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## Back to the Future: The Nature of Regulatory Capital Requirements

by R. Chami, T. Cosimano, E. Kopp, and C. Rochon

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I N T E R N A T I O N A L M O N E T A R Y F U N D

## IMF Working Paper

Institute for Capacity Development and Western Hemisphere Department

### Back to the Future: The Nature of Regulatory Capital Requirements<sup>1</sup>

Prepared by R. Chami, T. Cosimano, E. Kopp, and C. Rochon

Authorized for distribution by Ralph Chami and Stephan Danninger

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### Abstract

This paper compares the current regulatory capital requirements under the Dodd-Frank Act (DFA) and the 10-percent leverage ratio, as proposed by the U.S. Treasury and the U.S. House of Representatives' Financial CHOICE Act (FCA). We find that the majority of U.S. banks would not qualify for an "off-ramp" option—where regulatory relief is offered to FCA qualifying banks (QBOs)—unless considerable amounts of capital are added, and that large banks are much closer to the proposed leverage threshold and, therefore, are more likely to stand to gain from regulatory relief. The paper identifies an important moral hazard problem that arises due to the QBO optionality, where banks are likely to increase the riskiness of their asset portfolio and qualify for the FCA “off-ramp” relief with unintended effects on financial stability.

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## I. INTRODUCTION AND SUMMARY

Following the 2008 financial crisis, there was broad bipartisan support in the U.S. for measures aimed at strengthening the resilience of the financial system. While there were different views on how exactly to achieve that, there was consensus among all stakeholders and political parties that changes needed to be made to avoid a repeat of the crisis as well as taxpayer bailouts. These bipartisan discussions resulted in the *Dodd-Frank Wall Street Reform and Consumer Protection Act* (DFA). The regulatory reform program has over time led to strengthened capital and liquidity positions and better risk management practices, with the highest requirements set for systemically important financial institutions (SIFIs). However, the DFA regulatory reform is not yet complete, and some requirements have not been fully phased in yet.

Policymakers are now taking a step back to evaluate their position on financial regulation. With memories of the crisis fading, it appears that the international regulatory cycle is coming to an end. In the U.S., there is a commonly held view that small and community banks should be exempted from some of the most demanding DFA regulations, and that asset size thresholds for the application of more demanding standards were initially set too low. Governor Tarullo (2017) recently argued that “*the \$50 billion in assets threshold established in the Dodd-Frank Act for banks to be “systemically important” ... was set too low,*” as was the \$10 billion threshold from which banks were required to run internal stress testing. Furthermore, there is broad agreement that small and community banks should be exempted from some of the most demanding DFA regulations.

The broad-based review of financial regulation has led to several proposals. On June 8, 2017, the U.S. House of Representatives passed the Financial CHOICE Act (FCA), which was first put forward in 2016 by the House Financial Services Committee. According to the chairman of the committee, the FCA “*replaces Dodd-Frank’s growth-strangling regulations on small banks and credit unions with reforms that expand access to capital so small businesses on Main Street can grow and create jobs.*”<sup>2</sup> The FCA is a comprehensive regulatory proposal that, in reality, would modify some elements of the DFA, leave certain DFA key elements untouched, and repeal some parts of it. A key proposal is the introduction of a regulatory “off-ramp”, which would provide substantial regulatory relief for so-called “qualifying bank holding companies” (discussed below). On June 12, 2017, the U.S. Treasury Department presented a report on recommendations for regulatory reforms for banks, which echoes many of the FCA’s proposals, such as an off-ramp conditional on capital levels, but also regulatory relief for small and medium-sized banks as well as other measures.

Both reports criticize the DFA’s complexity and regulatory burden, especially for small and community banks, and call for regulatory relief. As options, they propose for banks to choose between the DFA and a leaner regulatory regime if capital levels are sufficiently high. Specifically, banks with a leverage ratio of 10 percent or more would qualify to become “qualifying banking organizations” (QBOs), and to be exempted from most DFA and Basel

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<sup>2</sup> Hensarling (2017), “Committee approves Financial CHOICE Act to end bailouts, promote economic growth,” House Financial Services Committee, Press Release, May 4, 2017.

III rules, including risk-based capital and liquidity standards; limits to concentration risk; counterparty risk standards, and any law that prevents banks from M&A or similar activities. Also, QBOs would be exempted from the application of Enhanced Prudential Standards (including mandatory supervisory and company-run stress tests; single counterparty credit limits; and minimum requirements on liabilities<sup>3</sup>) and the submission of living wills.

This paper undertakes three exercises to assess the QBO option. First, it estimates using balance sheet data which types of banks (by asset size) would qualify for the off-ramp under the FCA, and how much capital banks would need to add in order to qualify for the “off-ramp” regulation. Second, to surmise whether there could be a self-selection of more risk-prone banks in the off-ramp the paper analyzes the balance sheet characteristics of banks with a relatively small capital gap to the 10-percent leverage ratio.<sup>4</sup> The paper also highlights the potential for regulatory arbitrage by banks and the associated moral hazard problem that arises due to the QBO option. A final section discusses policy considerations.

The paper shows that, in contrast to initial expectations, small banks (total assets below \$3 billion) with capital gaps to the QBO threshold would tend not to opt for the “off-ramp.” Capital requirements for small banks are less demanding than those for SIFIs and, typically, smaller banks hold comparatively less risky assets—as indicated by the relatively lower RWA to total assets ratio (“RWA density”). This follows from a comparison of the capital requirement under DFA and the leverage ratio under FCA, conditional on a bank’s actual RWA density.<sup>5</sup> For small banks, the density would have to be almost 120 percent to meet the off-ramp criterion. Due to their higher average RWA density, large banks (total assets of more than \$3 billion) are closer to qualifying for the off-ramp, given current capital levels. In addition to the minimum risk-based Tier 1 capital requirement (6 percent) and the fully phased-in capital conservation buffer (CCB) of 2.5 percent, SIFIs are subject to a surcharge

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<sup>3</sup> Total Loss Absorbing Capacity.

<sup>4</sup> A comprehensive assessment of the regulatory regime choice is however not possible given the lack of data on regulatory costs under the DFA.

<sup>5</sup> Note that the definition of leverage ratio used in this paper corresponds to the U.S. leverage ratio, consistent with the House Financial Services Committee (2016/2017), *The Financial CHOICE Act: Comprehensive Summary*, which refers to a “simple leverage ratio” (p. 3). Also, the U.S. Treasury’s report “*A Financial System that Creates Opportunities: Banks and Credit Unions*,” dated June 12, 2017, on page 53 suggests the use of a “10% non-risk-weighted leverage ratio.” The simple leverage ratio (in the U.S. usually referred to as “U.S. leverage ratio”) is calculated “with a numerator of Tier 1 capital and a denominator of total on-balance sheet assets (reported on a GAAP basis).” Separately, the recent Congress Bill H.R.10 (2017), “Financial CHOICE Act of 2017,” dated June 12, 2017 in an Annex introduces yet another leverage ratio definition (“average leverage ratio”), which is defined as the “average of the banking organization’s quarterly leverage ratios for each of the most recently completed four calendar quarters.” Technically, this appears to resemble a 4-quarter, moving average supplementary leverage ratio (SLR). Also, note that the U.S. Treasury report recommends to narrow the definition of leverage exposure (the denominator of the SLR) by deducting cash on deposit with central banks, U.S. Treasuries, and initial margin for centrally cleared derivatives (see p. 54). In Annex I, the leverage ratios and supplementary leverage ratios for the largest U.S. banks are shown in a table.

of up to 4.5 percent of RWA, bringing the Tier 1 capital requirement to 13.0 percent.<sup>6</sup> For SIFIs to meet the off-ramp criterion, RWA density would need to exceed 77 percent.

This paper also provides a financial stability rationale for maintaining the DFA’s risk-based capital requirements. The analysis in this paper shows that, irrespective of balance sheet size, a bank is likely to use the option to be designated a QBO and engage in regulatory arbitrage, reducing the effective capital charge. This *moral hazard problem* would manifest itself through banks increasing the RWA imprint in their balance sheet through increased risk-taking, thereby qualifying for the “off-ramp” regulatory relief under which banks hold 10 percent leverage ratio while enjoying higher expected returns and lower regulatory costs. This would make the banks riskier and, due to smaller capital buffers, less resilient to adverse shocks. Although this moral hazard problem is present irrespective of bank size, large banks with riskier balance sheets (i.e., high RWA density) appear more likely to aim to become QBOs. This combination would make the largest banks subject to lower requirements than banks of other sizes, and the stated policy intention to give relief to small banks may not materialize.

## II. ANALYSIS OF REGULATORY REGIMES

In this paper, we assess some potential implications of introducing a regulatory off-ramp as proposed by the FCA. Currently, the majority of banks would need to change their capital structure to arrive at a 10 percent leverage ratio. Using SNL data on 579 banks as of 2016Q4, 326 banks (representing 80 percent of the sample) would not have leverage ratios high enough to qualify for the FCA’s off-ramp option. Translated into an aggregate capital gap (which is the sum of individual Tier 1 capital shortfalls to the 10-percent threshold), the banking system as a whole has an estimated gap of US\$200 billion in Tier 1 capital (or equivalent deleveraging), as shown in Table 1. However, supervisors and markets typically require more than the minimum. Experience with risk-based minimum capital requirements shows that supervisors expect a ratio that is at least 1 percentage point above the regulatory minimum. In that case, 442 banks, representing 95 percent of total banking system assets, would not be in a position to become QBOs unless they increased Tier 1 capital by a total of \$365 billion (or deleveraged equivalently). Further details can be found in Annex I.

Also, substitution of debt with equity is costly and has long-term capital structure implications, as the QBO option would create a change in average funding costs. Looking again at each bank individually—and considering their respective actual funding structures, existing market funding costs (cost of funds), as well as each bank’s actual return on average equity—the larger portion of equity in banks’ capital structure would increase the sample’s funding costs by approximately \$14 billion a year (net effect).<sup>7</sup> If supervisors’ comfort zone is assumed to start at an 11-percent Tier 1 leverage ratio, annual funding costs would increase

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<sup>6</sup> Regulation also foresees the application of a countercyclical capital buffer (CCyB). However, the Federal Reserve continues to set the requirement at 0 percent and, hence, we exclude that component from the analyses.

<sup>7</sup> See also Dagher and others (2016).

by \$26 billion a year. Taxes on operating income would also increase as more equity financing reduces the benefit from deducting debt interest, but that effect is not included in the above estimates. Also, these point-in-time estimates necessarily abstract from any behavioral response by banks. We now turn to the question of which types of banks are closest to qualifying as QBOs.

**Table 1. Shortfall to 10 Percent Tier 1 Leverage Ratio**

<b>Banks (in order of largest total assets)</b>	<b>Shortfall to 10 Percent Tier 1 Leverage Ratio (\$ billion)</b>
JP Morgan Chase & Co	40.4
Wells Fargo	20.3
Bank of America	23.4
Citigroup	0
US Bancorp	4.3
Bank New York Mellon	11.4
State Street Bank	8.5
Banks with TA < US\$50 billion	21.4
Banks with TA >= US\$50 billion	178.7

Sources: Federal Reserve, SNL, and authors' calculations.

Notes: TA denotes total assets.

### III. UNDERSTANDING DRIVERS OF CAPITAL GAPS

In this section, we compare the capital requirement under DFA and FCA to determine which regulatory requirement is more onerous and for which types of banks.

The regulatory constraints are based on the ones described in the dynamic framework developed in Chami et al (2017), which we now recall in a simplified form. The Liquidity Coverage Ratio is represented using the liquidity management model of Frost (1971), Freixas and Rochet (2008), and Dutkowsky and Van Hoose (2015). The Net Stable Funding Ratio, using King (2010), requires the capital provisions  $K$  of the bank to be larger than a proportion of the loan portfolio  $L$  (comprising both short- and long-term loans denoted by  $L_{ST}$  and  $L_{LT}$ ) and a proportion of the trading portfolio  $T$ , with weights  $\alpha_i$  reflecting the liquidity of the respective instruments. In this paper, the trading portfolio  $T$  includes all marketable securities, while the loan portfolio  $L$  includes all non-marketable securities (i.e. total assets minus Treasury securities). Reserves  $R$  reduce the need to hold capital:

$$K \geq \alpha_T * T + \alpha_{ST} * L_{ST} + \alpha_{LT} * L_{LT} - \alpha_R * R ,$$

where  $\alpha_T$  is the weight for Treasury securities  $T$ ,  $\alpha_{ST}$  and  $\alpha_{LT}$  denote the respective weights for short- and long-term liabilities  $L$ , and  $\alpha_R$  refers to the weight for reserves  $R$ .

The risk-weighted capital constraint of the bank is:

$$K \geq \kappa_T * T + \kappa_L * (L_{ST} + L_{LT}) + CCB * RWA$$

The leverage ratio is given by

$$K \geq \kappa * [T + L_{ST} + L_{LT}].$$

Let us reconsider the above constraints using RWA. Let  $\kappa_i$  be the risk-weight on assets in category  $i=1, \dots, N$  and let  $A_i$  be the amount of assets in this category. It is assumed that  $0 \leq \kappa_i \leq 1$ , so that  $\kappa_i = 1$  corresponds to the weight on risky assets, and  $\kappa_i = 0$  applies to safe assets. Consequently, the total assets of a bank are  $A = \sum_{i=1}^N A_i$  and its risk-weighted assets are  $RWA = \sum_{i=1}^N \kappa_i A_i$ . Hence,

$$(1) \quad RWA < A.^8$$

In this setup, under DFA, small banks are subject to a regulatory capital weight of 8.5 percent applied to RWA (i.e. 6 percent Tier 1, and a CCB of 2.5 percent). The banks that are designated as SIFIs under DFA are subject to an identical CCB, and a SIFI surcharge of up to 4.5 percent for a total capital charge of 13 percent. Conversely, the FCA proposes a leverage ratio of 10 percent applied to assets  $A$ .

Under these requirements, the difference in capital for small banks (SB) under DFA and FCA is:

$$(2) \quad K_{DFA}^{SB} - K_{FCA}^{SB} = 0.085RWA - 0.10A = 0.085A \left[ \frac{RWA}{A} - 1.176 \right].$$

For SIFIs, this difference becomes:

$$(3) \quad K_{DFA}^{SIFI} - K_{FCA}^{SIFI} = 0.13RWA - 0.10A = 0.13A \left[ \frac{RWA}{A} - 0.769 \right].$$

Interestingly, conditions (2) and (3) highlight the fact that irrespective of size, banks with riskier asset portfolios (that is, high  $RWA/A$ ) are more likely to find capital regulation under FCA less onerous. For example, a small bank may opt to be designated as a QBO when  $\frac{RWA}{A} > 1.176$ . Under (1), however, we see that (2) is always negative. Therefore, capital

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<sup>8</sup> This follows from the assumption that  $0 \leq \kappa_i \leq 1$ .  $RWA > A$  is theoretically possible, but has no practical relevance. If the risk weight is 100 percent, then the capital requirement is 8 percent for a typical bank. There are higher weights, up to 1250 percent, but these apply to certain exposures, past-due loans, securitization, and equity holdings, certain unsettled transactions, and exotic assets, which usually constitute a small portion of bank assets. RWA densities (i.e.  $RWA/A$ ) are typically below 80 percent.



requirements under DFA are less onerous than under FCA. In other words, the FCA leverage ratio would be more onerous on these banks relative to the RWA capital charge under DFA.

On the other hand, a SIFI may opt to be designated as a QBO when  $\frac{RWA}{A} > 0.77$ , and come under FCA. A SIFI with a high RWA density (above 77%) would incur a higher capital charge under DFA relative to a flat 10 percent leverage ratio under the FCA.<sup>9</sup>

**Table 2: Risk Weighted Assets/Total Assets for Selected SIFIs (12/31/2016)<sup>10</sup>**

<b>Bank</b>	<b>Total assets (\$ billion)</b>	<b>RWA (\$ billion)</b>	<b>RWA density (percent)</b>
JP Morgan Chase & Co	2,219	1,449	65
Wells Fargo	1,755	1,240	70
Bank of America	1,701	1,186	70
Citigroup	1,350	973	72
US Bancorp	441	352	80
Bank New York Mellon	284	153	54
State Street Bank	239	96	40

Source: FDIC.

Table 2 shows the RWA density of the five largest banks. We included Bank of New York Mellon and State Street as well, since they are trust banks that hold marketable securities for their clients. Only one bank in that group, US Bancorp, has a RWA density of 80 percent and would already qualify as a QBO without adding additional capital. All other banks would fall under DFA.

Finally, note that the calculations in (3) do not include off-balance sheet (OB) items. If we include OB items in the calculations in (3), and such OB items totaled x percent of assets, then (3) would become:

<sup>9</sup> Note that the DFA requirements, by design, get tighter when risks are on the rise. This would then move the RWA threshold lower and more banks would go for the off-ramp option exactly when prudent regulation would call for buffer building. In other words, the FCA may undermine countercyclical buffer building efforts.

<sup>10</sup> The calculation follows a standard approach. FDIC reports of financial statements of banks indicate that “Financial data for bank holding companies represent the summation of FFIEC Call Reports or OTS Thrift Financial Reports (TFR) filed by all FDIC insured bank and thrift subsidiaries held by a bank holding company, and do not reflect non-deposit subsidiaries or parent companies. Data values have not been adjusted for intra-company transactions. Official Holding Company Reports (such as the Y-9C) can be found at the website for the Federal Reserve System--National Information Center (NIC).”

$$(3^*) K_{DFA}^{SIFI} - K_{FCA}^{SIFI} = 0.13RWA - 0.10(1+x)A = 0.13A \left[ \frac{RWA}{A} - 0.923 \right], \text{ for } x = 0.2$$

With 20 percent of assets in off-balance sheet items as in (3\*), FCA is less costly than DFA for a RWA density above 92.3 percent. For FCA to be preferred, a bank would therefore need to take on more risk and bring RWA density to a higher level (92.3 percent) compared to a case without OB items (77 percent).

**Table 3. RWA Density for some Peer Groups of Banks** <sup>11,12</sup>

<b>Peer group of banks (by value of assets)</b>	<b>Tier 1 capital ratio: <i>Tier 1 capital/RWA</i></b>	<b>Tier 1 leverage ratio: <i>Tier 1 capital/total assets for leverage ratio</i></b>	<b>RWA density (percent)</b>
Between \$300 million and \$1 billion	14.2	10.3	72
Between \$1 billion and \$3 billion	13.0	10.0	76
Above \$3 billion	12.7	9.9	78

Source: FDIC, UBPR Peer group average reports, as of March 31 2017, and authors' calculations.

In Table 3, we show capital ratios and RWA densities for banks belonging to different peer groups of small banks: banks with total assets above \$3 billion; total assets between \$1 and \$3 billion; and total assets between \$300 million and \$1 billion. The results reveal that small banks would find capital requirements under DFA to be less onerous, given equation (2). In these calculations, the total assets for the leverage ratio correspond to consolidated assets minus deductions.<sup>13</sup>

<sup>11</sup> Annex 1 reports the results for other peer groups, using SNL data, as of end 2016.

<sup>12</sup> The Tier 1 capital ratio reported was calculated using the standardized capital ratios. These numbers would be much larger if the advanced approach had been used, in which case  $RWA/A$  would be much smaller and would therefore reinforce our conclusion.

<sup>13</sup> If the data on total assets were used in these calculations, the ratios would be even smaller, reinforcing the conclusion that small banks would prefer to be regulated by the DFA.

**Table 4. Leverage Ratios for Some Peer Groups of Banks (percent)<sup>14</sup>**

<b>Total assets</b>	<b>&lt; \$50 billion</b>	<b>&gt; \$50 billion</b>	<b>\$50-250 billion</b>	<b>&gt; \$250 billion</b>
<b>Median RWA/A</b>	77	76	79	64
<b>Leverage ratio</b>	6.54	9.88	10.27	8.32
<b>Largest RWA/A</b>	111	101	101	82
<b>Leverage ratio cut-off</b>	9.43	13.13	13.13	10.66

Source: SNL, as of end 2016 and authors' calculations.

At which leverage ratio would small banks qualify for FCA under the current conditions? In Table 4, we show the median RWA density of banks in various peer groups (in terms of their total assets), and the associated leverage ratio that would be needed in FCA for a bank with RWA density equal to the median to be indifferent between DFA and FCA. For leverage ratios above these values, equations (2) and (3) are negative, and banks with a RWA density equal to the median would therefore not qualify.

Table 4 also shows the “cut-off” leverage ratios<sup>15</sup> associated with the highest RWA density for each peer group. If the FCA’s minimum leverage requirement was equal to or larger than these cut-offs, all banks, including the ones with extraordinarily high RWA density, would find the capital requirements under DFA less onerous than the leverage ratio under FCA. Hence, a bank’s ability to become a QBO is a function of the bank’s portfolio composition, risk profile, and capital position. Even the riskier among the small banks would not qualify for the FCA as the associated cut-off of 9.1 percent is below the FCA minimum leverage ratio of 10 percent. Among the banks with total assets above \$50 billion, 8 banks have RWA densities above 82 percent, with associated leverage ratio cut-offs between 10.66 and 13.13 percent.

Interestingly, banks, irrespective of size, may potentially engage in *regulatory arbitrage* and choose to reallocate portfolio investments in a way that would increase their RWA density, and thus, be regulated by the FCA while getting regulatory relief from DFA risk-based capital requirements, which are more demanding than the 10 percent leverage ratio under FCA. This moral hazard problem arises because of the option given to the bank to be QBO.<sup>16</sup> For example, small banks would increase their RWA density above 117,6% and yet only incur a flat 10 percent leverage ratio due to off-ramp regulatory relief under FCA. Similarly,

<sup>14</sup> Annex 1 reports the results for other peer groups, using SNL data, as of end 2016.

<sup>15</sup> The cut-off leverage ratio is that ratio needed in FCA for a bank with a given RWA density to be indifferent between DFA and FCA.

<sup>16</sup> See Annex III for an explanation of optionality in this context.

a SIFI could increase its RWA density above 77 percent and be only subject to a flat 10 percent leverage ratio. Moreover, banks, by raising their RWA densities are likely to enjoy higher expected returns while unintentionally imposing risk to the financial system.<sup>17</sup>

#### IV. EXAMPLE

We now provide an example for a simplified bank portfolio to highlight the comparison between DFA and FCA.

We first consider banks with total assets less than \$50 billion that are subject to the DFA. In this case, these banks are subject to a regulatory capital weight of 8.5 percent, assumed to be applied to 50 percent of Treasuries ( $T$ , proxying for marketable securities), and to the overall loan portfolio ( $L$ , representing non-marketable securities). This includes a CCB of 2.5 percent. Next, we consider banks that are designated as SIFIs under DFA, for which the minimum regulatory risk-weighted Tier 1 capital ratio is 13 percent, reflecting the (maximum) SIFI surcharge. The FCA instead proposes a leverage ratio of 10 percent applied to the overall portfolio (Treasuries and loans).

**Table 5. Scenario Parameters**

	$\kappa_L$ <sup>18</sup>	NSFR/LCR	CCB <sup>19</sup>	LR ( $\kappa$ )	SIFI surcharge <sup>20</sup>
Dodd Frank Act	0.06	included	0.025	$\kappa = 0.04$	Included (1-4.5 percent)
CHOICE Act	n/a ( $\kappa_L = 0$ )	n/a	0	$\kappa = 0.10$	excluded

Using Chami et al (2017), the specific regulatory constraints take the following forms:

Capital required,  $K$ , under DFA, for banks with assets less than \$50 billion (Figure 1), referred to as SB<sup>21</sup>:

<sup>17</sup> The moral hazard problem could be avoided by removing the optionality that is currently awarded to banks. This could be done, for example, by mandating which types of banks can become QBOs. For example, the leverage ratio in the FCA could be set such that (3) is zero for a given percentage of the banks, which corresponds to a given RWA/A ratio. In addition, the legislation could impose that all small banks must be QBOs while all SIFI banks continue to be regulated under DFA. Again, by removing the option of becoming a QBO from a bank, the incentive to increase RWA density would be removed.

<sup>18</sup> For less risky assets (e.g. Treasury holdings), the capital requirement is between 0 and 4 percent, depending on the riskiness of the asset. Note that for sovereign bonds issued by OECD countries, the weight is set at 0.

<sup>19</sup> The fully phased-in CCB is 2.5 percent.

<sup>20</sup> SIFI surcharges can range between 1 and 4.5 percent. We use the maximum amount of 4.5 percent in the calculations.

<sup>21</sup> In equation (4), for minimum Tier 1, we use a threshold of 6 percent of RWA (see FDIC manual, section 2.1), and add a fully phased-in CCB of 2.5 percent, totaling 8.5 percent. This is applied to the loan portfolio  $L$ , and to

$$(4) K_{DFA}^{SB} = 0.085 * [0.5T + L]$$

Capital required under DFA for a SIFI (Figure 2):

$$(5) K_{DFA}^{SIFI} = 0.13 * [0.5T + L]$$

Capital required under FCA (Figures 1 and 2):

$$(6) K_{FCA} = 0.10 * [T + L]$$

Figure 1 compares the required capital under the two regimes (DFA eq. (4) and FCA eq. (6)) for banks with less than \$50 billion in assets. The colored plane illustrates the difference in capital requirements (DFA minus FCA). The black plane represents the 0-plane. We observe that the colored plane always lies under the 0-plane, and can therefore infer that FCA is more onerous for small banks since the capital requirement under the leverage ratio is greater than that under DFA. Note that this result holds true irrespective of the balance-sheet composition of the securities and loans portfolios.<sup>22</sup> All else equal, these banks would not opt to be designated as QBOs.

Next, we repeat the exercise and compare DFA with FCA for a SIFI. This is shown in Figure 2. Whether a bank would qualify as a QBO and mainly be subject to a leverage ratio depends on its balance sheet composition (and on the cost of regulation from DFA-compliant infrastructures) versus the profits the bank derives from its business model. Figure 2 suggests that a SIFI may qualify as a QBO for most portfolio choices. Only for very large portfolios of Treasuries (i.e., exceeding 85 percent of the loan portfolio if in (5) the weight on Treasuries is 0.5, or exceeding 44 percent of the loan portfolio if in (5) the weight on Treasuries is 0.25), would SIFIs remain under the DFA. This confirms the general result from (3) that eligibility as a QBO under FCA is dependent on the composition of the SIFI's assets.

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50 percent of the non-marketable securities portfolio  $T$ . In equation (5), we add the maximum SIFI surcharge of 4.5 percent, resulting in a capital threshold of 13 percent.

<sup>22</sup> For the purpose of this exercise, banks with less than \$50 billion in assets invest up to \$10 billion in Treasury securities. The remaining assets are labeled as "loans".

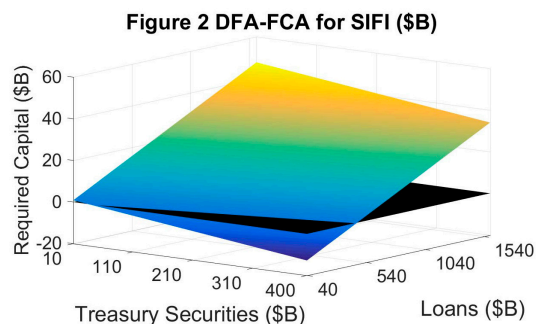
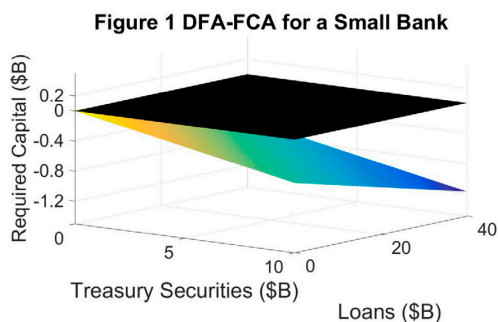
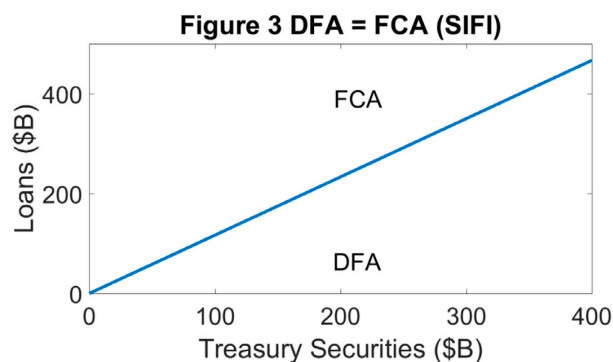


Figure 3 illustrates how the composition of portfolios matters. The blue line depicts, for any given level of Treasury securities, the level of loans such that the difference between the capital required under DFA and FCA is zero. Consider for instance a bank with \$100 billion in Treasuries. If the amount of loans in its portfolio is above the blue line, then FCA is the preferred regulatory regime for that bank because the DFA is associated with a higher level of required capital. From this figure, we can therefore distinguish the portfolio profiles of SIFIs for which DFA is less onerous from the ones where the leverage ratio under FCA is less onerous.



We can also calculate the difference between the capital to loan ratio under DFA and the capital to loan ratio under FCA, as a function of the Treasuries to loans ratio.<sup>23</sup> This relationship is given in Figure 4 for SIFIs. Using (5) and (6), the capital to loan ratio under FCA is below the capital to loan ratio under DFA for a ratio of Treasuries to loans below 86 percent. A similar analysis for small banks subject to an 8.5 percent capital requirement would show that such banks would tend to remain under the DFA.

<sup>23</sup> It turns out that the constraints can be compared for ratios of capital and Treasury Securities. Thus the constraints are independent of size.

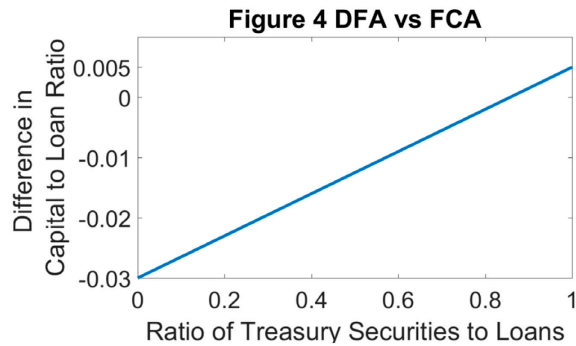


Figure 4 also suggests that a SIFI's balance-sheet composition is important in determining which regulatory regime is less onerous. Typically, SIFIs have a Treasuries to loans ratio below 86 percent. This is shown below in Table 6a and Table 6b for the largest SIFIs using two distinct definitions for marketable securities. Hence, with a required capital weight of 13 percent on loans, the capital to loan ratio is less under the FCA. There are no exceptions to this rule in Tables 6a and 6b. If the portfolios were composed of a proportion of Treasury securities to loans greater than 86 percent, a SIFI would opt not to be designated as QBO.

**Table 6a. Marketable to Non-Marketable Securities Ratios, T/L**

<b>Bank</b>	<b>Total assets (\$billion)</b>	<b>Marketable Securities <i>T</i> (\$billion)</b>	<b><i>T/L</i> (percent)</b>
JP Morgan Chase & Co	2219	529	31
Wells Fargo	1755	423	31
Bank of America	1701	480	39
Citigroup	1350	458	51
US Bancorp	441	111	34
Bank New York Mellon	284	115	68
State Street Bank	239	104	77

Source: FDIC, as of December 31 2016. Marketable securities (*T*) include securities and trading account assets; loans (*L*) are calculated as the difference between total assets and marketable securities.

**Table 6b. Marketable to Non-Marketable Securities Ratios, T/L**

<b>Bank</b>	<b>Total assets (\$billion)</b>	<b>Marketable Securities <i>T</i> (\$billion)</b>	<b><i>T/L</i> (percent)</b>
JP Morgan Chase & Co	2219	328	17
Wells Fargo	1755	387	28
Bank of America	1701	407	31
Citigroup	1350	328	32
US Bancorp	441	109	33
Bank New York Mellon	284	111	64
State Street Bank	239	96	67

Source: FDIC, as of December 31 2016. Marketable securities (*T*) are defined as securities in the FDIC report; loans (*L*) are calculated as the difference between total assets and marketable securities.

The recent proposals by the U.S. Treasury and the House Financial Services Committee are silent on what would happen to QBOs that are unable to sustain a leverage ratio of above 10 percent. Would such a bank automatically be subject to the full scope of DFA requirements if its leverage ratio drops below 10 percent? If so, banks would have to run both regulatory frameworks in parallel, which would negatively affect banks' regulatory compliance costs, and increase inefficiencies. A similar issue would occur under any portfolio reallocation that changes the Treasuries to loans ratio such that a bank decides to be regulated by a different regime (see Figure 4).

## V. CONCLUSION AND RECOMMENDATIONS

Despite the stated intention of policymakers to provide regulatory relief for small banks under the proposed FCA, this paper shows that these banks would opt to stay under the existing DFA regime. Analysis of the nature of the proposed capital constraints under both regimes shows that imposing the 10 percent leverage ratio has the unintended effect of inducing small banks to favor DFA which has a lower capital charge. Alternatively, the RWA density that would induce small banks to opt to become QBO is so high (above 117 percent) that it would lead to excessive risk taking among them.

The 10 percent leverage ratio, as stipulated in the FCA, implies that only SIFIs with RWA density over 77 percent (or 92 percent, in the case of 20 percent of off-balance sheet items) may opt to be designated as QBOs, again, reflecting riskier operations by these banks. Large banks and SIFIs would also largely opt for DFA, with banks with riskier portfolios being closer to the off-ramp leverage threshold.

The analysis also highlights a potential moral hazard problem that can arise from giving banks the option to be designated as QBOs. Basel I was first introduced to get a better measure of credit risk for the banks' balance sheet, at a time when the U.S. had a 3 percent leverage ratio. Banks had to weigh the risk to the balance sheet through the RWA schedule



provided by Basel I. As is well known, banks engaged in regulatory arbitrage by *lowering* RWA density to boost risk-based capital ratios. By so doing, banks appeared safer, and received better credit ratings. The option to be a QBO, in contrast, would be doing exactly the opposite. This option could induce banks to engage in risky behavior by *increasing* the RWA density while enjoying higher expected profits and a lower and flat 10 percent capital charge. This behavior is likely to result in more risk to the banking system.

Although the focus of this paper is on the nature of the capital requirements, it is worth mentioning that regulation that is solely focused on capital levels neglects key lessons learned from the Global Financial Crisis: Experience has shown that strong capital levels alone cannot prevent financial crisis from happening. For QBOs, key threats like market and funding liquidity risk, counterparty default risk, or contagion risk would not be regulated, potentially leaving too much room for individual optimization while ignoring systemic effects. Liquidity, market, and counterparty risks are, in fact, more immediate problems than credit risk, which is rather a medium-term issue.

Investors and the market would still expect large and globally active banks to meet modern regulatory standards. Also, banks that can have large maturity mismatches and a fewer share of highly liquid assets than demanded under the DFA or Basel III would be less attractive as a counterpart in the interbank market.

Finally, it is also clear that reliance on regulation alone (Pillar 1) cannot be sufficient. Supervisors (Pillar 2) need to continue to increase market discipline (Pillar 3) and transparency, and help financial institutions increase internal risk management capacity and capital planning.

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## Annex I: Leverage Ratios and Supplementary Leverage Ratios

Largest Banks	U.S. Leverage ratio	Supplementary leverage ratio
JP Morgan Chase & Co	8.4	6.5
Wells Fargo	9.0	7.6
Bank of America	8.9	7.0
Citigroup	10.1	7.6
Goldman Sachs Group, Inc	9.4	6.5
Morgan Stanley	8.4	6.5

Source: SNL, as of end 2016, and authors' calculations.

## Annex II: Comparing Peer Groups of Banks

	Total assets > \$1 billion	Total assets > \$10 billion	SIFIs /1
Total assets (\$billion)	18,454	17,189	10,654
Tier 1 common capital (\$billion)	1,379	1,214	830
Tier 1 capital (\$billion)	1,532	1,354	935
Tier-1 risk-based capital ratio (%)	13.8	13.8	14.1
U.S. leverage ratio (%)	9.1	9.0	8.9
Yield on debt and equity securities (%)	2.1	2.1	2.3
Cost of borrowings (%)	1.7	1.7	1.7
Cost of interest-bearing liabilities (%)	0.7	0.7	0.8
Cost of funds (%)	0.6	0.6	0.7

Source: SNL, as of end 2016. Percentage values are asset-weighted averages across the respective sample. /1 The SIFIs are Bank of America, Bank of New York Mellon, Citigroup, Goldman Sachs, JP Morgan Chase, Morgan Stanley, State Street, and Wells Fargo.

## Annex III: The Optionality Explained

We provide a graphical explanation as to how QBO optionality arises in the case of a **small** bank, and the implication for its behavior (similar argument can be made for a SIFI). In the figure below, the diagonal represents the capital to asset ratio for a small bank under the DFA, as a function of its density  $RWA/A$ , while the horizontal line represents the capital to asset leverage ratio under the FCA, as a function of the density. When  $RWA/A$  of a small bank is greater than 1.176, the risk-based capital requirement becomes more onerous under the DFA, as shown in (2), and it may opt to be regulated under the FCA, with a flat 10 percent leverage ratio. Thus, the expected effective capital charge for the bank becomes the red kinked line. Now, note that a bank whose  $RWA/A$  is close to 1.176, say at point B) can increase the riskiness of its asset portfolio and thereby lower its expected capital charge. More importantly, however, a small bank with initially less risky asset portfolio can increase the variance of its  $RWA$  density (by taking on a larger gamble) and still manage to lower its expected effective capital charge. Thus, this risky behavior illustrates the moral hazard issue

discussed in the text, and shows that it occurs irrespective of the initial RWA/A position, and is due to the QBO option provided to banks.

Interestingly, one way to avoid the moral hazard problem would be for the regulator to remove the option provided to banks and by mandating a 10 percent leverage ratio up to the cut-off RWA/A = 117.6 percent (or up to 77 percent for a SIFI), and then a gradual risk-based capital charge if banks were to go beyond the cut-off. This is captured by the green line in the case of small banks.

