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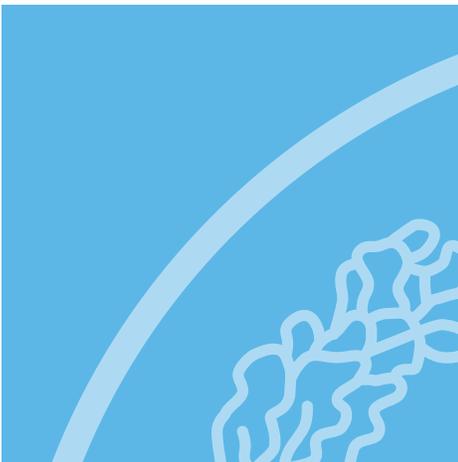
## Rationale for keeping the cap on the substitutability category for the G-SIB scoring methodology

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# I. Summary

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This memo evaluates the cap on the substitutability category used in the calculation of the global systemically important banks (G-SIB) systemic importance score. This evaluation is based on a market-based measure of systemic risk and U.S. banks' systemic risk reports (FR Y-15). The substitutability scores of a few institutions are disproportionately large, and this score is currently capped to prevent it from having a disproportionate impact on the overall measure of systemic risk. Indeed, the Basel Committee's methodology for assessing and identifying global systemically important banks noted that "the substitutability category had a greater impact on the assessment of systemic importance than was intended."<sup>1</sup> In addition, based on data from the G-SIB assessment sample,<sup>2</sup> only four G-SIBs (all headquartered in the U.S.) have had their scores reduced by the cap on the substitutability category.

The Basel Committee, however, is currently considering removing the cap to incentivize banks to reduce concentration in the provision of

payments, custody and underwriting services. To evaluate the suitability of removing the cap, this memo reports the results of regression analysis that relates a market measure of a bank's systemic risk to the components of its systemic risk score, including the substitutability score, both with and without the substitutability cap. The findings indicate that removing the cap on the substitutability score would reduce the economic and statistical significance of the substitutability category in explaining systemic risk. As a result, the cap on the substitutability category score makes the overall score more accurate in achieving its stated goal.

Moreover, our results also indicate that the economic magnitude of the interconnectedness category has an incorrect sign and the size category is not statistically important in explaining systemic risk, after controlling for the remaining categories. We plan to further explore these findings using data from both U.S. and non-U.S. G-SIBs in future research.

## II. Background

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The systemic risk of banks as calculated pursuant to the G-SIB surcharge systemic indicator score is very important because it determines large banks' capital and total-loss absorbing capacity (TLAC) requirements. The Basel Committee published a G-SIB assessment framework in 2013 and recently released a consultative document seeking feedback on specific proposals to revise that framework.<sup>3</sup> The proposed changes would have little impact on the scores of most banks, except for one proposal that

would increase substantially the scores of a few banks that are service providers in underlying market infrastructure (e.g., payment systems).

The G-SIB assessment methodology has two objectives: (i) to identify globally systemically important banks, and (ii) to define the G-SIB capital surcharge for such banks. The Basel Committee's methodology (Method 1) calculates the G-SIB score using five equally weighted categories: size, interconnectedness, substitutability, complexity and cross-jurisdictional activity. Those categories are subdivided into 12 systemic indicators,

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1 See Basel Committee, *Global systemically important banks: updated assessment methodology and the higher loss absorbency requirement* (July 2013), page 1, available at <http://www.bis.org/publ/bcbs255.pdf>.

2 To be able to implement the G-SIB framework, the Basel Committee currently collects systemic information for the 75 largest banking organizations around the world. Those banks are selected based on the financial year-end Basel III leverage ratio exposure measure.

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3 See Basel Committee, *Global systemically important banks - revised assessment framework*, consultative document (March 2017), available at <https://www.bis.org/bcbs/publ/d402.pdf>

with each indicator equally weighted within its category. For each systemic indicator, a bank divides its own measure by an aggregate global indicator amount, which effectively prevents all G-SIBs from reducing their systemic risk scores simultaneously, since the calculation is a relative measure. Next, the G-SIBs are assigned a specific capital surcharge based on their total systemic indicator scores, which is the sum across all 12 systemic indicator scores. This mapping is done in increments of 50 basis points of capital surcharge for each 100 basis-point band of G-SIB systemic indicator score. For example a total systemic indicator score between 430 and 529 basis points corresponds to a capital surcharge of 2.5 percent relative to risk-weighted assets. Regardless of their scores, all G-SIBs have a minimum capital surcharge of 1 percent. The Basel Committee currently

collects systemic information for the 75 largest banking organizations around the world to be able to implement the G-SIB framework. Of those, 30 banks currently are designated as G-SIBs.

In the implementation of the G-SIB assessment framework in the U.S., the banking agencies required U.S. banks to calculate their systemic indicator score under both Method 1 as well as the U.S.'s own method (Method 2), with whichever method results in a higher capital surcharge being binding.<sup>4</sup> Moreover, the G-SIB surcharge obtained under Method 1 is used to calculate TLAC requirements for the eight U.S. G-SIBs, and the removal of the cap on substitutability would increase the method 1 G-SIB surcharge of one U.S. bank by one percentage point of TLAC.

### III. Empirical results

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This section evaluates the empirical performance of the Method 1 G-SIB assessment framework categories, in particular the introduction of a cap on the substitutability category. As described above, the Method 1 G-SIB systemic indicator score of each bank is equal to an equally weighted sum of scores over five categories, which in turn are subdivided into 12 systemic indicators. For example, the substitutability category – which tries to capture the lack of readily available substitutes or financial institution infrastructure for the services they provide – has three indicators: (i) assets under custody, (ii) payments activity and (iii) underwritten transactions in debt and equity markets. Each indicator in the substitutability category receives a weight of 6.67 percent. In 2013, when the Basel Committee released the G-SIB surcharge methodology, it concluded that the substitutability category had a greater impact on the assessment of systemic importance than was originally intended and therefore capped the substitutability score at 500 basis points.<sup>5</sup> However, in a consultative document released in March 2017, despite the flaws that remain in the methodology of the substitutability category, the

Basel Committee proposed removing the cap with the aim of providing an incentive for banks to reduce concentration in the provision of payments, custody and underwriting services.<sup>6</sup>

A challenge in evaluating the Basel Committee's G-SIB assessment framework is that there is no empirical measure of the precise definition of the systemic risk of a financial firm. Thus, we follow the papers by Benoit, Hurlin and Perignon (2016) and Passmore

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4 Method 2 replaces the substitutability category with a measure of a bank's reliance on short-term wholesale funding (STWF) and also doubles the systemic indicator scores from the other categories. In contrast to the substitutability score under Method 1, the STWF indicator is divided by each bank's risk-weighted assets. This approach allows for aggregate reduction of the G-SIB surcharge if all U.S. G-SIBs reduce their reliance on short-term wholesale funding. More generally, Method 2 in its entirety has fixed coefficients, so a bank can change its own Method 2 score regardless of the actions by other firms. That said, the G-SIB capital surcharge obtained under Method 2 is currently higher than the capital surcharge obtained under the Basel Committee's methodology for all eight U.S. G-SIBs.

5 See the reference in footnote 1.

6 The substitutability category seeks to measure the degree to which a bank provides custody, payments, underwriting and trading services. The concern is that the degree to which a bank provides those services does not have a meaningful bearing on either a bank's systemic loss given default or its probability of failure.

and von Hafften (2017) and approximate the systemic risk of a bank with its market measure of private losses, which is represented by SRISK.<sup>7</sup> This measure is defined as the capital that a bank is expected to need if another financial crisis were to occur and is often called a “mark-to-market” stress, as it relies on banks’ stock returns during a stress scenario. The stress scenario in SRISK is defined by a 40 percent fall in the stock market over a six-month period. In addition, the capital shortfall is evaluated using the market leverage ratio against a capital requirement of 8 percent under stress. A negative SRISK indicates the bank maintains a market leverage ratio under stress above 8 percent, whereas a non-negative SRISK implies a bank has a capital shortfall after the occurrence of stress event. Note that the capital requirement acts as a scaling factor in the SRISK calculation, and the 8 percent choice represents the standard Cooke Ratio in place since the first Basel Accord. For instance, under a 4 percent post-stress requirement (akin to the requirement used in the U.S. supervisory stress tests for the tier 1 leverage ratio) all U.S.G-SIBs have a negative SRISK.

An alternative market measure is the CoVaR methodology of Adrian and Brunnermeier (2016).<sup>8</sup> The CoVaR is defined as the change in the value at risk of the financial system conditional on an institution being under distress. Although the CoVaR definition may suggest that it is a better proxy for a measure of systemic risk of a financial firm, a downside of the CoVaR is that it depends only on the correlation between each bank and the market and does not take into account differences in volatility across banks. That is, two firms with the same correlation with the market but different volatilities would have the same CoVaR, even if one of the banks has a very low volatility. Moreover, in contrast to the SRISK measure, CoVaR is not explicitly sensitive to size or leverage.<sup>9</sup> For these

reasons the analysis presented in the remainder of the note is performed using SRISK as a more accurate market measure of a bank’s systemic risk.

Figure 1 shows a scatterplot between the Method 1 G-SIB scores (x-axis) and the SRISK (y-axis). The red dots represent the G-SIB scores with the cap on the substitutability category. The blue dots denote the scores when the cap on substitutability is removed for the banks for which a cap would bind, namely BK, C, JPM and STT and which are labelled in the figure. The correlation between the current Method 1 G-SIB score (with the cap on substitutability) and SRISK is 0.82 (the R-squared of the regression shown in Figure 1 is equal to the squares of the correlation between the two series, 0.68), which is quite high.<sup>10</sup>

Table 1 presents the estimates of a regression of SRISK on the five categories of the Method 1 G-SIB surcharge with and without the cap on substitutability. The coefficients of the regression can be interpreted as the implicit weights of each category of systemic importance. Under Method 1, each of the five systemic categories is equally weighted, so we expect to find regression coefficients to be greater than zero and approximately the same. The regression also includes year fixed-effects (dummy variables for each year) to account for any time-series variation in SRISK that is not attributed to any of the five systemic risk categories. Our econometric results indicate that the substitutability, complexity and cross-jurisdictional activity categories have approximately the same coefficients, if the score on substitutability is capped. For the size category, the estimated coefficient is almost never statistically different from zero at standard confidence levels. Lastly, the coefficient on interconnectedness has an incorrect sign, indicating that a higher interconnectedness score is correlated with a lower SRISK.

**Retaining the cap on the substitutability score – shown in columns (3) and (4) in the table – is important for both economic and statistical reasons.**

7 See, Acharya, Viral, Robert Engle and Matthew Richardson, *Capital shortfall: a new approach to ranking and regulating systemic risks* (April 2012), AER Papers and Proceedings; Benoit, Sylvain, Christophe Hurlin and Christophe Perignon, *Transparent Systemic-Risk Scoring* (September 2016), manuscript; Passmore, Wayne, and Alexander H. von Hafften, *Are Basel’s Capital Surcharges for Global Systemically Important Banks Too Small?* (February 2017), Finance and Economics Discussion Series 2017-021. Washington: Board of Governors of the Federal Reserve System, <https://doi.org/10.17016/FEDS.2017.021>. The paper by Perignon et al (2016) also looks at the impact of the cap on substitutability on the G-SIB surcharge for 106 global banks. Their paper focuses on documenting the banks that are impacted by the cap.

8 See, Adrian, Tobias and Markus Brunnermeier, *CoVaR* (July 2016) American Economic Review, Vol. 106, pp. 1705-1741.

9 In addition, SRISK is also updated weekly and posted at <http://vlab.stern.nyu.edu/welcome/risk>.

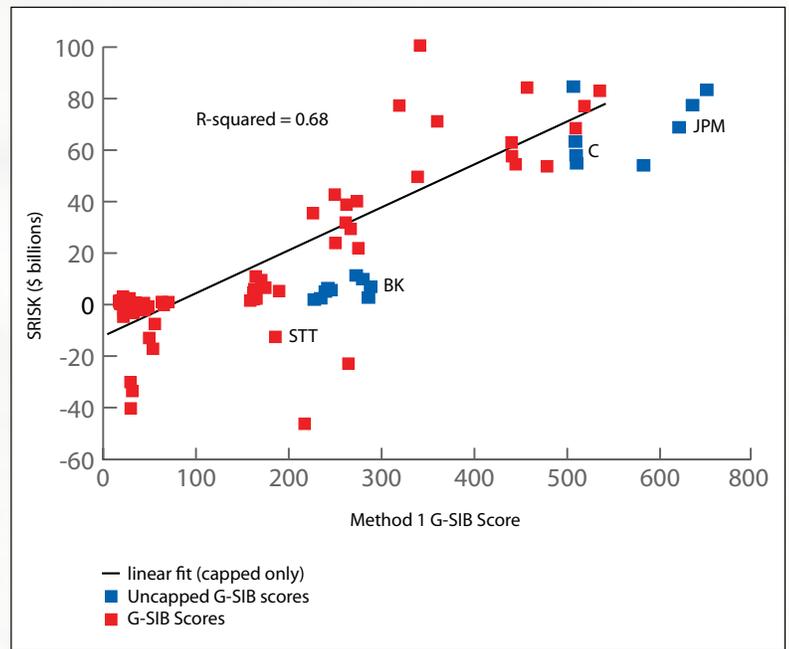
10 The correlation with the uncapped Method 1 G-SIB score drops slightly to 0.81.

First, the regression coefficient associated with the substitutability category doubles in size with the cap. Specifically, the estimated coefficient on substitutability is 0.08 in column (1) when the cap is removed and rises to 0.19 in column (3) with the cap. Similarly, when year fixed-effects are included, the estimated coefficient on substitutability is 0.07 when the cap is removed and increases to 0.16 with the cap. Second, the coefficient on substitutability is only statistically different from zero at a 5 percent confidence level with the cap, as shown by the p-value being less than 5 percent in columns (3) and (4). When the cap is removed the coefficient on substitutability is not statistically different from zero at the 5 percent confidence level as shown in columns (1) and (2).

## IV. Summary

Our findings indicate that removing the cap on the substitutability score would reduce the economic and statistical significance of the categories included in the G-SIB score in explaining systemic risk. In addition, the removal of the cap on substitutability would increase the Method 1 G-SIB surcharge, and therefore increase the TLAC requirement, of one U.S. bank by one percentage point. Lastly, our results also indicate that the economic magnitude of the interconnectedness category has an incorrect sign, and the size category is not statistically important in explaining systemic risk, after controlling for the remaining categories. As for future research, we plan to further investigate the incorrect sign of the interconnectedness category and the statistical importance of the size category using the data available for all global banks.

**FIGURE 1**  
Market measure of private losses and systemic losses given default



**TABLE 1**  
Regressions of SRISK on the categories of method 1 G-SIB surcharge

The sample period includes year-end data from 2012 through 2015 for all U.S. bank holdings companies that file the “Banking Organization Systemic Risk Report – FRY-15” and are publicly traded. The dependent variable is SRISK, or the uncovered private losses imposed on shareholders from a systemic crisis in the financial system. The explanatory variables are the 5 categories used to identify global systemically important bank holding companies using the Method 1 formula. The results shown in columns (1) and (2) remove the cap on the substitutability category without and with year fixed-effects and the results shown in columns (3) and (4) apply the cap to the substitutability category also without and with year fixed-effects. Each model is estimated using ordinary least squares and robust standard errors are reported in parenthesis. \* p-value < 0.10; \*\* p-value < 0.05; and \*\*\* p-value < 0.01.

Dependent variable: SRISK				
	(1)	(2)	(3)	(4)
Size	0.09 (0.07)	0.12 (0.08)	0.11 (0.07)	0.13* (0.07)
Interconnectedness	-0.30** (0.11)	-0.32*** (0.11)	-0.34*** (0.13)	-0.35*** (0.12)
Substitutability	0.08* (0.05)	0.07 (0.05)	0.19** (0.0714)	0.16** (0.0750)
Complexity	0.11*** (0.04)	0.10*** (0.03)	0.12*** (0.04)	0.10*** (0.03)
Cross-jurisdictional activity	0.20*** (0.07)	0.22*** (0.07)	0.21*** (0.08)	0.23*** (0.07)
Cap on substitutability	No	No	Yes	Yes
Year fixed-effects	No	Yes	No	Yes
R-squared	0.78	0.80	0.79	0.81
# of observations	74	74	74	74