



Occupy risk weighting: how the minimum leverage ratio dominates capital requirements

Occupy risk
weighting

A Swiss example

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Abstract

Purpose – In September 2009, G20 representatives called for introducing a minimum leverage ratio as an instrument of financial regulation. It is supposed to assure a certain degree of core capital for banks, independent of the controversial procedures used to assess risk. The paper aims to discuss these issues.

Design/methodology/approach – This paper discusses the interaction and tensions between the leverage ratio and risk-based capital requirements, using financial data of the Swiss systemically important bank United Bank of Switzerland.

Findings – It can be shown that the leverage ratio potentially undermines risk weighting such that banks feel encouraged to take greater risks.

Originality/value – The paper proposes an alternative instrument that is conceived as a base risk weight and functions as a backstop. It ensures a minimum core capital ratio, based on unweighted total exposure by ensuring a minimum ratio of risk-weighted to total assets for all banks. The proposed measure is easy to compute like the leverage ratio, and also like the latter, it is independent of risk weighting. Yet, its primary advantage is that it does not supersede risk-based capital adequacy targets, but rather supplements them.

Keywords Base capital requirement, Basel III, Global systemically important banks, Leverage ratio, Risk-based capital requirement, Switzerland

Paper type Research paper

1. Introduction

One of the main reasons for the severity of the economic and financial crisis that started in 2007, was that the banking sectors of many countries had built up excessive on- and off-balance sheet leverage. Stricter regulatory capital adequacy requirements were intended to strengthen the resilience of individual banks and the entire banking system in future crises. In December 2009, the Basel Committee on Banking Supervision (BCBS) drew up a comprehensive package of reforms called Basel III[1]. In December 2011, the BCBS issued the Basel III rules text, which presents the details of global regulatory standards on bank capital adequacy and liquidity, as agreed upon by the Group of Central Bank Governors and Heads of Supervision, and endorsed by the G20 Leaders at their November 2011 Seoul summit. The Swiss regime of regulation for global systemically important banks (G-SIBs)[2] had already been adjusted in the autumn of 2008 (Kellermann and Schlag, 2010a), whereby the Swiss regulatory framework is still undergoing reforms (FINMA, 2010).



The new rules are the response by the regulators to the, at times, harsh criticism of previous capital requirements. Such criticism was aimed in particular at the inadequate limits on the eligible regulatory capital and problems in risk weighting procedures. The regulatory capital framework of Basel and its national execution was generally deemed as lacking transparency and susceptible to manipulation by the banks under scrutiny (Bichsel and Blum, 2005; Blum, 2008; Scientific Advisory Board of the German Federal Ministry of Economics and Technology, 2010). Unsurprisingly in September 2009, representatives of the G20 nations called for the implementation of a leverage ratio requirement, as a simple and transparent supplement to risk-based capital measures[3]. The BCBS accepted this demand and pronounced that:

[...] the Committee is [...] introducing a leverage ratio requirement that is intended to achieve [...] additional safeguards against model risk and measurement error by supplementing the risk-based measure with a simple, transparent, independent measure of risk that is based on gross exposures (BCBS, 2009b, p. 7).

Recently, the BCBS (2011, p. 2) described the leverage ratio explicitly as a measure that serves as a backstop to risk-based capital measures, which “[...] is intended to constrain excess leverage in the banking system, and provide an extra layer of protection against model risk and measurement error”.

However, this oversight instrument shows itself to have some shortcomings. In particular, the inherent danger is that the leverage ratio could annul risk weighting, such that banks may feel encouraged to take greater risks. This paper delves into the interaction between a risk-based capital requirement and a non-risk-based leverage ratio, using financial data of United Bank of Switzerland (UBS)[4], the major Swiss bank. It shows that the minimum leverage ratio does not always function as the desired backstop (Kellermann and Schlag, 2010b). If calibrated incorrectly, the minimum leverage ratio instead becomes the binding capital requirement. This paper thus proposes an alternative regulatory instrument – which in the following will be denoted as base risk weight for total exposure[5] (*Sockelrisikogewicht* in German). This approach ensures a minimum core capital ratio for all banks, based on unweighted total exposure by ensuring a minimum ratio of risk-weighted to total assets. The proposed measure is easy to compute like the leverage ratio, and also like the latter, it is independent of risk weighting. Yet, its primary advantage is that it does not supersede risk-based capital adequacy targets, but rather supplements them.

The paper is divided into seven sections. Section 2 summarizes the economic policy debate on the leverage ratio, Section 3 looks at issues associated with risk weighting, while Section 4 gives an overview of different risk-based capital requirements. It focuses on the recent adjustment of the Basel regulatory framework and the way the Swiss will adapt it. Section 5 addresses the issue of how the leverage ratio could encourage banks to take greater risks. Section 6 introduces the base risk weight as an alternative backstop to the leverage ratio. Section 7 summarizes the findings.

2. Definition and calculation of the leverage ratio

In June 2011, BCBS presented a method for computing the leverage ratio based on the definitions of eligible regulatory capital – the capital measure – and total exposure – the exposure measure[6]. The capital measure represents the numerator of the leverage ratio and is based on the new definition of Tier 1 class of capital as set out by BCBS (2011).

Under Basel III, the Tier 1 capital will include the common equity Tier 1 (CET1) and the additional Tier 1 (AT1)[7]. CET1 refers to loss-absorbing equity capital of the highest quality and consists of paid-in capital, disclosed reserves and retained earnings. The exposure measure is again defined precisely by BCBS (2011, p. 62ff.). It covers the total assets (TA) of a bank and certain off-balance sheet items (OBI). It further represents the denominator of the leverage ratio. During the transition period from January 1, 2013 to January 1, 2017, BCBS will test a minimum Tier 1 leverage ratio of 3 percent[8], subject to the following requirement[9]:

$$\text{Tier 1} > 0.03^* \text{exposure measure.} \quad (1)$$

Disclosure of the leverage ratio and its components at the bank level will start on January 1, 2015[10].

The new international minimum standards for the leverage ratio will be adopted under Swiss law, as a part of the planned revision to the CAO in 2017 (FINMA, 2011). Yet, the Swiss Financial Market Supervisory Authority (FINMA)[11] had already introduced a leverage ratio requirement in November 2008 for the Swiss banks, UBS and Credit Suisse (CS) (EBK, 2008). At present both Swiss banks are still subject to this FINMA regulation, which define the leverage ratio as the ratio of core capital (Tier 1) to adjusted total assets (BS)[12]:

$$\text{Tier 1} > 0.03^* \text{adjusted BS} \quad (1')$$

This minimum leverage ratio for corporations is 3 and 4 percent for individual institutions. In times of robust economies – as expressed by financial oversight regulators – the leverage ratio should exceed the required minimum levels (EBK, 2008)[13]. The adjusted total assets primarily reflect the total assets less Swiss lending activities[14]. This adjustment of the exposure measure was made because of the obvious impact of the Swiss G-SIBs on domestic lending activities and because the country was in the midst of a recession in November 2008 (EBK, 2008, p. 2). FINMA's goal was to lower the economic and business costs that may arise from implementing too strict rules (BCBS, 2010a, b)[15]. The adjustment had a major effect – it cuts the minimum core capital required under the leverage ratio by almost a third.

3. The risk of risk assessment

By implementing a leverage ratio and minimum leverage ratio, respectively, several goals are pursued. The leverage ratio provides the financial supervisors a simple and transparent oversight instrument which enables them to confidently judge a critical situation, reach quick decisions and take a firm line with the supervised banks. This is not always self-evident, since the oversight agency typically suffers from an information gap compared to the banks. Still, the leverage ratio is not merely an observation metric. Its primary aim is to straightforwardly ensure a minimum of eligible regulatory capital for banks[16], independent of complex risk assessment procedures[17].

After experiencing the financial turmoil of 2007 and 2008, Hildebrand (2008) describes this assessment procedure as inherently risky for achieving financial stability and thus a risk by itself[18], since it gives banks the ability to undertake regulatory arbitrage[19]. A further deficiency of risk assessment is that it relies far too heavily on financial mathematical models that are based on wrong assumptions and shows severe flaws.

This criticism is backed by the empirical fact that many banks built up excessive leverage in the pre-2007 years, while showing strong risk-based capital ratios. In order to put a backstop to the expansion of a company's balance sheet and to mitigate deficiencies in the risk assessment models, the minimum leverage ratio as a risk-neutral measure is supposed to supplement the risk-based capital requirements (FINMA, 2012). This means that the minimum leverage ratio should become effective if risk weighting fails, for whatever reason. Yet, there is no intention to eliminate risk weighting completely. Higher levels of risks in banks assets should basically lead to higher capital requirements[20]. To ensure this, the leverage ratio needs to be calibrated adequately; a task, that is not quite easily accomplished[21].

Risk assessing under Basel II is applied to total exposure (TE) of a bank in order to determine the risk-weighted assets (RWAs) (BCBS, 2006)[22]. It is based on the assumption that not every position the intermediary is responsible for entails the same level of risk. For this reason, less risky positions require less equity to underpin them than more risky ones (FINMA, 2012). The ratio of RWAs to total exposure is designated in the following as *aggregate risk weight* $w(R)$ [23]. It can be interpreted as the average risk weight over all exposure classes and risk categories, so that:

$$RWA = w(R)TE = w(R)(TA + OBI). \quad (2)$$

Total exposure (TE) is the sum of total assets (TA) and certain off-balance sheet items (OBI)[24]. The average risk weight features two dimensions: first, it indicates the absolute amount of RWAs as a percentage of total exposure[25]. Table I shows the amount of total exposure, the values of RWAs and the according $w(R)$ of UBS for several years. As of December 31, 2009 total assets amounted to CHF 1,341 billion and off-balance sheet items equaled CHF 78.7 billion so that total exposure add up to CHF 1,419 billion. Pooling and assessing all risks taken on in the bank result in RWAs that amounting to CHF 225.6 billion[26]. The aggregate risk weight $w(R)$ is thus 16 percent. In 2010 and 2011 this ratio is 15.5 and 17.1 percent, respectively. The second dimension of the average risk weight is its risk sensitivity. Since the intent of risk assessing is to have the RWAs of a bank increase with its risk profile[27], $\partial w(R)/\partial R > 0$ holds. In other words, if the risks taken by a bank rise whereas, the amount of TE is held constant, the aggregate risk weight will also rise.

Figure 1 shows RWAs based on total assets at the end of the years 2002-2011 for further Swiss banks: CS, the Raiffeisen Group (RG), the Zürcher Kantonalbank (ZKB), and the private Bank Sarasin (BS). The figure shows the dominance of UBS and CS in the Swiss banking sector measured by total assets (Kellermann, 2010). It further demonstrates that a rise in total assets involves a disproportionate increase in RWAs so that bigger banks hold relatively less RWAs.

Figure 2 plots the aggregate risk weight $w(R)$ for the listed Swiss banks. The relationship of RWAs to total assets (without off-balance sheet items) is around 20 percent for the major banks CS and UBS, but approximately 45 percent for the smaller ones. In the mind-set of risk assessment this result suggests that the total assets of major banks involve relatively lower risks. One reason for this could be that major banks have a refined risk management system and options for greater diversification of their portfolios. However, this applies only as long as the complex system of risk assessment works properly, so that the RWAs actually show a sensitive reaction to the risk borne by

UBS (CHF billion)	December 31, 2009	December 31, 2010	December 31, 2011 Basel II	December 31, 2011 Basel II enhancements
<i>A. Assets</i>				
Total assets	1,340.5	1,317.2	1,419.2	1,419.2
+ Off-balance sheet items	78.7	73.8	78.3	78.3
= Total exposure (TE)	1,419.2	1,391.0	1,497.4	1,497.4
Total adjusted assets	809.4	794.2	714.2	714
<i>B. Risk-weighted assets (RWAs)</i>				
Credit risk	140.5	119.9	124.3	126.8
+ Non-counterparty related risk	7.0	6.2	6.1	6.1
+ Market risk	12.9	20.8	9.2	49
+ Operational risk	46.1	51.9	58.9	59
= Total RWA (BIS)	206.5	198.9	198.5	241.0
+ Additional RWA according to FINMA regulations	19.1	16.1		15.5
= Total RWA (FINMA)	225.6	215.0		256.4
<i>C. Aggregate risk weight w(R)</i>				
Aggregate risk weight w(R) BIS ^a (%)	14.6	14.3	13.3	16.1
Aggregate risk weight w(R), FINMA ^b (%)	15.9	15.5		17.1
<i>D. Capital adequacy</i>				
BIS core Tier 1 capital	40.1	30.4	34.6	34.0
BIS Tier 1 capital	31.8	35.3	39.0	38.4
BIS Tier 2 capital	9.1	5.2		
= Total eligible capital	40.9	40.5	42.8	41.6
<i>E. Capital ratios</i>				
BIS total capital ratio (%)	19.8	20.4	21.6	17.3
BIS Tier 1 capital ratio (%)	15.4	17.8	19.6	15.9
BIS core Tier 1 capital ratio (%)	19.4	15.3	17.4	14.1
FINMA total capital ratio (%)	18.1	18.9		16.2
FINMA Tier 1 capital ratio (%)	14.1	16.4		15.0
FINMA core Tier 1 capital ratio (%)	17.8	14.1		13.3
FINMA leverage ratio (%)	3.9	4.4	5.5	5.4

Notes: ^aTotal RWA (BIS) in relation to total assets plus off-balance sheet items; ^btotal RWA (FINMA) in relation to total assets plus off-balance sheet item
Source: UBS (2010, 2012), authors' calculations

Table I.
 UBS (CHF billion, ratios
 in percent)

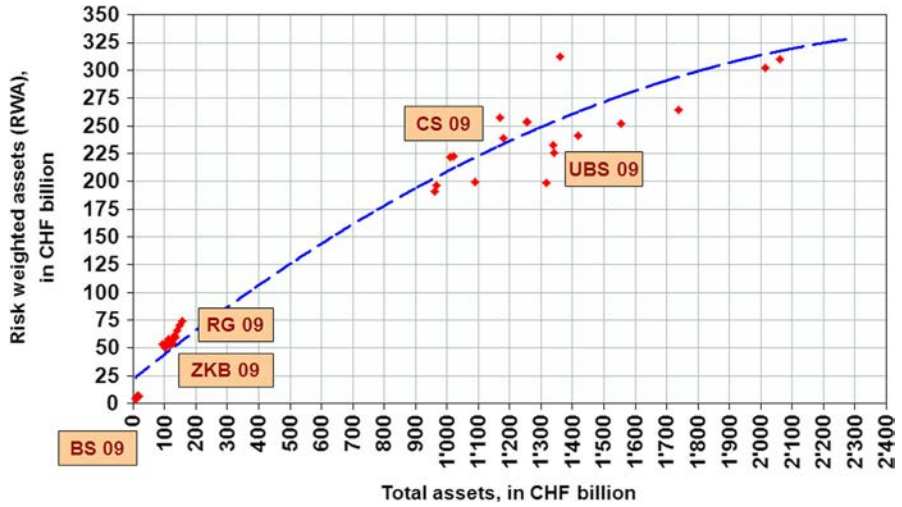


Figure 1.
Total assets and RWAs
2002-2011, end of the
year (CHF billion)

Notes: Blue line: trend of RWAs; Swiss banks: UBS, CS, RG, ZKB, BS
Source: Annual reports of the banks (2002-2011)

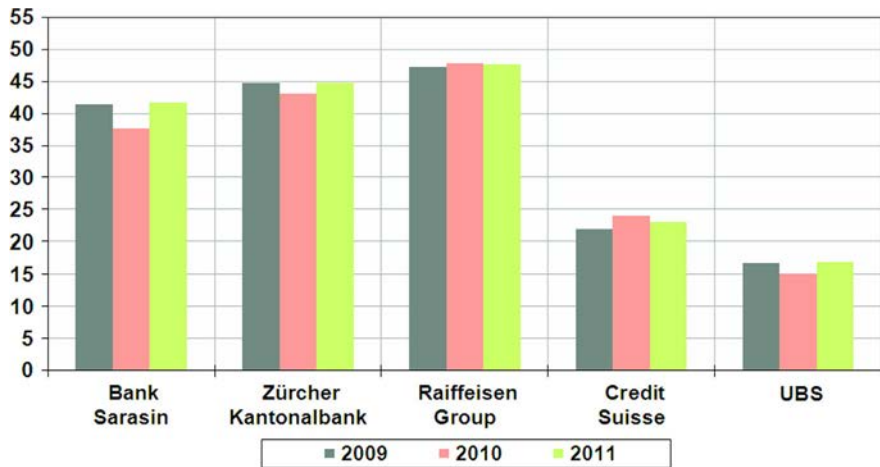


Figure 2.
Aggregate risk weight
w(R) of selected Swiss
banks 2009-2011, end of
year (in percent)

Source: Annual reports of the banks (2009 - 2011), end of year, authors' calculations

a financial institution. From a critical perspective, however it is conceivable that the described result stems from the greater degree of freedom of major banks in choosing risk models[28]. At any rate, the analysis in this paper assumes that risk weighting functions such that a lower risk leads to a decline in RWAs. The question whether or not the degree of risk sensitivity is adequate under the current regulatory regimes is not subject of the analysis.

4. Risk-based minimum capital requirements

Since the introduction of Basel II, RWAs serve as the central basis for measuring risk-weighted capital ratios and minimum capital requirements. This will be retained unchanged after implementing Basel III, albeit Basel III will result in modified procedures for determining RWAs, and also in higher minimum capital requirements (BCBS, 2011)[29]. Table II lists the key parameters valid under the current (Basel II) and future (Basel III) regulatory framework. The risk-weighted minimum capital requirements reflect under both regimes fixed shares of RWAs. Switzerland implemented the Basel II regulations in 2006 and enhanced these with its Swiss

<i>Capital instruments</i>	Basel II <i>BCBS proposal</i>	<i>Implementation Switzerland</i>
Minimum capital requirements		
Minimum core capital		Tier 1 > 0.04 RWA ^{SF}
Minimum capital		Tier 1 + Tier 2 > 0.08 RWA ^{SF}
Supervisory review process		
Intervention boundary		Tier 1 + Tier 2 > 0.12 RWA ^{SF}
Target value		Tier 1 + Tier 2 > 0.16 RWA ^{SF}
	Basel III (as of 1 January, 2019)	
<i>Capital requirements</i>		<i>Swiss TBTF regime</i>
Minimum		
Basic component	CET1 > 0.045 RWA	CET1 > 0.045 RWA
Core capital	Tier 1 > 0.06 RWA	
Total capital	Tier 1 + Tier 2 > 0.08 RWA	
Buffer		
Capital conservation buffer: 2.5%	CET1 > 0.07 RWA	
G-SIB: additional loss absorbency requirement (progressive requirement): 1-2.5%	CET1 > 0.08 to 0.095 RWA	CET1 > 0.10 RWA
Total	Tier 1 + Tier 2 > 0.115 to 0.13 RWA	CET1 + CoCo ⁷ > 0.13 RWA CET1 + CoCo ⁷ + CoCo ⁵ > 0.14 to 0.19 RWA
Countercyclical buffer: 0-2.5%	CET1 > 0.07 to 0.095 RWA	CET1 > 0.10 to 0.125 RWA CET1 + CoCo ⁷ + CoCo ⁵ > 0.14 to 0.215 RWA Tier 1 > 0.13 to 0.155 RWA
Leverage ratio		
Minimum leverage ratio	Tier 1 > 0.03 TE	

Notes: RWA^{SF}: RWA after Swiss Finish; CoCo⁷ with trigger CET1 = 0.07 RWA; CoCo⁵: with trigger CET1 = 0.05 RWA

Source: BIS (2011), authors' calculations

Table II.
Minimum capital requirements for G-SIBs

Finish (SF) guidelines, country-specific rules to assess risks that lead to slightly higher RWA^{SF} compared to international standards[30]. Under Basel II, the core capital (Tier 1) must be at least 4 percent of RWA^{SF} . The minimum capital requirement (Tiers 1 and 2) equals 8 percent of RWA^{SF} . This is supplemented by the Swiss supervisory review process under which the Swiss G-SIBs are required to build up additional anti-cyclical capital buffers during financially healthy times for drawdown in periods of stress. The target level provided for by the buffer is 100 percent above the international minimum, which can be run down to an intervention level of 50 percent above the minimum. Thus, the buffer is allowed to fluctuate within a range from 16 to 12 percent of RWA^{SF} (FINMA, 2010).

A key element in Switzerland's present ongoing implementation process of Basel III is the "Too Big To Fail" (TBTF) reform package, which was approved by the Swiss Parliament in September 2011, and came into force in March 2012. Following a peer review, the Financial Stability Board (FSB, 2012, p. 6) commented that the Swiss TBTF package "[...] goes beyond international minimum standards in terms of regulatory capital requirements and has been influential in the international policy debate on this issue". Pursuant to Basel III, the ratios that apply to G-SIBs as of 2019 are listed in the second column of Table III. The third column shows how these will be implemented in Switzerland via a basic component and three buffers. The basic component is 4.5 percent of RWAs[31] and is to be fully covered by CET1. Here it is to note that the Swiss Finish will be dropped in connection with the implementation of the Basel III framework. Next come the "equity buffer" comprising two elements: the first makes up 5.5 percent of RWAs and must be fulfilled by CET1. It is a slightly stricter adaption of the capital "conservation buffer" of 2.5 percent and the "G-SIBs loss absorbency requirement" between 1 and 2.5 percent advocated by Basel III. The second element of the "equity buffer" can be made up of high-trigger contingent convertible bonds (CoCos)[32] and must be at least make 3 percent of RWAs[33]. Thus, the consequence is a 13 percent Tier 1 requirement and a 10 percent CET1 requirement for Swiss G-SIBs. By comparison for systemically important banks Basel III proposes 11.5-13 percent Tier 1 and 7-9.5 percent CET1.

The second buffer is called progressive component. It is made up of low-trigger CoCos that must contribute between 1 and 6 percent of RWAs depending on the overall size of the bank[34], whereas a minimum of 1 percent of RWAs must always be maintained. Eventually, there is a countercyclical capital buffer that ranges from 0 to 2.5 percent of RWAs, and must be fulfilled using CET1. It aims to strengthen the banking sector by requiring banks to hold additional equity capital during times of strong credit growth. In a downturn, the countercyclical capital buffer is reduced or eliminated, which frees up assets for lending and has thus potentially a stimulating effect on the economy (SNB, 2012b). In future, to fulfill all capital requirements, the Swiss G-SIBs have to be in funds of Tier 1 reserves of at least 13-15.5 percent of RWAs. The overall capital requirement, comprising CET1, high-trigger and low-trigger CoCos, will call for a minimum ratio of 14-21.5 percent of RWAs.

5. Leverage ratio and risk-based capital ratio: an odd couple

The leverage ratio and risk-based capital ratios are supposed to interact, in order for the former to function as an effective backstop without undermining risk-weighting. The Swiss TBTF-Commission of Experts (2010, p. 33) specifies that:

UBS (CHF billion)	December 31, 2009	December 31, 2010	December 31, 2011 Basel II	December 31, 2011 Basel II enhancements	December 31, 2011 Swiss TBTF ^a	December 31, 2011 Implementation Basel III
<i>A. Minimum capital requirements</i>						
Minimum capital requirements (Tier 1 + Tier 2)	16.5	15.9	15.9	19.3	14.3	CET1, basic component
+ Additional capital requirements according to FIMIVIA regulations	1.5	1.3		1.2		
= Total minimum capital requirements (FINMA)	18.1	17.2	15.9	20.5		
Minimum core capital (Tier 1)	9.0	8.6	7.9	10.3	41.3-49.3	Minimum Tier 1
<i>B. Supervisory review process</i>						
Swiss Finish capital buffer (+100%)						
Intervention boundary: + 50% Range intensified supervisory between + 50 and + 100%	27.1	25.8	23.8	30.8		
Target value	36.1	34.4	31.8	41.0	44.5-68.4	Minimum Tier 1 + Tier 2
Minimum leverage ratio ^b (Tier 1)	24.3	23.8	21.4	21.4	44.9	

Notes: ^aThe application of the Swiss TBTF regime is based on an analysis done by FINMA which indicates that the transition from Basel II to the Swiss TBTF regime will lead to 24 percent higher RWA with respect to Swiss G-SIB (Bischof, 2011); ^bunder Basel III adjusted total assets are replaced by total exposure as denominator of the leverage ratio; the amount of CHF 44.9 billion equal 3 percent of total exposure

Source: UBS (2012) and BIS (2011), authors' calculations

Table III.
UBS in CHF billion

[...] the leverage ratio should be set at such a level that the resulting requirement would normally fall just below the risk-weighted requirements [...]. As a result, the leverage ratio will generally be non-restrictive.

The Swiss Parliament adopted this view, as is evident from its statement that “the leverage ratio is supposed to operate as a safety net to offset the effects of potential shortfalls in risk-weighted requirements” (Swiss Executive Federal Council, 2011, p. 4750f.). To counteract the likely risk that the leverage ratio becomes a limiting factor, the Swiss Bankers Association (SBA, 2012)[35] recently demanded that this principle be explicitly included into the CAO. As will be shown in the following, the bankers' concerns are not unfounded. At least during the years after implementing the leverage ratio for the Swiss G-SIBs, it has dominated the risk-based Tier 1 requirement.

Figure 3 graphically collates the modules that build the risk-based and non-risk-based minimum capital requirements, applying UBS data from December 31, 2009. The right-hand side of the figure shows how the risk-based minimum Tier 1 level is calculated. The computation is based on the amount of total exposure that is marked on the lower part of the ordinate. In 2009 it adds up to CHF 1,419 billion comprising TA and OBI. Point A assigns RWA^{SF} in the amount of CHF 225.6 billion to the total exposure measure. The minimum risk-based capital ratios based on RWA^{SF} are drawn as four lines radiating from the origin into the upper right quadrant, to depict the risk-based minimum capital levels. In December 2009, the minimum core capital requirement for UBS amounted to CHF 9.1 billion, whereas the minimum capital requirement was CHF 18.1 billion. The intervention boundary was CHF 27.1 billion, and the target value of eligible capital was CHF 36.1 billion. With an eligible regulatory capital in 2009 of CHF 40.8 billion and a Tier 1 core capital of CHF 31.8 billion, UBS fulfilled all regulatory requirements (UBS, 2010).

The left-hand side of Figure 3 shows the computation of the leverage ratio. The total adjusted assets of UBS of CHF 809 billion are marked on the lower ordinate and reflected via the 45° line on to the left abscissa, where they form the basis for computing the non-risk-based minimum Tier 1 level of CHF 24.3 billion. This amount exceeds its risk-based counterpart of CHF 9.1 billion by far[36]. Generally, the leverage ratio represents the binding rule that dominates the risk-based requirement if the following condition holds:

$$0.03 (\text{adjusted TA}) > 0.04 RWA = 0.04 w(R)(TA + OBI). \quad (3)$$

Table III shows that this condition not only applied in 2009, but also in the years 2010 and 2011. In 2010, the risk-based minimum Tier 1 level was CHF 8.6 billion. Still, the minimum leverage ratio called for Tier 1 capital in the amount of CHF 23.8 billion.

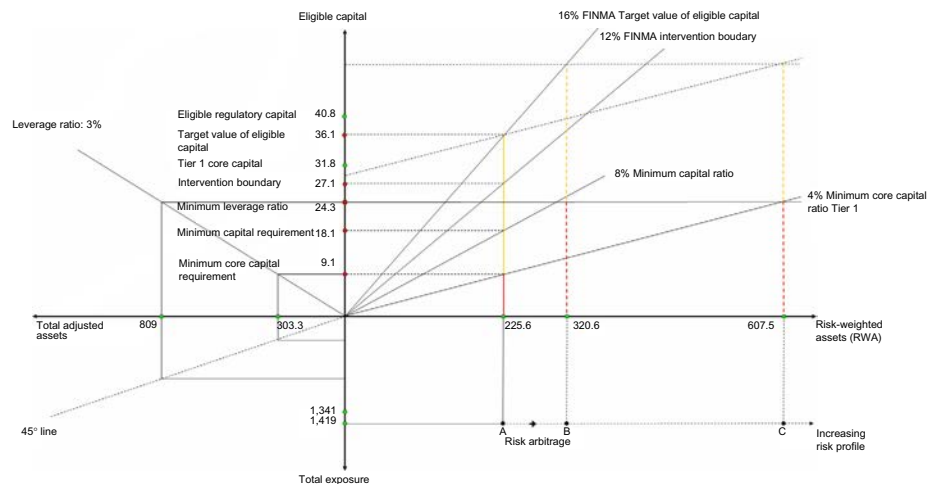


Figure 3.
Risk arbitrage through
introduction of the
leverage ratio, UBS,
December 31, 2009
(CHF billion)

Notes: Green points: eligible capital (UBS, 2010); red points: requirements (risk-based); red
rectangle: requirements (non-risk-based)

Source: Authors' calculations

The capital requirements of 2011 are computed in three different modes: namely in accordance with Basel II and Basel 2.5[37], which is enhanced by Swiss Finish and by the application of the new Swiss TBTF regime. The latter is based on an analysis done by FINMA (Bischof, 2011), which indicates that the transition from Basel II to the Swiss TBTF regime will lead to 24 percent higher RWAs with respect to Swiss G-SIBs. In 2011 Basel II required a risk-based minimum Tier 1 level of CHF 7.9 billion, whereas the leverage ratio requirement called for a total of CHF 21.4 billion. Under Basel 2.5, the risk-based minimum Tier 1 level is CHF 10.3 billion, which is less than half the non-risk-based level of CHF 21.4 billion. In line with the Swiss TBTF regime, the minimum core capital requirement (Tier 1) should lie between CHF 41.3 and 49.3 billion, whereas the leverage ratio calls for Tier 1 capital of CHF 44.9 billion. Hence, the minimum leverage ratio shows a tendency to represent the binding Tier 1 requirement even under the new Swiss TBTF regime[38].

This unintended functional interaction could provide incentives for banks to adjust in response to the implementation of a binding minimum leverage ratio. If the bank commences with an amount of eligible Tier 1 capital equalling the minimum core capital requirement, it would even be forced to make adjustments. Haldane and Madouros (2012) concede that the case against leverage ratios is that they may encourage banks to increase their risk per unit of assets by shifting from assets with low risk weights to those with higher risk weights. Before the adoption of Basel I, several jurisdictions relied solely on the leverage ratio, which according to IMF (2012, p. 42) created incentives for banks to allocate resources to higher-risk assets because the returns on those assets were not offset by a requirement to hold larger amounts of capital against them. To discuss this point, again UBS-data from 2009 are used. Figure 3 shows three possible adjustment scenarios that could occur:

- (1) The first adjustment possibility following the introduction of a minimum leverage ratio is that the bank builds up the additionally required CHF 15.2 billion of Tier 1 capital, while leaving its total exposure at the initial level of CHF 1.419 billion[39]. This opens up new room for taking risks[40]. With the Tier 1 minimum requirement of CHF 24.3 billion requested by the minimum leverage ratio, the bank could theoretically expand its RWAs to CHF 607.5 billion, without violating the risk-based Tier 1 requirement of 4 percent. Point C in Figure 3 shows this. Compared to the initial situation marked by point A, where the aggregate risk-weight $w(R)$ equals 0.16, in point C the risk-weight $w(R)$ rises to 0.46. Note that if the bank focuses on the Tier 1 capital as the relevant bottleneck and adjusts RWAs up to point C, it will be forced to build up Tier 2 capital.
- (2) The next possible adjustment from the bank's perspective is to build up its Tier 1 capital by the additionally required CHF 15.2 billion, while leaving the Tier 2 capital at its original level of CHF 27.1 billion in point A. This amount is the sum of the Tier 2 requirement of CHF 9.1 billion plus CHF 18.1 billion in line with the supervisory review process. Adding this Tier 2 capital to the Tier 1 capital required by the leverage ratio of CHF 24.3 billion, the bank has a total of regulatory capital of CHF 51 billion. Therefore, its RWAs could increase to a maximum of CHF 320.6 billion, without injuring any risk-based requirement. Due to the implementation of the minimum leverage ratio the bank gains maneuvering room to shift from point A up to point B where the aggregate risk weight $w(R) = 0.23$ [41].

- (3) The third adjustment option for the bank could be to reduce its total assets, while holding both the Tier 1 capital at CHF 9.1 billion and RWAs at CHF 225.6 billion constant. Even in this case, the risks taken by the bank rise. At a fixed Tier 1 level of CHF 9.1 billion, the adjusted total assets must not exceed an amount of CHF 303.3 billion to comply with minimum leverage ratio of 3 percent. Therefore, the adjusted total assets have to shrink considerably by CHF 505.7 billion from its initial level of CHF 809 billion. To accomplish this reduction total exposure has also to decrease sharply so that – given fixed RWAs – the risk weight rises.

The example of UBS seems to demonstrate that the minimum leverage ratio dominates the core capital requirement to some extent. The reason for this is that the relation of RWAs and total exposure is calibrated inappropriate, so that the risk-weighted capital requirements reach only an insufficient level. However, referring to the FPC-report of March 2012 Haldane and Madouros (2012) take the view that this could be desirable since non-risk-weighted and risk-weighted requirements should have equal billing. What Haldane and Madouros (2012) neglect is the fact that even if the leverage ratio acts in tandem with risk-based capital ratios only one of these requirements is ultimately binding. Therefore, preserving risk-sensitivity while providing more robustness hardly be achieved by just placing leverage and capital ratios on equal footing.

6. The base risk weight as an effective backstop

The described tension between the two regulatory measures call for an alternative instrument that functions as a backstop and is independent of risk-assessment, without substantially undermining risk weighting. Such an instrument should, on the one hand ensure that minimum capital standards are risk-sensitive in general. But on the other hand, it should also protect against failure in risk assessment. To accomplish both simultaneously, this paper suggest the implementation of a simple but effective base risk weight. The base risk weight is indicated w and conceived as the minimum threshold ratio of RWAs to total exposure. By implementing the base risk weight, equation (2) becomes:

$$RWA^* = (w + w^*(R))TE = w(TA + OBI) + w^*(R)(TA + OBI). \quad (2')$$

where RWA^* denote augmented risk-weighted assets. RWA^* is the sum of the backstop assets $BSA = w(TA + OBI)$ and a component, that is risk-weighted as before. As long as the configuration of risk assessment maintained unchanged, $w^*(R)$ equals $w(R)$ of equation (2). In this case, the implementation of w exhibits just a level effect. It amplifies risk-weighting with respect to the absolute amount of the augmented risk-weighted assets RWA^* and thus in its first dimension. At the same time risk-sensitivity – the second dimension – remains unchanged. The base risk weight w and the BSAs are independent of the risk taken by the bank and the procedures of risk assessment. It therefore ensures that the minimum Tier 1 level can never fall below 4 percent of BSAs. In this regard the base risk weight functions as a backstop. Nevertheless, the minimum Tier 1 requirement:

$$\text{Tier 1} > \text{minimum core capital requirement} = 0.04(w + w^*(R))(TA + OBI) \quad (4)$$

remains unflinchingly risk-sensitive. Equation (4) shows, that if the risk profile of a bank rises marginally, the minimum core capital requirement, at constant total exposure level,

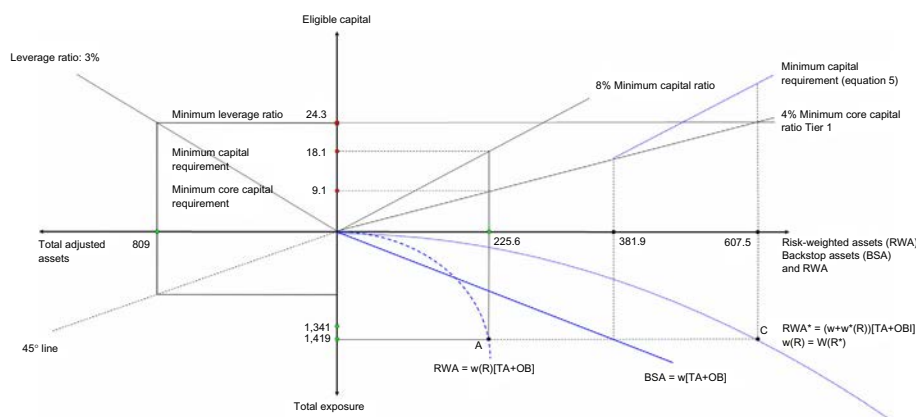
rises by $0.04(\partial w^*(R)/\partial R)(TA + OBI)$. The implementation of the base risk weight does not subvert risk weighting and therefore avoid adverse incentive for banks to take greater risks. If, like the minimum leverage ratio, the backstop is supposed to impact only the core capital requirement, the minimum capital requirement depicted in Table II becomes:

$$\text{Tier 1} + \text{Tier 2} > 0.04BSA + 0.08w^*(R)(TA + OBI). \quad (5)$$

The question remains how to calibrate the base risk weight w [42]. One approach would be to calibrate w such that at a total exposure level of CHF 1.419 billion the minimum Tier 1 capital requirement equals CHF 24.3 billion. This is exactly the amount of core capital required by the leverage ratio. To reach this Tier 1 level RWA^* must equal CHF 607.5 billion. Keeping the risk assessment framework unchanged $w(R) = w(R)^*$, at a total exposure level of CHF 1.419 billion the RWAs are still CHF 225.6 billion, according to equation (2'') w must be chosen so that BSAs equal CHF 381.9 billion. This leads to a base risk weight $w = 0.27$. Figure 4 shows how the introduction of $w = 0.27$ modifies the existing regulation framework. The blue line in the lower right quadrant indicates the BSAs allocated to total exposure. The slope of the BSA-line is determined by w . The dashed blue curve shows the RWAs, as a result of conventional risk assessment[43]. At a total exposure level of CHF 1.419 billion the RWAs equal CHF 225.6 billion as shown in point A. Adding RWAs to BSAs horizontally creates the dotted blue line, which allocates RWA^* to total exposure. In point C RWA^* amount to CHF 607.5 billion. The minimum level of core capital must reach CHF 24.3 billion as shown in the upper right quadrant[44].

7. Conclusion

The BCBS (2009a) considers the leverage ratio as the appropriate instrument, to safeguard the system of financial regulation and supervision against failure in risk assessment. Such failures appear, when the RWAs and consequently the minimum capital requirements turn out to be too low from the standpoint of



Notes: Green points: eligible capital (UBS, 2010); red points: requirements (risk-based); red rectangle: requirements (non-risk-based)
Source: Authors' calculations

Figure 4. Introduction of a base risk weight, UBS, December 31, 2009 (CHF billion)

responsible financial supervision. In this case the leverage ratio is supposed to serve as a backstop to risk-based capital measures. However, it is evident from the analysis done in this paper, that the minimum leverage ratio shows a strong tendency to undermine the risk-based requirements. At least during the years 2009-2011 the minimum leverage ratio requirement became a binding rule for the major Swiss bank UBS. This may adversely encourage banks to take greater risks. The paper thus proposed an alternative instrument to the minimum leverage ratio – termed base risk weight. The base risk weight reduces the impact of potential flaws in risk assessment and by setting a minimum threshold cuts down the options banks have to deflate their RWAs. In this respect it operates as does the leverage ratio. Simultaneously however, it ensures that the capital requirements are risk-sensitive and allows the principle of risk weighting to take full effect. In other words, unlike the minimum leverage ratio, the base risk weight actually functions as a backstop. The leverage ratio remains useful as a viable observation metric.

Notes

1. Basel III is a package of reforms drawn up by the BCBS to strengthen regulation in the banking sector. The new set of regulations should replace the current international standard of Basel II and be introduced at the national level in 2013. However, there is a transition period through 2019, during which the requirements will be gradually introduced (SIF, 2012). In Switzerland, a task force is currently revising the Capital Adequacy Ordinance (CAO) and relevant implementation regulations (FINMA, 2012, p. 39).
2. According to FINMA (2009), the crisis did reveal the considerable macroeconomic and financial system risks arising from the failure of G-SIBs, and demonstrated that large losses by these institutions were not merely a theoretical possibility.
3. This regulatory instrument has been implemented in the USA and Canada. See D'Hulster (2009) for details of how the leverage ratio is defined in the USA and Canada.
4. The UBS is organized as an Aktiengesellschaft. UBS AG is the parent company of the UBS Group. Headquartered in Zurich and Basel UBS has offices in more than 50 countries and employs approximately 65,000 people.
5. The total exposure measure is sometimes referred to as total assets measure. However, the total exposure measure includes OBS items, as proposed by the BCBS. The detailed approach to measure total exposures is described in BCBS (2011).
6. Leverage ratio is here used in the sense of a capital-to-asset ratio. It is sometimes expressed as a leverage multiple, which is simply the inverse of the leverage ratio (D'Hulster, 2009). According to the BCBS (2012b, p. 21) “[. . .] when a bank is referred to as having more leverage, or being more leveraged, this refers to a multiple (e.g. 33 times) as opposed to a ratio (e.g. 3 percent). Therefore, a bank with a high level of leverage will have a low leverage ratio”.
7. Basel II differentiates between the Tiers 1 and 2 classes of equity capital. The Tier 3 supplementary capital (BCBS, 2006) no longer counts.
8. BCBS uses the transition period to monitor leverage data of banks on a semi-annual basis in order to assess whether the proposed minimum leverage ratio of 3 percent is appropriate.
9. BCBS (2011, 2012a, b) also collects data during the transition period to track the impact of using total regulatory capital (Tiers 1 and 2) and CET1 capital as capital measure.
10. If BCBS prevails, the minimum leverage ratio will migrate to a Pillar 1 treatment on January 1, 2018 – following any final adjustments to the definition and calibration of the leverage ratio. However, integration of the leverage ratio into Pillar 1 is controversial. According to Zeitler (2012), the German Bundesbank pushed for defining the debt quota in

Pillar 2, in order to underscore its character as a mere oversight instrument. A compromise was reached such that the experience gained during the 2013-2017 monitoring period will be applied to make necessary adjustments in 2017, before integrating the debt quota in Pillar 1 as of 2018 (Zeitler, 2012, p. 8).

11. The FINMA is the regulatory and supervisory authority responsible for the supervision of banks, insurance companies, stock exchanges, securities dealers, and other financial intermediaries. The Swiss National Bank (SNB) and the Federal Department of Finance (FDF) are FINMA's key corresponding national agencies.
12. Starting in 2013 the leverage ratio will be determined in terms of the Basel III exposure measure.
13. Empirical studies show that the leverage ratio (current variable) in the banking system is cyclical (Adrian and Shin, 2008). Banks thus adjust the leverage ratio to the respective economic situation: it is lowered in a growth period (debt level rises) and raised in a downturn.
14. The adjustments include assets from Swiss lending activities (excluding Swiss interbank lending), cash and balances with central banks, certain Swiss franc reverse repurchase agreements, and certain other assets, such as goodwill and intangible assets that are excluded in determining the regulatory Tier 1 capital (CS, 2010, p. 105).
15. These costs include lower profitability of banks and the risk that banks would limit their lending. Frenkel and Rudolf (2010) analysed the potential impact of the implementation of a leverage ratio on the loan portfolio of banks.
16. Haldane and Madouros (2012, p. 19) call the leverage ratio an "internationally-agreed [...] 1/N rule".
17. These procedures take account of hedging, diversification, and differences in risk management techniques, especially portfolio management between banks. For this purpose banks' internal models to assess risk are used. They attempt explicitly to quantify the banks' credit, market, and operating risks by estimating loss probability distributions for various risk positions. However, the SNB calls on the Swiss big banks to regularly calculate and disclose their RWAs according to the Basel standardised approach. "The results of such calculations would provide a basis for comparison with RWA figures calculated using internal risk models. This comparison would enable the ongoing reduction of risks to be presented more transparently" (Danthine, 2012, p. 3).
18. Greenspan (1998, p. 165) took the opposite position. He encouraged the regulators to use risk management techniques applied by banks: "These internal capital allocation models have much to teach the supervisor and are critical to understanding the possible misallocative effects of inappropriate capital rules".
19. In FINMA (2009, p. 12) stated: "In particular, the value-at-risk models used by the banks to measure and provide capital cover for market risks proved to be completely inadequate. In stress situations, trading book positions are markedly less liquid than previously assumed. The capital adequacy requirements for these risks were therefore insufficient and set false incentives for shifting from credit to market risks".
20. The rationale for seeking risk-sensitivity in the Basel framework in the first place was to encourage banks to price risks properly (Haldane and Madouros, 2012). According to the IMF (2012, p. 2), an efficient regulatory framework should "[...] apply similar prudential standards to similar risks to avoid regulatory arbitrage that would allow risks to migrate and potentially threaten stability".
21. In a report held on March 16, 2012, the Bank of England's Financial Policy Committee states that regulatory instruments as the countercyclical capital buffer, sectoral capital requirements

- and a leverage ratio have somewhat overlapping effects and so need careful explanation (Bank of England, 2012, p. 4). However, the Committee members come to the conclusion, that there should be no hierarchy relating to the application of the leverage ratio and other instruments.
22. Total RWAs are determined by (i) the capital requirements for market risk, (ii) RWAs for credit risk, and (iii) the operational risk. However, the operational risk is not derived directly from assets. It is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events. The Basel framework outlines several methods for calculating the operational risk capital. Following the basic indicator approach, banks must hold capital for operational risk equal to a fixed percentage of the average positive annual gross income over the past three years (BCBS, 2006).
 23. The aggregate risk weight is purely a computed variable that is not found in any official BCBS documents. However, risk weights are used as risk measures with respect to credit risks (BCBS, 2006).
 24. The risk potential of the institutions under supervision is categorized by FINMA in terms of the balance sheet total, assets under management, and privileged deposits (FINMA, 2012).
 25. Total RWAs are determined by multiplying the capital requirements for market risk and operational risk by 12.5 (i.e. the reciprocal of the minimum capital ratio of 8 percent) and adding the resulting figures to the sum of RWAs for credit risk (BCBS, 2006, p. 12).
 26. On November 20, 2008, FINMA (2008a, b) issued a circular to banks, setting forth the regulations for RWAs governing equity capital requirements to cover credit risks and market risks. These are closely related to Basel II, but go beyond those on several aspects (Kellermann and Schlag, 2010a).
 27. The risk profile comprises all threats faced by the bank, the likelihood of adverse effects occurring, and the level of disruption and costs associated with each type of risk. The SNB (2012a, p. 17) measures the individual risk profile of banks by a score that summarizes indicators covering different aspects of the banks' risk-taking, such as credit growth, mortgage exposure in regions showing signs of overvaluation of residential properties, and sensitivity to interest rate shocks. However, these risks should be mirrored in the RWAs.
 28. Furthermore, are systemic risks generated by big banks so far not considered in the procedures of risk assessment.
 29. Basel III will further result in stricter requirements on the quality, consistency and transparency of the capital base.
 30. The term Swiss Finish refers to surcharges, discounts, and special rules in effect during implementation of the Basel II standards. In future, Switzerland will not introduce any country-specific rules, except in the TBTF regime. Hence, Swiss Finish will be dropped in lieu of the Basel III framework.
 31. It must be met on an ongoing basis.
 32. In Switzerland, the AT1 capital and the supplementary Tier 2 capital will comprise mainly CoCos. This is debt capital that can be converted into equity under certain conditions. CoCos are a relatively new instrument, designed to improve a bank's situation in a crisis. High-trigger CoCos convert into shares (or participation certificates) or trigger a write-off if common equity falls below 7 percent of RWAs, while low-trigger CoCos convert if common equity falls below 5 percent of RWAs. When a firm's situation deteriorates, the former bonds convert to improve its loss absorbing capacity and stabilize the company. The latter bonds are designed to generate the capital necessary to finance maintenance of systemically important functions in the event of an insolvency threat (FSB, 2012, p. 15; FINMA, 2012).
 33. The conversion of Coco⁷ to CET1 is triggered at a CET1 level of 7 percent of RWAs.

34. The size measure consists of total assets and certain off balance-sheet items as well as the bank's market shares in domestic deposit-taking and lending.
35. The SBA is reputed as the leading professional organization of the Swiss financial center.
36. Pursuant to Art. 30(1) of CAO, the Tier 2 capital counts only up to 100 percent of the core capital. If this requirement also applies to the buffer, the core capital requirement rises to 8 percent of RWAs (CHF 18.1 billion Tier 1). Even in this case, the leverage ratio remains the binding minimum Tier 1 requirement.
37. Basel 2.5 is the enhancement of the Basel II framework. It introduced higher risk weighting for securitization exposures and also requires that banks analyse externally rated securitization exposures more rigorously (BIS, 2009).
38. The results of the Basel III monitoring exercise show that of a sample of 209 banks only 153 banks meet the required leverage ratio of 3 percent. More banks meet the required risk-weighted capital ratios (BCBS, 2012b). According to Barfield (2012) these results show "[...] that the leverage ratio is starting to emerge as a critical issue. This might have gone under many people's radars as banks may hit the capital ratio (which is the main focus) but still fall short on the leverage ratio".
39. This adjustment depends of course upon the ability to raise capital.
40. In March 2012 a few members of the Interim Financial Policy Committee were concerned that "[...] if a leverage limit were used in isolation, some financial institutions might shift the composition of their balance sheets towards riskier assets while maintaining the level of total assets unchanged" (Bank of England, 2012, p. 7). The calculations presented above show that this is already the case if the leverage ratio becomes the binding requirement.
41. The FINMA target value of eligible capital equals CHF 51 billion and thus 16 percent of CHF 320.6 billion.
42. To make the instrument more flexible an option is to impose different base risk weights, in terms of TA and OBI, respectively. Another option could be to categorize banks by their risk potential and assign specific base risk weights to these risk categories.
43. It reflects the functional relationship depicted in Figure 1, which at least empirically mirrors the relation of total exposure and RWAs in a specific historic case.
44. The dotted blue line in the upper quadrant of Figure 4 shows the minimum capital requirement according to condition (5).

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