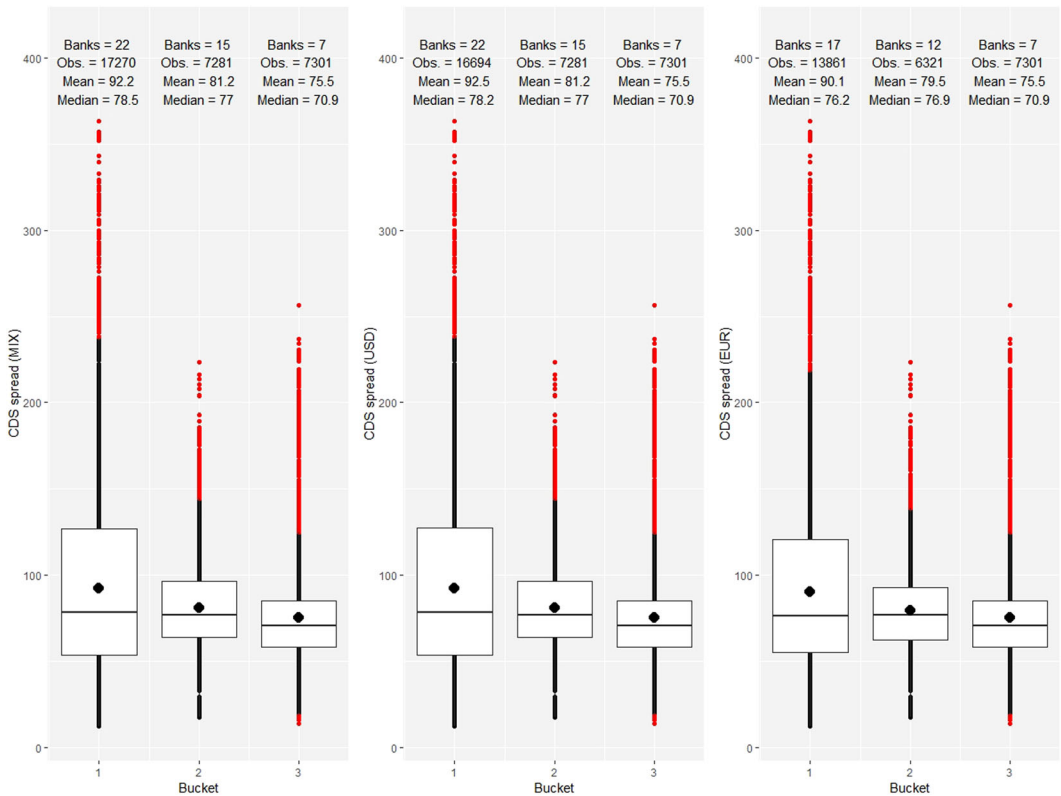


FIGURE 2 Credit default swap spreads of all banks and currencies, independent of the year [Color figure can be viewed at wileyonlinelibrary.com]

and depicted in the boxplot. We observe CDS spreads ranging from 50 to 350 bps within buckets, which if averaged across banks within a bucket could give us a skewed picture of the average default risk. This would eventually result in biased abnormal CDS spread changes of G-SIB banks. The mean of CDS spreads denoted by a (large) dot represents the average default risk of the banks in the corresponding bucket. It is observed from the figure that G-SIB banks that are required to hold a higher capital surcharge have a lower average CDS spread; that is, the mean CDS spread of bucket 3 is the lowest for every currency, and the mean for bucket one is the highest. These descriptive statistics indicate that it seems appropriate to control for the average default risk through the buckets. Finally, the red dots mark the outliers in our data, defined as CDS spreads that are 1.5 times larger than the interquartile range.

In general, we define a group \mathcal{T} of the 24 bucket reallocations in Table 2. In addition, \mathcal{S} is the group of all G-SIB banks that have been in the sample at least once between 2012 and 2017. We define the baseline benchmark (control) group as an equally-weighted average of the CDS spreads of all banks in the old and new bucket allocation of the affected bank, with the bucket to be differing before and after the event. Therefore, the average default risk before the event date is adjusted by the old bucket before reallocation; whereas, the average default risk after the event date is adjusted by the new bucket after the reallocation. This control group selection is similar to the differentiation by credit ratings of previous papers on CDS spreads (Finnerty et al., 2013; Hull et al., 2004; Norden & Weber, 2004):

$$BM_{it}^1 = \begin{cases} \frac{1}{n_{o1}} \sum_{k \in N_{o1}} \Delta CDS_{kt} & \text{if } t < 0, \\ \frac{1}{n_{n1}} \sum_{k \in N_{n1}} \Delta CDS_{kt} & \text{if } t \geq 0 \end{cases} \quad (3)$$

with BM_{it}^1 : benchmark for affected bank $i \in \mathcal{T}$ on trading day $t \in [-90, 90]$, CDS_{kt} : observed CDS spread for the control group bank k on day t , $N_{B1} \in \mathcal{S}$, $B \in \{o, n\}$ for the group of nonaffected banks in the bucket of i before the bucket reallocation for (old) and after for (new), n_{B1} is the number of banks in N_{B1} . Hence, the baseline benchmark (i.e., benchmark 1) results in two series before and after day zero, depending on the old and new bucket of the affected bank.

Moreover, the abnormal CDS spread changes (ASCs) that are adjusted by the baseline benchmark would be

$$ASC_{it} = \begin{cases} (\Delta CDS_{it}) - (BM_{ot}^1) & \text{if } t < 0, \\ (\Delta CDS_{it}) - (BM_{nt}^1) & \text{if } t \geq 0. \end{cases} \quad (4)$$

We expect a reallocation to a higher bucket to have an opposite effect than reallocation to a lower bucket. As described in Table 2, we observe bucket reallocations to lower and higher buckets. Since these two types of bucket reallocations have opposite signs on the abnormal CDS spread changes, we multiply the time series of the banks that migrate into a lower bucket by -1 to make all our bucket reallocations comparable for the calculation of the ASCs. This will enable us to undertake one-sided tests of significance in increases and decreases separately.

Finally, the cumulative abnormal relative CDS spread changes (relative CASCs) are computed by summing up the daily ASCs in the event window (similar to Norden and Weber, 2004).

5 | RESULTS

5.1 | Panel estimation

The panel specification in Section 4.2 yields interesting results. In Table 3 for almost all time intervals the indicator of a reallocation of a higher bucket is significantly positive. Moreover, for periods $[-60, -31]$ and $[2, 30]$ the interaction term is also positively significant, which implies that there are marginally higher daily relative CDS changes during these time intervals around a reallocation to a higher bucket of the bank. Interestingly, the same is not true for a reallocation to a lower bucket. A possible explanation for this result is that investors update their prior beliefs regarding the systemic risk of the bank, even before the announcement, and would like to hedge against this specific increase in systemic risk in their portfolios by purchasing CDS of these banks. The following section will analyze this result by looking at abnormal CDS spreads around the event.

5.2 | Event study

An initial visualization depicts the mean cumulative abnormal relative CDS spreads in Figure 3. The graph displays no significant change in the ASCs up to $t = -1$, whereas the figure indicates an

TABLE 3 Panel regression

This table reports the results of the panel regression that explains the daily relative CDS spreads (*Daily Rel CDS*) with indicator variables based on time intervals around possible upward and downward bucket reallocations and their interaction. *Upwards Reallocation* takes the value 1 whenever the day that the relative CDS spread of a bank is computed lies within the $[-90, 90]$ event window of an upwards bucket reallocation for the bank, and 0 otherwise. *Downwards Reallocation* takes the value 1 whenever the day that the relative CDS spread of a bank is computed lies within the $[-90, 90]$ event window of a downwards bucket reallocation for the bank, and 0 otherwise. *Time Dummy* takes the value 1 if the day that the relative CDS spread of a bank is computed lies within the time interval in the header, and 0 for outside of the $[-90, 90]$ event window, while all other observations within the event window were dropped. The terms *Upwards* \times *Time Dummy* and *Downwards* \times *Time Dummy* consist of the interaction of these variables. All specifications make use of bank-fixed effects and robust standard errors. ***, ** and * indicate statistical significance with p values $p < 0.01$, $p < 0.05$ and $p < 0.1$, respectively.

	Daily Rel CDS	Daily Rel CDS	Daily Rel CDS	Daily Rel CDS	Daily Rel CDS	Daily Rel CDS	Daily Rel CDS
Time dummy	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
Upwards reallocation	-0.0044**	-0.0046**	-0.0043**	-0.0045**	-0.0045**	-0.0046**	-0.0045**
<i>p</i> value	0.0363	0.0265	0.0385	0.0318	0.0302	0.0261	0.0290
Downwards reallocation	-0.0013	-0.0012	-0.0014	-0.0012	-0.0013	-0.0013	-0.0013
<i>p</i> value	0.5535	0.5758	0.5227	0.5841	0.5367	0.5489	0.5347
Time dummy	-0.0005	-0.0015**	-0.0007	-0.0006	0.0035***	0.0002	0.0001
<i>p</i> value	0.4156	0.0435	0.8323	0.4019	0.0000	0.5820	0.8355
Upwards * Time Dummy	0.0050*	0.0042	0.0044	0.0044*	0.0021	0.0040*	0.0039*
<i>p</i> value	0.0599	0.1144	0.4834	0.0904	0.3846	0.0738	0.0750
Downwards * Time Dummy	0.0011	-0.0003	-0.0029	-0.0014	0.0014	0.0001	0.0005
<i>p</i> value	0.6760	0.9027	0.5810	0.5703	0.6000	0.9543	0.8288
Observations	23,246	23,056	19,402	23,067	23,198	36,041	44,521
R^2	0.0005	0.0008	0.0007	0.0006	0.0019	0.0003	0.0003
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

increase in the ASCs for the time interval 1 to 30. Overall, the relative CASCs reach a maximum of ca. 6%, which reveals that the CDS spread changes of affected banks increase faster than the respective benchmark. We will investigate this visual observation through formal tests.

As argued in Section 4, the analysis of absolute CDS spreads can be biased due to the heterogeneity of the CDS spreads of the G-SIBs. Since the relative approach corrects for this possible bias, corresponding results ought to be more accurate. We compute the time series of means across

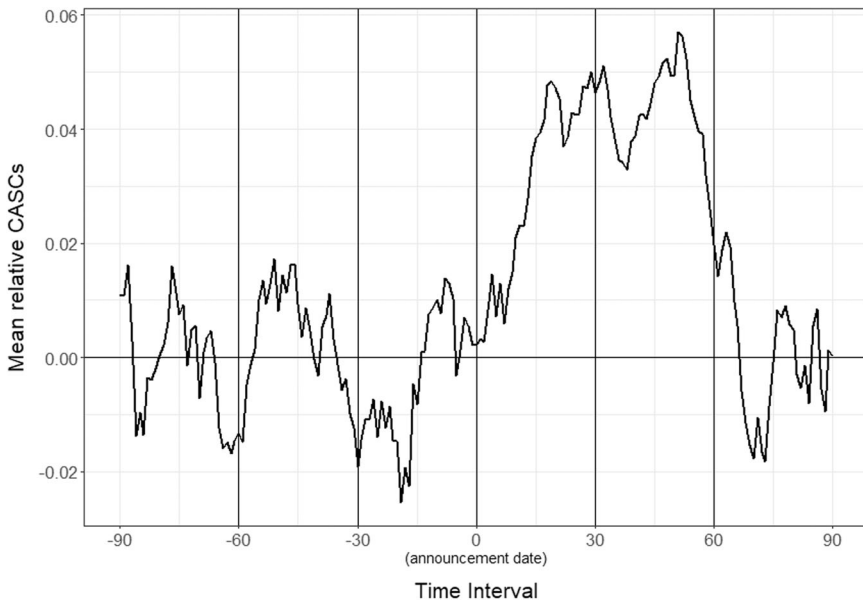


FIGURE 3 Mean cumulative abnormal relative CDS spread changes. Mean cumulative abnormal relative CDS spread changes around the announcement date over the baseline benchmark with full sample.

the relative CDS spread changes of all affected banks as outlined in Section 4.3. We employ one-sided cross-sectional t -tests and Wilcoxon sign-rank tests to determine if there is evidence on a significant increase in abnormal CDS spreads for the affected group. Table 4 displays the mean, median and their p value of the one-sided t -test and Wilcoxon sign-rank test, respectively.

As can be seen in Table 4 the mean relative CDS spread changes of the announcement banks are significantly greater than the benchmark spreads, so that the mean abnormal relative CDS spreads are always positive for the time interval [2, 30]. This observation provides initial support for H_2 , such that a higher capital surcharge leads to higher realized CDS spreads for the banks after controlling for increases in benchmark group's CDS spreads. On the other hand, we observe significant negative mean absolute ASCs for the interval [31, 60] at a 95%-level, which supports H_1 . Apart from that, there is no statistical evidence to reject the hypotheses in any other time interval. All in all, Table 4 also provides an indication that this increase and subsequent decrease in CDS spreads results in overall insignificance in $[-60, 60]$ or in $[-90, 90]$ intervals, that is, the effect resolves beyond the event window.

5.3 | Analysis of the temporary reversal

The temporary reaction of the CDS market could be seen once again in Figure 3; that is, after an initial rise, a decline from Day 45 after the event with a convergence to very initial CDS spread levels after Day 70. From the figure we can observe that the CASCs reach around -4% , which implies that the CDS spread changes of the affected banks decrease almost 8%–10% faster than the benchmarks during this reversal time period.

This creates a puzzle: Why would the CDS spread revert back to initial levels after an announcement of a reallocation to a higher/lower bucket? There might be several explanations for

TABLE 4 Baseline result for abnormal relative CDS spread changes

This table reports the abnormal relative CDS spread changes. The null hypothesis for tests of increases under the t -test is mean ASC ≤ 0 and under the Wilcoxon sign rank test is median ASC 0. The null hypothesis for tests of decreases under the t -test is mean ASC 0 and under the Wilcoxon sign rank test is median ASC 0. ***, **, * and * indicate statistical significance with p values $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
Increases							
Mean	0.0001	0.0006	-0.0008	0.0015***	-0.0009	0.0001	0.0000
t -test p -val	0.4499	0.2388	0.6045	0.0091	0.9579	0.2937	0.4963
Median	0.0009	0.0008	0.0009	0.0020**	-0.0012	0.0002	0.0000
Rank test p -val	0.1050	0.2024	0.5000	0.0173	0.8950	0.5000	0.7976
Decreases							
Mean	0.0001	0.0006	-0.0008	0.0015	-0.0009**	0.0001	0.0000
t -test p -val	0.5501	0.7612	0.3955	0.9909	0.0421	0.7063	0.5037
Median	0.0009	0.0008	0.0009	0.0020	-0.0012	0.0002	0.0000
Rank test p -val	0.9534	0.8950	0.6612	0.9947	0.2024	0.6612	0.3388

this phenomena. After an announcement of a reallocation to a higher bucket, it is revealed that the bank would be expected to raise additional capital and might have lower projected income in due time. This might have been moving CDS spreads initially higher (H_2). However, for certain banks that have gone through this reallocation, if the market expects the bank to raise this capital easily without any encumbrance on income projections, the early rise in CDS spreads might quickly revert back to initial levels.

To understand this argument, Figure 4 depicts the Mean Tier 1 capital ratios of those banks that experience a reversal in their CASCs versus those banks that do not experience this reversal and had a different pattern than initial rise and reversion. After creating an index value of 100 for their end of Q3 capital ratio values in the announcement year and after mirroring the index values of the banks that are reallocated to a lower bucket, Figure 4 reveals that the reversal banks respond to the announcement much quicker than the banks that do not experience this reversal. This finding highlights why some banks might be experiencing this reversal in CDS spreads whereas others do not.

Figure 5 provides a further look at how income projections could reveal an understanding of the CASC reversal. By once again creating an index value of 100 for their end of Q3 total income values in the announcement year, we observe that the reversal banks have a better income projection than the banks that do not experience this reversal. This could indicate that the market could be reacting to the better income projection of these ‘reversal’ banks with a subsequent decrease in their default risk valuation.

These figures provide an initial understanding on a possible mechanism behind the CDS spread activity after an announcement. The following section presents further robustness checks to our baseline results.

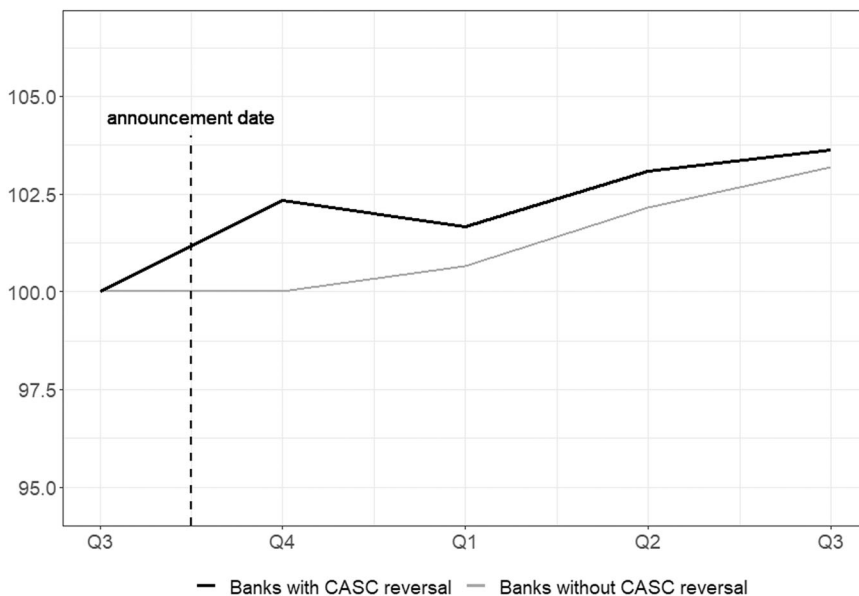


FIGURE 4 Mean tier 1 capital ratio (Q3 = 100). The graph shows the development of the mean tier 1 capital ratio around bucket reallocations, with the tier 1 capital ratio of those banks that are reallocated to a lower bucket mirrored at 100. The black line depicts the mean tier 1 capital ratio of banks whose relative CASCs increase from the announcement date to day 30 and decrease from Day 30 to 60. The grey line depicts the mean tier 1 capital ratio of all banks whose relative CASCs behave differently.

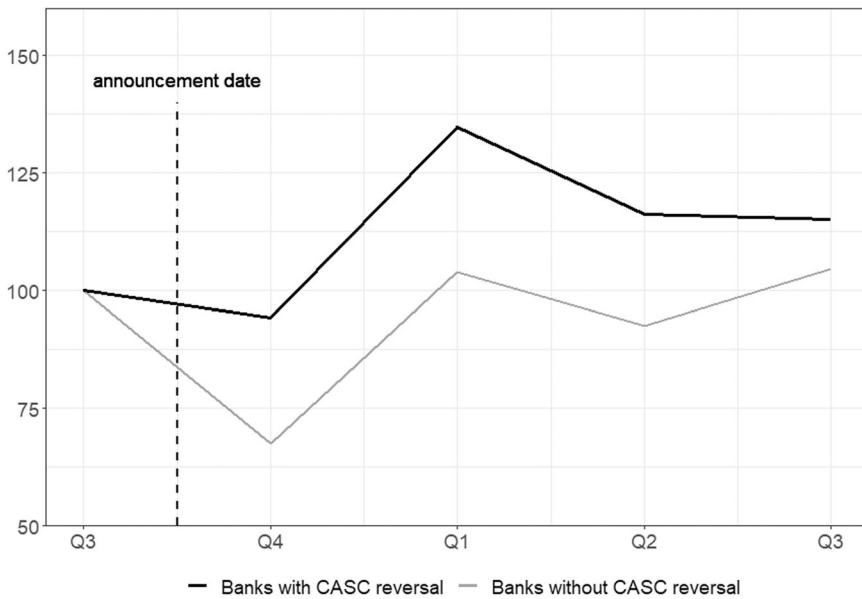


FIGURE 5 Total income (Q3 = 100). The graph shows the development of total income values around bucket reallocations, with the total income of those banks that are reallocated to a lower bucket mirrored at 100. The black line depicts the mean total income of banks whose relative CASCs increase from the announcement date to day 30 and decrease from Day 30 to 60. The grey line depicts the mean total income of all banks whose relative CASCs behave differently.

6 | FURTHER CHECKS AND ROBUSTNESS TESTS

6.1 | Regional subsamples

Recall that we initially considered the full sample for our baseline analysis and decided to make use of the two subsamples depending on the currency choice (USD and EUR) and headquarters location of the bank for robustness. Table 5 presents the results with the USD and EUR-based samples.

It is seen in Table 5 that not only the reversal effect is observed in both subsamples, but also that there is an indication of anticipation of the bucket reallocations for EUR banks in the $[-60, -31]$ interval. On the other hand, the table provides further support the initial increase and the following reversal effect is only temporary, since that the windows $[-60, 60]$ or $[-90, 90]$ are insignificant, that is, the effect resolves beyond the event window.

6.2 | Alternative benchmark groups

In this section, we describe the two additional choices for a benchmark (control) group composition:

$$BM_{it}^j = \frac{1}{n_{ij}} \sum_{k \in N_{ij}} \Delta CDS_{kt}, \text{ where } j \in \{2, 3\}, \quad (5)$$

TABLE 5 Abnormal relative spread changes with currency subsamples

This table reports the abnormal relative CDS spread changes for the USD and EUR samples. The null hypothesis for tests of increases under the t -test is mean ASC ≤ 0 and under the Wilcoxon sign rank test is median ASC ≤ 0 . The null hypothesis for tests of decreases under the t -test is mean ASC 0 and under the Wilcoxon sign rank test is median ASC ≥ 0 . ***, ** and * indicate statistical significance with p -values $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
USD increases	Mean	0.0000	0.0011	-0.0007	0.0015***	-0.0009	0.0002	0.0001
	t -test p -val	0.4932	0.1295	0.6000	0.0064	0.9548	0.1634	0.3609
	Median	0.0009	0.0008	0.0009	0.0020**	-0.0012	0.0002	0.0000
	Rank test p -val	0.2024	0.2024	0.5000	0.0173	0.8950	0.5000	0.7976
USD decreases	Mean	0.0000	0.0011	-0.0007	0.0015	-0.0009**	0.0002	0.0001
	t -test p -val	0.5068	0.8705	0.4000	0.9936	0.0452	0.8366	0.6391
	Median	0.0009	0.0008	0.0009	0.0020	-0.0012	0.0002	0.0000
	Rank test p -val	0.8950	0.8950	0.6612	0.9947	0.2024	0.6612	0.3388
EUR increases	Mean	0.0007*	0.0003	0.0052	0.0016**	-0.0013	0.0001	-0.0001
	t -test p -val	0.0902	0.3928	0.1984	0.0321	0.9893	0.3458	0.5968
	Median	0.0010**	0.0004	-0.0018	0.0024**	-0.0015	-0.0001	0.0000
	Rank test p -val	0.0481	0.4073	0.7597	0.0154	0.9846	0.7597	0.5927
EUR decreases	Mean	0.0007	0.0003	0.0052	0.0016	-0.0013**	0.0001	-0.0001
	t -test p -val	0.9098	0.6072	0.8016	0.9679	0.0107	0.6542	0.4032
	Median	0.0010	0.0004	-0.0018	0.0024	-0.0015**	-0.0001	0.0000
	Rank test p -val	0.9846	0.7597	0.4073	0.9962	0.0481	0.4073	0.5927

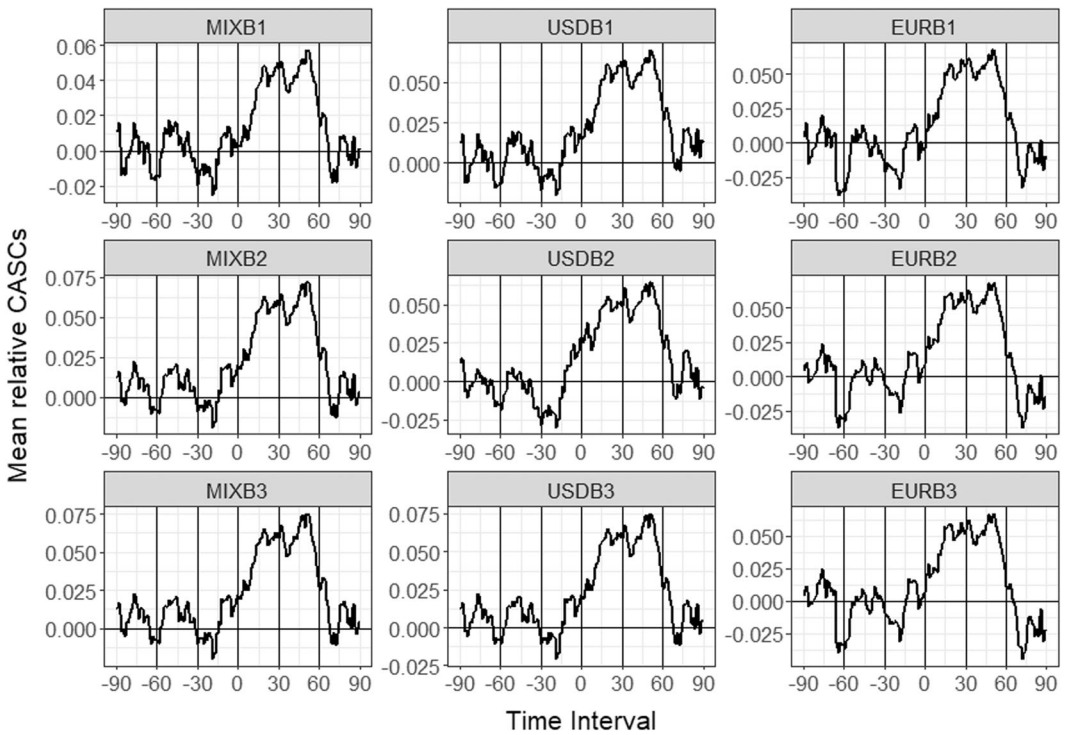


FIGURE 6 Mean cumulative abnormal relative CDS spread changes Note: Mean cumulative abnormal relative CDS spread changes around the announcement date over the baseline (B1) and two alternative benchmarks (B2, B3) with full(mix), USD, and EUR samples.

where BM_{it}^j : benchmark for bank $i \in \mathcal{T}$ on trading day $t \in [-90, 90]$, CDS_{kt} : observed CDS spread for bank k on day t , $N_{ij} \in \mathcal{S}$ for the group of nonaffected banks in the year of the bucket reallocation of i for the second benchmark ($j = 2$) and the group of all banks except the bank i in that event window in the G-SIB list for the third benchmark ($j = 3$); n_{ij} is the number of banks in N_{ij} . As a result, the calculation of benchmark 2 depends on the affected banks in a given year¹² and benchmark 3 on the affected bank independent of the year.

Hence, the abnormal relative CDS spread changes that are adjusted by these benchmarks would be

$$ASC_{it} = \Delta CDS_{it} - BM_{it}^j, \text{ where } j \in \{2, 3\}. \quad (6)$$

Figure 6 depicts all relative CASCs (for all three benchmarks and for full, USD and EUR subsamples). The figure shows that there has been an increase in the ASCs for every currency and benchmark between the time interval -1 to 30 . Overall, the relative CASCs reach a maximum of 6% , which reveals that the CDS spread changes of affected banks increase faster than the respective benchmark.

The visual observations in Figure 6 are pronounced as statistical significance in Tables 6 and 7, which provides the results with the alternative two benchmarks with a breakdown to

¹²The notation results in BM_{it}^2 is equal for all $i \in \mathcal{T}$ in a given year.

TABLE 6 Abnormal relative spread changes with alternative benchmark 2

This table reports the abnormal relative CDS spread changes with benchmark 2 for the USD, EUR, and mixed samples. The null hypothesis for tests of increases under the t -test is mean ASC ≤ 0 and under the Wilcoxon sign rank test is median ASC ≤ 0 . The null hypothesis for tests of decreases under the t -test is mean ASC 0 and under the Wilcoxon sign rank test is median ASC 0 . ***, ** and * indicate statistical significance with p -values $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
Full B2 increases	Mean	0.0001	0.0006	0.0014	0.0014***	-0.0011	0.0002	0.0000
	t-test p-val	0.4099	0.2384	0.2688	0.0086	0.9795	0.2571	0.4735
	Median	0.0007	0.0009	0.0007	0.0016**	-0.0015	0.0003	0.0000
	Rank test p-val	0.3388	0.2024	0.5000	0.0466	0.9534	0.5000	0.5000
Full B2 decreases	Mean	0.0001	0.0006	0.0014	0.0014	-0.0011**	0.0002	0.0000
	t-test p-val	0.5901	0.7616	0.7312	0.9914	0.0205	0.7429	0.5265
	Median	0.0007	0.0009	0.0007	0.0016	-0.0015	0.0003	0.0000
	Rank test p-val	0.7976	0.8950	0.6612	0.9827	0.1050	0.6612	0.6612
USD B2 increases	Mean	0.0001	0.0006	0.0014	0.0014***	-0.0011	0.0002	0.0000
	t-test p-val	0.4066	0.2342	0.2680	0.0050	0.9780	0.2360	0.4715
	Median	0.0008	0.0015	0.0007	0.0016**	-0.0014	0.0003	0.0000
	Rank test p-val	0.3388	0.2024	0.5000	0.0466	0.9534	0.5000	0.5000
USD B2 decreases	Mean	0.0001	0.0006	0.0014	0.0014	-0.0011**	0.0002	0.0000
	t-test p-val	0.5934	0.7658	0.7320	0.9950	0.0220	0.7640	0.5285
	Median	0.0008	0.0015	0.0007	0.0016	-0.0014	0.0003	0.0000
	Rank test p-val	0.7976	0.8950	0.6612	0.9827	0.1050	0.6612	0.6612
EUR B2 increases	Mean	0.0009**	0.0003	0.0055	0.0011	-0.0014	0.0001	-0.0001
	t-test p-val	0.0296	0.3967	0.1692	0.1056	0.9904	0.3954	0.6100
	Median	0.0008**	0.0013	0.0012	0.0022**	-0.0015	0.0004	-0.0001
	Rank test p-val	0.0481	0.2403	0.1189	0.0481	0.9846	0.4073	0.7597

TABLE 6 (Continued)

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
EUR B2 decreases	Mean	0.0009	0.0003	0.0055	0.0011	-0.0014***	0.0001	-0.0001
	t-test p-val	0.9704	0.6033	0.8308	0.8944	0.0096	0.6046	0.3900
	Median	0.0008	0.0013	0.0012	0.0022	-0.0015**	0.0004	-0.0001
	Rank test p-val	0.9846	0.8811	0.9519	0.9846	0.0481	0.7597	0.4073

TABLE 7 Abnormal relative spread changes with alternative benchmark 3

This table reports the abnormal relative CDS spread changes with benchmark 3 for the USD, EUR, and mixed samples. The null hypothesis for tests of increases under the t -test is mean ASC = 0 and under the Wilcoxon sign rank test is median ASC \leq 0. The null hypothesis for tests of decreases under the t -test is mean ASC \geq 0 and under the Wilcoxon sign rank test is median ASC \geq 0. ***, **, * and * indicate statistical significance with p values $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
Full B3 increases	Mean	0.0001	0.0007	0.0015	0.0014***	-0.0011	0.0002	0.0000
	t -test p -val	0.4193	0.2171	0.2290	0.0058	0.9823	0.2247	0.4608
	Median	0.0008	0.0006	0.0009	0.0021**	-0.0013	0.0003	0.0000
	Rank test p -val	0.3388	0.2024	0.5000	0.0466	0.9827	0.2024	0.5000
Full B3 decreases	Mean	0.0001	0.0007	0.0015	0.0014	-0.0011**	0.0002	0.0000
	t -test p -val	0.5807	0.7829	0.7710	0.9942	0.0177	0.7753	0.5392
	Median	0.0008	0.0006	0.0009	0.0021	-0.0013**	0.0003	0.0000
	Rank test p -val	0.7976	0.8950	0.6612	0.9827	0.0466	0.8950	0.6612
USD B3 increases	Mean	0.0001	0.0007	0.0015	0.0014***	-0.0011	0.0002	0.0000
	t -test p -val	0.4172	0.2131	0.2280	0.0037	0.9814	0.2073	0.4580
	Median	0.0009	0.0016	0.0009	0.0019***	-0.0014	0.0003	0.0000
	Rank test p -val	0.3388	0.2024	0.5000	0.0053	0.9827	0.2024	0.5000
USD B3 decreases	Mean	0.0001	0.0007	0.0015	0.0014	-0.0011**	0.0002	0.0000
	t -test p -val	0.5828	0.7869	0.7720	0.9963	0.0186	0.7927	0.5420
	Median	0.0009	0.0016	0.0009	0.0019	-0.0014**	0.0003	0.0000
	Rank test p -val	0.7976	0.8950	0.6612	0.9987	0.0466	0.8950	0.6612
EUR B3 increases	Mean	0.0010**	0.0003	0.0060	0.0012	-0.0014	0.0001	-0.0001
	t -test p -val	0.0236	0.3904	0.1588	0.1007	0.9947	0.4126	0.6670
	Median	0.0010**	0.0007	0.0012	0.0022	-0.0014	0.0003	0.0000
	Rank test p -val	0.0481	0.2403	0.4073	0.1189	0.9993	0.2403	0.5927

TABLE 7 (Continued)

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
EUR B3 decreases	Mean	0.0010	0.0003	0.0060	0.0012	-0.0014***	0.0001	-0.0001
	<i>t</i> -test <i>p</i> -val	0.9764	0.6096	0.8412	0.8993	0.0053	0.5874	0.3330
	Median	0.0010	0.0007	0.0012	0.0022	-0.0014***	0.0003	0.0000
	Rank test <i>p</i> -val	0.9846	0.8811	0.7597	0.9519	0.0038	0.8811	0.5927

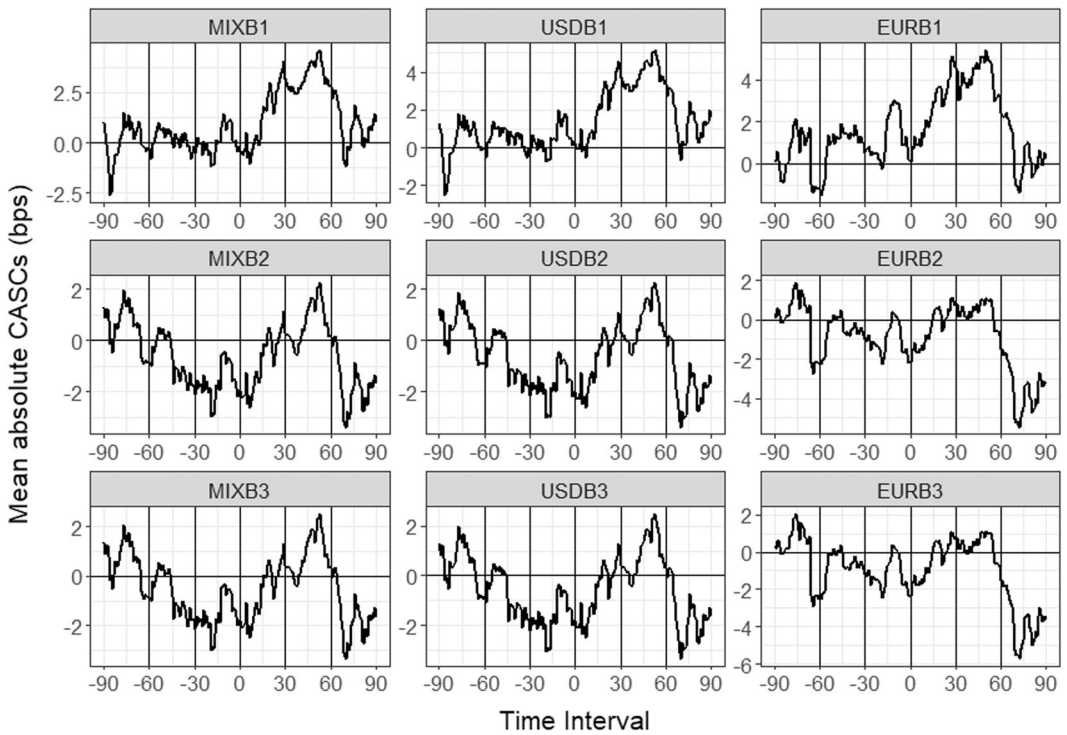


FIGURE 7 Mean cumulative abnormal absolute CDS spread changes. Mean cumulative abnormal absolute CDS spread changes around the announcement date over the baseline (B1) and two alternative benchmarks (B2, B3) with full(mix), USD, and EUR samples.

currency subsamples. It can be seen that the choice of two alternative benchmarks does not alter the results with the baseline benchmark, keeping the outcome to be robust. The only exception is the EUR sample with Benchmark 3, which slightly insignificant in the [2, 30] interval.

6.3 | Abnormal absolute CDS spread changes

Instead of the initial choice of relative CDS spread changes, one can test robustness of the results by making use of absolute CDS spread changes.

Similar to Equation (3) we compute the baseline benchmark with the abnormal absolute CDS spread changes by

$$\widetilde{BM}_{it}^1 = \begin{cases} \frac{1}{n_{o1}} \sum_{k \in N_{o1}} CDS_{kt} & \text{if } t < 0, \\ \frac{1}{n_{n1}} \sum_{k \in N_{n1}} CDS_{kt} & \text{if } t \geq 0 \end{cases} \quad (7)$$

with \widetilde{BM}_{it}^1 : benchmark for affected bank $i \in \mathcal{T}$ on trading day $t \in [-90, 90]$, CDS_{kt} : observed CDS spread for the control group bank k on day t , $N_{B1} \in \mathcal{S}$, $B \in \{o, n\}$ for the group of

TABLE 8 Abnormal absolute spread changes

This table reports the abnormal absolute CDS spread changes for the USD, EUR, and mixed samples. The null hypothesis for tests of increases under the t -test is mean $ASC \leq 0$ and under the Wilcoxon sign rank test is median $ASC \leq 0$. The null hypothesis for tests of decreases under the t -test is mean $ASC \geq 0$ and under the Wilcoxon sign rank test is median $ASC \geq 0$. ***, ** and * indicate statistical significance with p values $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
Full B1 increases	Mean	0.0041	-0.0076	-0.0402	0.1265*	-0.0111	0.0188	0.0056
	t -test p -val	0.4667	0.5372	0.5720	0.0602	0.5921	0.1920	0.3977
	Median	0.0738	0.1056	0.2592	0.1063	-0.0448	0.0224	-0.0048
	Rank test p -val	0.1050	0.5000	0.1050	0.2024	0.7976	0.3388	0.6612
Full B1 decreases	Mean	0.0041	-0.0076	-0.0402	0.1265	-0.0111	0.0188	0.0056
	t -test p -val	0.5333	0.4628	0.4280	0.9398	0.4079	0.8080	0.6023
	Median	0.0738	0.1056	0.2592	0.1063	-0.0448	0.0224	-0.0048
	Rank test p -val	0.9534	0.6612	0.9534	0.8950	0.3388	0.7976	0.5000
USD B1 increases	Mean	-0.0023	0.0068	-0.0394	0.1265*	-0.0111	0.0224	0.0087
	t -test p -val	0.5186	0.4669	0.5704	0.0608	0.5920	0.1537	0.3454
	Median	0.0627	0.1088	0.2746	0.1063	-0.0307	0.0224	-0.0048
	Rank test p -val	0.1050	0.5000	0.1050	0.2024	0.7976	0.3388	0.6612
USD B1 decreases	Mean	-0.0023	0.0068	-0.0394	0.1265	-0.0111	0.0224	0.0087
	t -test p -val	0.4814	0.5331	0.4296	0.9392	0.4080	0.8463	0.6546
	Median	0.0627	0.1088	0.2746	0.1063	-0.0307	0.0224	-0.0048
	Rank test p -val	0.9534	0.6612	0.9534	0.8950	0.3388	0.7976	0.5000
EUR B1 increases	Mean	0.0711**	-0.0028	-0.0080	0.1312**	-0.0729	0.0163	0.0012
	t -test p -val	0.0377	0.5148	0.5091	0.0476	0.9690	0.2714	0.4780
	Median	0.0688**	0.0500	-0.0335	0.1712	-0.0560	0.0308	0.0235
	Rank test p -val	0.0481	0.5927	0.7597	0.1189	0.9519	0.2403	0.4073

(Continues)

TABLE 8 (Continued)

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
EUR B1 decreases	Mean	0.0711	-0.0028	-0.0080	0.1312	-0.0729**	0.0163	0.0012
	<i>t</i> -test <i>p</i> -val	0.9623	0.4852	0.4909	0.9524	0.0310	0.7286	0.5220
	Median	0.0688	0.0500	-0.0335	0.1712	-0.0560	0.0308	0.0235
	Rank test <i>p</i> -val	0.9846	0.5927	0.4073	0.9519	0.1189	0.8811	0.7597

TABLE 9 Abnormal absolute spread changes with alternative benchmark 2

This table reports the abnormal absolute CDS spread changes with benchmark 2 for the USD, EUR and mixed samples. The null hypothesis for tests of increases under the t -test is mean ASC = 0 and under the Wilcoxon sign rank test is median ASC ≤ 0 . The null hypothesis for tests of decreases under the t -test is mean ASC ≥ 0 and under the Wilcoxon sign rank test is median ASC ≥ 0 . ***, ** and * indicate statistical significance with p values $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
Full B2 Increases	Mean	-0.0309	-0.0127	-0.0124	0.0867*	-0.0051	0.0012	-0.0095
	t -test p -val	0.7183	0.5582	0.5312	0.0748	0.5375	0.4815	0.6635
	Median	0.0341	0.0571	0.2415	0.0633	-0.0359	0.0076	0.0049
	Rank test p -val	0.5000	0.5000	0.1050	0.3388	0.8950	0.3388	0.5000
Full B2 Decreases	Mean	-0.0309	-0.0127	-0.0124	0.0867	-0.0051	0.0012	-0.0095
	t -test p -val	0.2817	0.4418	0.4688	0.9252	0.4625	0.5185	0.3365
	Median	0.0341	0.0571	0.2415	0.0633	-0.0359	0.0076	0.0049
	Rank test p -val	0.6612	0.6612	0.9534	0.7976	0.2024	0.7976	0.6612
USD B2 Increases	Mean	-0.0294	-0.0123	-0.0123	0.0867*	-0.0046	0.0012	-0.0094
	t -test p -val	0.7102	0.5576	0.5310	0.0750	0.5344	0.4823	0.6602
	Median	0.0570	0.0802	0.2538	0.0633	-0.0269	0.0102	-0.0009
	Rank test p -val	0.5000	0.5000	0.1050	0.3388	0.8950	0.2024	0.6612
USD B2 Decreases	Mean	-0.0294	-0.0123	-0.0123	0.0867	-0.0046	0.0012	-0.0094
	t -test p -val	0.2898	0.4424	0.4690	0.9250	0.4656	0.5177	0.3398
	Median	0.0570	0.0802	0.2538	0.0633	-0.0269	0.0102	-0.0009
	Rank test p -val	0.6612	0.6612	0.9534	0.7976	0.2024	0.8950	0.5000

(Continues)

TABLE 9 (Continued)

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
EUR B2 Increases	Mean	0.0490*	-0.0308	0.0647	0.0812	-0.0753	-0.0095	-0.0182
	<i>t</i> -test <i>p</i> -val	0.0886	0.6106	0.4176	0.1486	0.9338	0.6227	0.7632
	Median	0.0482	0.1014	0.0661	0.1411	-0.0547	0.0027	0.0217
	Rank test <i>p</i> -val	0.1189	0.4073	0.2403	0.1189	0.9846	0.5927	0.2403
EUR B2 Decreases	Mean	0.0490	-0.0308	0.0647	0.0812	-0.0753*	-0.0095	-0.0182
	<i>t</i> -test <i>p</i> -val	0.9114	0.3894	0.5824	0.8514	0.0662	0.3773	0.2368
	Median	0.0482	0.1014	0.0661	0.1411	-0.0547**	0.0027	0.0217
	Rank test <i>p</i> -val	0.9519	0.7597	0.8811	0.9519	0.0481	0.5927	0.8811

TABLE 10 Abnormal absolute spread changes with alternative benchmark 3

This table reports the abnormal absolute CDS spread changes with benchmark 3 for the USD and EUR samples. The null hypothesis for tests of increases under the t -test is mean $ASC \leq 0$ and under the Wilcoxon sign rank test is median $ASC \leq 0$. The null hypothesis for tests of decreases under the t -test is mean $ASC \geq 0$ and under the Wilcoxon sign rank test is median $ASC \geq 0$. ***, **, and * indicate statistical significance with p values $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
Full B3 increases	Mean	-0.0314	-0.0057	-0.0136	0.0856*	-0.0039	0.0024	-0.0092
	t -test p -val	0.7195	0.5279	0.5334	0.0537	0.5298	0.4620	0.6611
	Median	0.0351	0.0566	0.3000	0.0654	-0.0289	0.0058	0.0034
	Rank test p -val	0.5000	0.5000	0.2024	0.5000	0.8950	0.3388	0.5000
Full B3 decreases	Mean	-0.0314	-0.0057	-0.0136	0.0856	-0.0039	0.0024	-0.0092
	t -test p -val	0.2805	0.4721	0.4666	0.9463	0.4702	0.5380	0.3389
	Median	0.0351	0.0566	0.3000	0.0654	-0.0289	0.0058	0.0034
	Rank test p -val	0.6612	0.6612	0.8950	0.6612	0.2024	0.7976	0.6612
USD B3 increases	Mean	-0.0301	-0.0060	-0.0136	0.0857*	-0.0035	0.0023	-0.0091
	t -test p -val	0.7122	0.5296	0.5332	0.0538	0.5267	0.4639	0.6595
	Median	0.0564	0.0753	0.2887	0.0652	-0.0206	0.0079	0.0033
	Rank test p -val	0.5000	0.5000	0.2024	0.5000	0.8950	0.3388	0.5000
USD B3 decreases	Mean	-0.0301	-0.0060	-0.0136	0.0857	-0.0035	0.0023	-0.0091
	t -test p -val	0.2878	0.4704	0.4668	0.9462	0.4733	0.5361	0.3405
	Median	0.0564	0.0753	0.2887	0.0652	-0.0206	0.0079	0.0033
	Rank test p -val	0.6612	0.6612	0.8950	0.6612	0.2024	0.7976	0.6612

(Continues)

TABLE 10 (Continued)

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
EUR B3 increases	Mean	0.0527*	-0.0317	0.0745	0.0833	-0.0762	-0.0099	-0.0201
	t-test p-val	0.0689	0.6294	0.4079	0.1214	0.9499	0.6266	0.7876
	Median	0.0503**	0.1024	0.0887	0.1286	-0.0655	0.0040	0.0132
	Rank test p-val	0.0481	0.4073	0.2403	0.1189	0.9846	0.5927	0.4073
EUR B3 decreases	Mean	0.0527	-0.0317	0.0745	0.0833	-0.0762*	-0.0099	-0.0201
	t-test p-val	0.9311	0.3706	0.5921	0.8786	0.0501	0.3734	0.2124
	Median	0.0503	0.1024	0.0887	0.1286	-0.0655**	0.0040	0.0132
	Rank test p-val	0.9846	0.7597	0.8811	0.9519	0.0481	0.5927	0.7597

nonaffected banks in the bucket of i before the bucket reallocation for (*old*) and after for (*new*), n_{B1} is the number of banks in N_{B1} , whereas we obtain benchmarks 2 and 3 by

$$\widetilde{BM}_{it}^j = \frac{1}{n_{ij}} \sum_{k \in N_{ij}} CDS_{kt}, \text{ where } j \in \{2, 3\}. \quad (8)$$

as in Equation (5).

Once again, we calculate the absolute abnormal CDS spread changes of the affected banks by adjusting it with benchmarks 1, 2 and 3 as

$$ASC_{it} = \begin{cases} (CDS_{it} - CDS_{it-1}) - (\widetilde{BM}_{ot}^1 - \widetilde{BM}_{ot-1}^1) & \text{if } t < 0, \\ (CDS_{it} - CDS_{it-1}) - (\widetilde{BM}_{nt}^1 - \widetilde{BM}_{nt-1}^1) & \text{if } t \geq 0. \end{cases} \quad (9)$$

and

$$ASC_{it} = (CDS_{it} - CDS_{it-1}) - (\widetilde{BM}_{it}^j - \widetilde{BM}_{it-1}^j), \text{ where } j \in \{2, 3\}. \quad (10)$$

which could be compared with the above Equations (4) and (6) (Figure 7).

We observe similar effects with the absolute CDS spreads as in the analysis in Table 4; that is, the mean abnormal absolute CDS spread changes are almost always significantly greater than the benchmark groups for all currencies at a 90% level for the time interval [2, 30]. Moreover, the anticipation of the CDS markets can be also observed in the intervals $[-60, -31]$ for EUR for all three benchmarks. Once again, the bucket reallocation effect in CDS spreads disappears when we look at the $[-60, 60]$ or $[-90, 90]$ intervals, thus it reveals itself to be temporary (Tables 8–10).

6.4 | Alternative relative CDS spread changes

We also try an alternative calculation of the relative CDS spreads. The methodology for these can be found in the Appendix. It can be seen that the results remain robust with respect to earlier analysis.

7 | CONCLUSIONS

This paper tests the TBTF hypothesis on how the CDS market reacts to an increase or decrease of the G-SIB capital surcharge envisaged by regulators. We find surprising evidence that CDS spreads of a G-SIB bank increase (decrease) after the announcement of a higher (lower) capital surcharge. However, this effect is temporary, because the mean CDS spreads revert to preannouncement level, dropping sharply after this rise. Furthermore, the panel analysis also revealed that reallocation to buckets with a higher capital surcharge requirement is associated with daily positive relative CDS spread increases, whereas reallocation to lower buckets does not have this effect.

These results create a puzzle, whether G-SIB banks exclusively benefit from TBTF status. Our findings support the idea that the announcement of a reallocation to a higher bucket could simply imply a lower projected income in the future, since raising new equity is costly. This could in turn indicate more intrusive supervision by the regulators and higher perceived risk in markets, so that the CDS market participants might be pricing the marginal cost of additional capital required by the G-SIB into the credit risk of the bank. Indeed, we show descriptively that the banks, whose CDS prices revert to initial levels after a reallocation to a higher bucket are also those banks that are able to raise Tier 1 equity ratio quicker and have a better-projected income.

In this respect, our results with CDSs as a funding cost metric comply with those of Moenninghoff et al. (2015) for the effects of the G-SIB regulation on stock markets, since the additional regulatory measures involve not only costs that are priced in the equity market, but also through the credit risk of the institution in terms of higher funding costs. Moreover, the update of information on the systemic importance of the bank could create a signal for investors to hedge against this specific increase in systemic risk in their portfolios by purchasing CDS. Thus, the initial announcement would increase demand for the affected bank's CDS, pushing its price higher. Nevertheless, the temporary effect on the credit risk of the banks should be viewed as a transitory shock to announcements of higher capital surcharges.

A more structural explanation for the initial increase of CDS spreads may potentially be found in the structural credit risk model literature. Recent model of Berndt et al. (2022) structurally elaborates how higher capital requirements might implicitly tone down bailout expectations. Our results overlap well with their findings that document a significant reduction in CDS market-implied probabilities of a TBTF government intervention within the last decade. In essence, additional capital requirements would implicitly move the default threshold upwards in Merton (1974) type models, since it is easier to violate the higher capital requirements designated by regulators, that is, the bank is implicitly closer to default. This would cause distance-to-default, a major parameter in structural-type models, to decrease, which would, in turn, be reflected in higher CDS prices. Similarly, the reason for the consequent decrease in CDS spreads could follow this structural explanation and be based on banks' adjustment of risk-weighted assets (RWA). It has been documented in the literature that banks might choose to reduce their RWA in case of additional capital requirements, even by shifting their portfolios to zero risk-weight assets. The [31, 60] interval could be a time window when the bank adjusts its RWA, and as investors perceive less credit risk, the CDS spread of the bank decreases.

Our analysis contributes to the debate on whether being designated as a TBTF bank necessarily implies funding cost advantages to G-SIBs. The results support the notion that the regulatory reform to limit TBTF through a higher capital surcharge and more stringent regulation is effective and succeed in outweighing its implicit advantages.

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DATA AVAILABILITY STATEMENT

The data used in the study is subject to third party restrictions. The CDS data that support the findings of this study are available from Markit. Restrictions apply to the availability of these data, which were used under license for this study. Availability of the data from the authors is subject to permission of Markit.

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APPENDIX A: ALTERNATIVE RELATIVE ASC APPROACH

We have described two different approaches which we applied to draw our conclusions: the relative CDS changes approach and the absolute CDS changes approach. We have also explained the reasons for which the relative CDS changes approach might be more appropriate and more robust than the absolute one. In this Appendix, we illustrate a third approach similar to the relative approach which further provides robustness to our results.

As opposed to the relative ASC approach described in Section 4.3, where the benchmark is a mean of the relative changes, in the alternative approach benchmarks are computed by first taking the average CDS spread of the G-SIBs included in the benchmark and then by performing the calculation of the relative changes.

We define the benchmarks' average CDS spreads same as in Sections 4.3 and 6.2. The notation of the indexes also reflects those in these sections.

Benchmark 1:

$$BM_{it}^1 = \begin{cases} \frac{1}{n_{o1}} \sum_{k \in N_{o1}} CDS_{kt} & \text{if } t < 0, \\ \frac{1}{n_{n1}} \sum_{k \in N_{n1}} CDS_{kt} & \text{if } t \geq 0 \end{cases} \quad (\text{A1})$$

Benchmark 2 and 3:

$$BM_{it}^j = \frac{1}{n_{ij}} \sum_{k \in N_{ij}} CDS_{kt} \quad (\text{A2})$$

The abnormal relative CDS spread changes in the alternative approach with benchmark 1 are calculated similarly to Equation (4) in Section 4.3.

$$ASC_{it} = \begin{cases} \left(\frac{CDS_{it} - CDS_{it-1}}{CDS_{it-1}} - \frac{(BM_{ot}^1 - BM_{ot-1}^1)}{BM_{ot-1}^1} \right) & \text{if } t < 0, \\ \left(\frac{CDS_{it} - CDS_{it-1}}{CDS_{it-1}} - \frac{(BM_{nt}^1 - BM_{nt-1}^1)}{BM_{nt-1}^1} \right) & \text{if } t \geq 0. \end{cases} \quad (\text{A3})$$

where BM_{ot}^1 represents the average CDS spread level at time t of the G-SIBs belonging to the same bucket of the affected bank before reallocation to a new bucket (i.e., before $t = 0$) and BM_{nt}^1 is the average CDS spread at time t of the G-SIBs belonging to the same bucket of the affected bank after reallocation to a new bucket (i.e., after $t = 0$).

The abnormal relative CDS spread changes in the alternative approach with benchmarks 2 and 3 are calculated similarly to Equation (6) in Section 6.2.

$$ASC_{it} = \frac{(CDS_{it} - CDS_{it-1})}{CDS_{it-1}} - \frac{(BM_{it}^j - BM_{it-1}^j)}{BM_{it-1}^j}, \text{ where } j \in \{2, 3\}. \quad (\text{A4})$$

Following the definition of the benchmarks in Section 6.2, BM_{it}^2 is representing the average CDS spread level of the nonaffected G-SIBs in year t while BM_{it}^3 is the average CDS spread level of all G-SIB banks except bank i .

APPENDIX B: RESULTS WITH ALTERNATIVE RELATIVE ASC APPROACH

Tables B1 and B2 present the results for the hypotheses tests looking at different time intervals. Overall, results are symmetric to Tables 4, 5, 6, and 7, using the relative CDS changes approach. We find significant support for hypothesis H_2 of increasing abnormal CDS spread changes for the time interval [2, 30] and for hypothesis H_1 of decreasing abnormal CDS spread changes for the time interval [31, 60]. The bucket reallocation effect resolves at the $[-60, 60]$ or $[-90, 90]$ intervals, thus it reveals that the effect is temporary.

The alternative approach overall confirms the findings of the paper. We find evidence that CDS spreads of a G-SIB bank increases (decreases) after the announcement of a higher (lower) capital surcharge. However, this effect is temporary.

TABLE B1 Tests of increases in the alternative relative spread

This table reports [Full/USD/EUR]B1 is abnormal alternative relative CDS Spread changes with Benchmark 1, [Full/USD/EUR]B2 is abnormal alternative relative CDS Spread changes with Benchmark 2, and [Full/USD/EUR]B3 is Abnormal alternative relative CDS Spread changes with Benchmark 3. The null hypothesis under the t-test is mean ASC ≤ 0 and under the Wilcoxon sign rank test is median ASC ≤ 0 ***, ** and * indicate statistical significance with p values $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

Currency/ BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
Full B1	Mean	0.0004	0.0002	0.0023	0.0017**	-0.0009	0.0002	0.0001
	<i>t</i> -test <i>p</i> -val	0.2546	0.4059	0.1861	0.0181	0.9571	0.1422	0.3389
	Median	0.0013	0.0008	0.0048	0.0018	-0.0007	0.0002	0.0001
	Rank test <i>p</i> -val	0.3388	0.2024	0.2024	0.2024	0.9534	0.5000	0.3388
Full B2	Mean	0.0001	0.0005	0.0022	0.0014**	-0.0010	0.0002	0.0000
	<i>t</i> -test <i>p</i> -val	0.4538	0.3125	0.1139	0.0166	0.9197	0.2215	0.4544
	Median	0.0011	0.0010	0.0037	0.0007	-0.0013	0.0000	0.0000
	Rank test <i>p</i> -val	0.5000	0.3388	0.2024	0.3388	0.9534	0.6612	0.6612
Full B3	Mean	0.0001	0.0006	0.0023	0.0014**	-0.0010	0.0002	0.0000
	<i>t</i> -test <i>p</i> -val	0.4527	0.2792	0.1119	0.0108	0.9376	0.2069	0.4522
	Median	0.0011	0.0010	0.0038	0.0010	-0.0012	0.0000	0.0000
	Rank test <i>p</i> -val	0.5000	0.3388	0.2024	0.2024	0.9534	0.5000	0.6612
USD B1	Mean	0.0003	0.0005	0.0023	0.0017**	-0.0009	0.0002	0.0001
	<i>t</i> -test <i>p</i> -val	0.3015	0.3271	0.1842	0.0182	0.9563	0.1154	0.2947
	Median	0.0013	0.0008	0.0043	0.0018	-0.0007	0.0002	0.0001
	Rank test <i>p</i> -val	0.3388	0.2024	0.2024	0.2024	0.8950	0.3388	0.3388

(Continues)

TABLE B1 (Continued)

Currency/ BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
USD B2	Mean	0.0001	0.0005	0.0022	0.0014**	-0.0010	0.0002	0.0000
	<i>t</i> -test <i>p</i> -val	0.4458	0.3091	0.1127	0.0167	0.9206	0.2239	0.4522
	Median	0.0011	0.0014	0.0039	0.0006	-0.0012	0.0000	0.0000
	Rank test <i>p</i> -val	0.5000	0.3388	0.2024	0.3388	0.9534	0.5000	0.6612
USD B3	Mean	0.0001	0.0006	0.0023	0.0014**	-0.0010	0.0002	0.0000
	<i>t</i> -test <i>p</i> -val	0.4457	0.2791	0.1110	0.0108	0.9387	0.2092	0.4512
	Median	0.0011	0.0013	0.0038	0.0010	-0.0011	0.0001	0.0000
	Rank test <i>p</i> -val	0.5000	0.3388	0.2024	0.2024	0.9534	0.3388	0.6612
EUR B1	Mean	0.0008*	0.0005	0.0048	0.0016*	-0.0013	0.0002	0.0000
	<i>t</i> -test <i>p</i> -val	0.0630	0.3456	0.2145	0.0505	0.9913	0.2691	0.5240
	Median	0.0012**	0.0005	-0.0002	0.0022	-0.0015	0.0002	0.0000
	Rank test <i>p</i> -val	0.0481	0.4073	0.5927	0.1189	0.9962	0.2403	0.4073
EUR B2	Mean	0.0008*	0.0002	0.0056	0.0011	-0.0018	-0.0001	-0.0002
	<i>t</i> -test <i>p</i> -val	0.0722	0.4333	0.1691	0.1220	0.9783	0.5813	0.7377
	Median	0.0012**	0.0014	0.0015	0.0025**	-0.0018	0.0000	0.0002
	Rank test <i>p</i> -val	0.0481	0.4073	0.2403	0.0481	0.9962	0.5927	0.4073
EUR B3	Mean	0.0008*	0.0002	0.0059	0.0011	-0.0018	-0.0001	-0.0002
	<i>t</i> -test <i>p</i> -val	0.0570	0.4228	0.1605	0.1174	0.9879	0.6051	0.8076
	Median	0.0012**	0.0014	0.0013	0.0024**	-0.0017	0.0000	0.0000
	Rank test <i>p</i> -val	0.0481	0.4073	0.2403	0.0481	0.9962	0.5927	0.5927

TABLE B2 Tests of decreases in the alternative relative spread

This table reports [Full/USD/EUR]B1 is abnormal alternative relative CDS Spread changes with Benchmark 1, [Full/USD/EUR]B2 is abnormal alternative relative CDS Spread changes with Benchmark 2, and [Full/USD/EUR]B3 is abnormal alternative relative CDS Spread changes with Benchmark 3. The null hypothesis under the t-test is mean ASC ≥ 0 and under the Wilcoxon sign rank test is median ASC ≥ 0 ***, ** and * indicate statistical significance with p-values $p < 0.01$, $p < 0.05$ and $p < 0.10$, respectively.

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
Full B1	Mean	0.0004	0.0002	0.0023	0.0017	-0.0009**	0.0002	0.0001
	t-test p-val	0.7454	0.5941	0.8139	0.9819	0.0429	0.8578	0.6611
	Median	0.0013	0.0008	0.0048	0.0018	-0.0007	0.0002	0.0001
	Rank test p-val	0.7976	0.8950	0.8950	0.8950	0.1050	0.6612	0.7976
Full B2	Mean	0.0001	0.0005	0.0022	0.0014	-0.0010*	0.0002	0.0000
	t-test p-val	0.5462	0.6875	0.8861	0.9834	0.0803	0.7785	0.5456
	Median	0.0011	0.0010	0.0037	0.0007	-0.0013	0.0000	0.0000
	Rank test p-val	0.6612	0.7976	0.8950	0.7976	0.1050	0.5000	0.5000
Full B3	Mean	0.0001	0.0006	0.0023	0.0014	-0.0010*	0.0002	0.0000
	t-test p-val	0.5473	0.7208	0.8881	0.9892	0.0624	0.7931	0.5478
	Median	0.0011	0.0010	0.0038	0.0010	-0.0012	0.0000	0.0000
	Rank test p-val	0.6612	0.7976	0.8950	0.8950	0.1050	0.6612	0.5000
USD B1	Mean	0.0003	0.0005	0.0023	0.0017	-0.0009**	0.0002	0.0001
	t-test p-val	0.6985	0.6729	0.8158	0.9818	0.0437	0.8846	0.7053
	Median	0.0013	0.0008	0.0043	0.0018	-0.0007	0.0002	0.0001
	Rank test p-val	0.7976	0.8950	0.8950	0.8950	0.2024	0.7976	0.7976

(Continues)

TABLE B2 (Continued)

Currency/BM	Description	[-60, -31]	[-30, -2]	[-1, 1]	[2, 30]	[31, 60]	[-60, 60]	[-90, 90]
USD B2	Mean	0.0001	0.0005	0.0022	0.0014	-0.0010*	0.0002	0.0000
	<i>t</i> -test <i>p</i> -val	0.5542	0.6909	0.8873	0.9833	0.0794	0.7761	0.5478
	Median	0.0011	0.0014	0.0039	0.0006	-0.0012	0.0000	0.0000
	Rank test <i>p</i> -val	0.6612	0.7976	0.8950	0.7976	0.1050	0.6612	0.5000
USD B3	Mean	0.0001	0.0006	0.0023	0.0014	-0.0010*	0.0002	0.0000
	<i>t</i> -test <i>p</i> -val	0.5543	0.7209	0.8890	0.9892	0.0613	0.7908	0.5488
	Median	0.0011	0.0013	0.0038	0.0010	-0.0011	0.0001	0.0000
	Rank test <i>p</i> -val	0.6612	0.7976	0.8950	0.8950	0.1050	0.7976	0.5000
EUR B1	Mean	0.0008	0.0005	0.0048	0.0016	-0.0013***	0.0002	0.0000
	<i>t</i> -test <i>p</i> -val	0.9370	0.6544	0.7855	0.9495	0.0087	0.7309	0.4760
	Median	0.0012	0.0005	-0.0002	0.0022	-0.0015**	0.0002	0.0000
	Rank test <i>p</i> -val	0.9846	0.7597	0.5927	0.9519	0.0154	0.8811	0.7597
EUR B2	Mean	0.0008	0.0002	0.0056	0.0011	-0.0018**	-0.0001	-0.0002
	<i>t</i> -test <i>p</i> -val	0.9278	0.5667	0.8309	0.8780	0.0217	0.4187	0.2623
	Median	0.0012	0.0014	0.0015	0.0025	-0.0018**	0.0000	0.0002
	Rank test <i>p</i> -val	0.9846	0.7597	0.8811	0.9846	0.0154	0.5927	0.7597
EUR B3	Mean	0.0008	0.0002	0.0059	0.0011	-0.0018**	-0.0001	-0.0002
	<i>t</i> -test <i>p</i> -val	0.9430	0.5772	0.8395	0.8826	0.0121	0.3949	0.1924
	Median	0.0012	0.0014	0.0013	0.0024	-0.0017**	0.0000	0.0000
	Rank test <i>p</i> -val	0.9846	0.7597	0.8811	0.9846	0.0154	0.5927	0.7597