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The Bank Capital Requirements in the SSM

A Supervisory Approach

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Abstract

The financial and supervisory data collection and analysis of the 128 significant institutions of the SSM shows that in 2017, on average, European banks were operating with a considerable excess regulatory total capital ratio.

Although this might empirically challenge part of the literature – according to which banks would tend to operate with as much leverage as they are allowed to – a more granular analysis shows that despite the level playing field envisaged by the Banking Union, there are still statistically significant national differences among Pillar 2 capital add-ons, which were expected to address strictly idiosyncratic risks of institutions.

Keywords: *Bank Capital Structure, Banking Supervision, Capital Requirements*.

1 Introduction

Economic theory is controversial on the existence of a financially efficient capital structure for corporations. The banking industry, however, has several specificities that challenge some of the general assumptions made in that context, one being the fact that financial distress and bankruptcy costs are fully internalized in the cost of debt.

The existence of minimum capital requirements for banks lies precisely on the conclusion that said assumption does not hold true, *i. e.* financial distress and bankruptcy costs are only partially internalized in the banks' cost of debt (the private cost of financial distress), the remainder being externalities (the social cost of financial distress) which are not considered in the reckoning of the private optimum leverage, and that must therefore be publicly addressed, namely through minimum solvency levels.

The question then lies on which solvency levels to require, both in order to prudentially account for those costs, without putting banks in a competitive disadvantage vis-à-vis less demanding jurisdictions. Such concerns are particularly relevant in the context of particularly integrated markets, as is the European case.

While Basel accords set a competition minimum level playing field for the world financial industry, the creation of a Banking Union, and especially the Single Supervision Mechanism, was indeed the most praiseworthy step to ensure consistent supervision and a level playing field across the banks of the Euro Area. However, evidence suggests there might be basic aspects – such as the setting of capital requirements' add-ons – that could benefit from further harmonization, with far greater priority than overcoming national specificities arising from legal, financial and even cultural contexts.

2 Background and economic theory

2.1 The banks capital structure: M&M theorem in the context of banks

According to the Modigliani-Miller original theorem (MODIGLIANI and MILLER, 1958), in an efficient tax-free market, and whenever a firm's cash flows are independent of its financing, the capital structure of such firm does not affect its value, nor its weighted average cost of capital.

Therefore, it would be indifferent for a firm's shareholders, from an efficiency standpoint, and disregarding business strategy qualitative variables, risk aversion, or other personal preferences, to finance their activities either with debt or with capital.

However, in the second version of the theorem (MODIGLIANI and MILLER, 1963), the authors revised one the abovementioned assumptions, this time considering the bias that corporate income taxes pose towards debt. Such bias arises from the fact that unlike dividend payments, interest payments are tax deductible, therefore granting the firm an increase of value corresponding to such tax shield.

Following the latter approach, the authors' conclusion was that the tax shield effect indeed lowers the weighted average cost of capital, and there is therefore an optimal financing structure, corresponding to a 100% leverage.

This approach was later mitigated by the trade-off theory of capital structure, first presented by Kraus and Litzenberger (KRAUS and LITZENBERGER, 1973), according to which the benefits arising from additional debt have to be balanced with the financial distress and bankruptcy costs it entails. In fact, under these author's approach, there is a point in the firm's leveraging in which the financial distress and bankruptcy costs more than offset the tax shield benefit.

Despite being questioned by part of the literature (namely by MILLER, 1977), especially on the lack of evidence that the costs in hand are indeed empirically observable, the trade-off theory of capital structure does give theoretical support to the fact that firms actually do not have near as close leverage as the Modigliani-Miller theorem with taxes would suggest as being financially efficient.

In any case, it should be noted that the trade-off theory does not quite disproof the Modigliani-Miller theorem with taxes. It rather questions the reliance of its major assumption: the assumption that there are no financial distress or bankruptcy costs.

Although this assumption might indeed be arguable vis-à-vis ordinary firms, in the specific context of banking it comes by design. In fact, in general, *i. e.*, depending on its location, risk profile, size, business model, along with other variables we qualified above as being strictly qualitative:

i) Banks heavily rely on a very specific form of debt (deposits), as a source of financing;

In fact, in the end of the third quarter of 2017, deposits had been consistently and increasingly accounting for more than two thirds of the liabilities, and more than 60% of the total financing of the significant institutions (SIs) of the Single Supervisory Mechanism (SSM).

Table 1: Composition of liabilities and equity of the SSM's Significant Institutions by reference period

Liabilities and equity	Q3 2016		Q4 2016		Q1 2017		Q2 2017		Q3 2017	
	EUR	in % of	EUR	in % of	EUR	in % of	EUR	in % of	EUR	in % of
Liabilities	20 927,30	93,68%	20 324,05	93,56%	20 498,73	93,48%	20 015,75	93,43%	19 877,56	93,33%
Deposits	13 108,03	58,68%	12 965,70	59,69%	13 364,33	60,94%	13 247,77	61,84%	13 272,57	62,32%
Central banks	797,47	3,57%	802,24	3,69%	976,02	4,45%	967,12	4,51%	937,21	4,40%
General governments	484,33	2,17%	475,42	2,19%	476,77	2,17%	492,76	2,30%	500,11	2,35%
Credit institutions	1 886,42	8,44%	1 688,80	7,77%	1 703,17	7,77%	1 631,94	7,62%	1 588,57	7,46%
Other financial corporations	2 056,50	9,21%	1 978,16	9,11%	2 120,97	9,67%	2 027,51	9,46%	2 081,99	9,78%
Non-financial corporations	2 405,59	10,77%	2 505,42	11,53%	2 558,19	11,67%	2 522,20	11,77%	2 608,12	12,25%
Households	5 477,72	24,52%	5 515,65	25,39%	5 529,21	25,21%	5 606,24	26,17%	5 556,56	26,09%
Debt securities issued	3 968,70	17,77%	3 878,31	17,85%	3 887,50	17,73%	3 720,74	17,37%	3 644,22	17,11%
Derivatives	2 415,69	10,81%	2 141,33	9,86%	1 823,07	8,31%	1 697,54	7,92%	1 611,66	7,57%
Provisions [1)]	152,78	0,68%	155,49	0,72%	150,77	0,69%	147,05	0,69%	143,83	0,68%
Other liabilities [2)]	1 282,11	5,74%	1 183,22	5,45%	1 273,06	5,81%	1 202,65	5,61%	1 205,28	5,66%
Equity	1 411,22	6,32%	1 399,19	6,44%	1 429,89	6,52%	1 406,73	6,57%	1 420,80	6,67%
Total liabilities and equity	22 338,52	100,00%	21 723,24	100,00%	21 928,62	100,00%	21 422,48	100,00%	21 298,36	100,00%

Source of data: ECB supervisory statistics, 2017 Q3, T02.04.1.
Note: Significant institutions at the highest level of consolidation for which common reporting on capital adequacy (COREP) and financial reporting (FINREP) are available in each reference period.
1) In line with IAS 37.10 and IAS 1.54(l).
2) Computed as the difference between "total liabilities and equity" and the sum of the other sub-categories.

ii) Banks' assets and inflows are particularly linked to such source of financing;

In fact, the bank product (especially loans and advances) is primarily placed with their customer base, *i. e.*, bank's lenders are their clients, because as a rule, they are not only depositors, but also service and product recipients and payers at least in some point in time.

Table 2: Composition of assets of the SSM's Significant Institutions by reference period

Assets	Q3 2016		Q4 2016		Q1 2017		Q2 2017		Q3 2017	
	EUR	in % of	EUR	in % of	EUR	in % of	EUR	in % of	EUR	in % of
Loans and advances	13 576,41	60,78%	13 298,75	61,22%	13 533,63	61,72%	13 267,28	61,93%	13 285,78	62,38%
Central banks	187,72	0,84%	200,12	0,92%	300,69	1,37%	245,98	1,15%	280,21	1,32%
General governments	1 049,01	4,70%	1 026,32	4,72%	1 018,63	4,65%	980,19	4,58%	971,43	4,56%
Credit institutions	1 433,45	6,42%	1 273,87	5,86%	1 343,31	6,13%	1 256,21	5,86%	1 264,43	5,94%
Other financial corporations	1 265,33	5,66%	1 168,16	5,38%	1 215,62	5,54%	1 172,22	5,47%	1 173,34	5,51%
Non-financial corporations	4 534,52	20,30%	4 553,69	20,96%	4 552,27	20,76%	4 486,36	20,94%	4 546,59	21,35%
Households	5 106,38	22,86%	5 076,59	23,37%	5 103,11	23,27%	5 126,32	23,93%	5 049,78	23,71%
Debt securities	3 194,18	14,30%	3 031,49	13,96%	3 014,41	13,75%	2 890,18	13,49%	2 833,14	13,30%
Equity instruments	429,24	1,92%	429,56	1,98%	497,29	2,27%	479,81	2,24%	486,57	2,28%
Derivatives	2 349,48	10,52%	2 102,55	9,68%	1 781,25	8,12%	1 662,68	7,76%	1 577,88	7,41%
Investments in subsidiaries	161,88	0,72%	156,86	0,72%	158,01	0,72%	157,05	0,73%	146,26	0,69%
Intangible assets and goodwill	137,96	0,62%	136,02	0,63%	137,08	0,63%	132,67	0,62%	135,19	0,63%
Other assets [1)]	1 207,10	5,40%	1 177,04	5,42%	1 193,49	5,44%	1 117,77	5,22%	1 087,89	5,11%
Total assets	**22 338,52**	**100,00%**	**21 723,24**	**100,00%**	**21 928,62**	**100,00%**	**21 422,48**	**100,00%**	**21 298,36**	**100,00%**

Source of data: ECB supervisory statistics, 2017 Q3, T02.03.1.
Note: Significant institutions at the highest level of consolidation for which common reporting on capital adequacy (COREP) and financial reporting (FINREP) are available in each reference period.
1) Computed as the difference between "total assets" and the sum of the other sub-categories.

iii) Banks's financial distress and bankruptcy frameworks have features that prevent the corresponding costs from being fully internalized in the weighted average cost of capital;

In fact, the existence of prudential rules and of financial supervision authorities in charge of their enforcement, the existence of mutualistic or public schemes guaranteeing deposits up to a certain amount, and the existence of bank resolution measures unavailable under ordinary insolvency procedures, constitute a framework to which the literature refers to as the banks' "safety net".

In the context of banking, Modigliani-Miller theorem with taxes is thus confirmed, since the hypothetical and unpredictable negative impact of additional leverage in banks' cash flows is indeed negligible, when compared to the arithmetically certain positive impact of the tax shield.

This conclusion seems to be empirically observable. Despite the relative increase in capital ratios since the financial crisis of 2007-2008, when the first Basel accord was signed, in 1988,

banks were operating worldwide with extremely high levels of leverage, which suggests the race to the bottom is the industry's actual trend, when laxly regulated, and left to competition alone.

Therefore, banks tend to operate with as much leverage as they can and are allowed to, since from a strictly financial standpoint, it is the most efficient approach.

2.2 The relation between leverage and return on equity

Considering that the return on equity of a credit institution is a function of its return on assets and its leverage:

$$Return\ on\ Equity = \underbrace{\frac{Net\ Income}{Assets}}_{Return\ on\ Assets} \times \underbrace{\frac{Assets}{Equity}}_{Leverage}$$

the more leveraged said institution is, the more profitable its equity becomes, *ceteris paribus* (*i. e.*, assuming that both its gross return on assets and its financing costs remain unchanged).

Setting aside extreme scenarios (*e. g.* the hypothesis of an infinitely leveraged credit institution, or even the hypothesis of a credit institution operating with negative own funds), both the latter assumptions seem reasonable, as we saw earlier.

On the one hand, and in theory, changes in the liability side of the balance sheet would not have a substantial impact in the asset side of the balance sheet. On the other hand, and concerning the liability side of the balance sheet, the risk that additional leverage poses for the institution's creditors is not perfectly nor completely reflected in its financing costs, as it would in an ordinary company, and even if it is, as long as the operational margin remains positive, extra leverage is always lucrative.

2.3 The relation between leverage and capital requirements

In the Basel III agreement, the Basel Committee on Banking Supervision (BCBS) introduced a leverage limit, as a backstop aimed at preventing the build-up of excessive on- and off-balance sheet leverage, concealed by apparently strong risk-based capital ratios. However, the leverage ratio is expected to be a merely supplementary regulatory requirement, along with the risk-based capital requirements already in force.

The ratio is calculated according to the article 429 of the Capital Requirements Regulation (CRR), and it is expressed as a percentage between the bank's capital measure and its total exposure, calculated as sum of all assets and off-balance sheet items not deducted when determining the Tier 1 capital measure (*i. e.*, the sum of Common Equity Tier and Additional Tier 1 capital, as further detailed below). In any case, the final calibration of the measure and its reckoning are still ongoing. During the transitional period the BCBS will monitor a 3% minimum requirement.

The leverage ratio requirement envisages the restriction to the build-up of leverage in the banking sector, and the enhancement of the capital ratios with a further, simple and not risk based measure.

2.4 The bank's capital requirements in the SSM

In a competitive market, the circumstance covered in the previous paragraphs, *i. e.*, the fact that operating with relatively less capital makes the institution more profitable, would entail a race to the bottom, in which banks would operate with progressively less capital, thus becoming more risky and ultimately fail under minor economic setbacks.

The intuition behind this conclusion confirms both the M&M theory and the efficient market hypothesis: *ceteris paribus* (*i. e.*, once again assuming that both its gross return on assets and

its financing costs remain unchanged) the returns of highly leveraged banks would not be higher out of thin air; they would be higher because such banks are riskier.

However, as we saw earlier, unlike an ordinary company, in the context of banking, there is indeed an incentive for additional risk taking (to which ADMATI and HELLWIG (2013) refer to as the addictive *"dark side of borrowing"*). Moreover, there are externalities arising from a bank failure that do not arise from the failure of an ordinary company.

In order to address both this moral hazard and these externalities, capital requirements were progressively introduced and became more demanding and sophisticated up to the implementation of the SSM.

2.4.1 Overall Capital Requirements (OCR)

Under the SSM legal framework, the overall capital requirements (OCR) for credit institutions are composed by the set of total SREP capital requirements (TSCR), and the combined buffer requirements (CCB).

$$OCR = TSCR + CRB$$

Both components of the OCR consist of a set of ratios, determined either by law or by the supervision authorities, designed to address different risks, which will be further detailed.

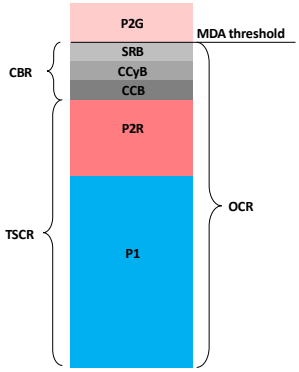
Each of these ratios is determined by a fraction having in the numerator a certain amount of regulatory capital, and in the denominator the amount of the institution's exposure to the risks in hand (*i. e.*, its risk weighted assets), quantified through different methods that will not be covered herein.

There are two major consequences for the capital of a bank becoming below the overall threshold, one being the obligation to present a capital conservation plan destined to restore its

financial soundness, and the other being a limitation on the distribution of dividends. Therefore, the OCR is also qualified as the Maximum Distributable Amount (MDA) threshold.

The abovementioned capital stack can be represented as follows:

Figure 1: Illustration of the SSM's capital requirements stack



2.4.1.1 Total SREP Requirement (TSCR)

The TSCR is the result of the Supervisory Review and Evaluation Process (SREP) decision, which is the outcome of the exercise carried out annually by the European Central Bank (ECB), acting as a financial supervision authority, with regard to the significant institutions of the SSM, in order to address prudential risks for the institutions themselves (idiosyncratic risks).

$$TSCR = P1 + P2R$$

2.4.1.1.1 Pillar 1 requirements (P1)

The purpose of Pillar 1 capital requirements (P1) is not only to introduce a *de minimis* level playing field across the banks of the G20 group, but also to address credit, market and operational risks.

In the context of the SSM, Pillar 1 requirements are enforced by article 92 of CRR, according to which institutions shall at all times satisfy minimum own funds requirements of a Common Equity Tier 1 capital ratio of 4.5 %, a Tier 1 capital ratio of 6 % and a total capital ratio of 8 %,

which correspond to the amount of each of the three capital quality amounts, as further detailed below, expressed as a percentage of the total risk exposure amount.

2.4.1.1.2 Pillar 2 requirements (P2R)

In the context of the SSM, Pillar 2 requirements are enforced by article 16 of the SSM Regulation, according to which the banking supervision authorities have the power to require institutions to hold own funds in excess of the Pillar 1 capital requirements, and in excess of the combined buffer requirement we will detail later on.

The purpose of this P2R is to address the elements of risks and risks not covered (or at least not sufficiently covered) by the relevant EU acts, especially the interest rate risk in the banking book (IRRBB) and concentration risk, but also other risks not generally considered material (including, for instance, business risk, reputational risk, participation risk, insurance risk, funding cost risk, etc.).

However, unlike P1, P2R capital add-ons are institution-specific, and unlike the combined buffer requirements we will consider below, they are expected to be set on an exclusively micro-prudential perspective, following the results of the Internal Capital Adequacy Assessment Process (ICAAP), and its scrutiny by the financial supervision authorities in the context of the SREP.

P2R is thus the only fully "institution-specific" capital add-on, since despite being bound to soft law instruments that are expected to ensure a certain level playing field among the institutions of the SSM, it is technically a discretionary add-on. In fact, unlike the buffers that follow, it is neither fixed, nor has underlying objective legal or regulatory criteria.

2.4.1.2 Combined Buffer Requirements (CBR)

The CRB refers to the macroprudential instruments which are aimed at addressing risks that an institution poses to the financial system, as a whole.

$$CBR = CCB + CCyB + SRB$$

2.4.1.2.1 Capital Conservation Buffer (CCB)

The capital conservation buffer is a capital add-on aimed at accommodating losses from a potential financial system adverse scenario. CCB's rate is harmonized at a EU level, and according to article of 129 of the fourth Credit Requirements Directive (CRD IV), corresponds to 2.5% of a bank's total risk exposures, as determined for P1 purposes. Although this capital buffer is currently phasing-in until 2019, national macroprudential authorities may frontload the total buffer, which in the context of the SSM, was an option exercised only by Luxembourg, Estonia, Latvia, Lithuania, Finland and Slovakia.

2.4.1.2.2 Countercyclical Buffer (CCyB)

The countercyclical buffer aims to mitigate the effects of periods of excess aggregate credit growth (which could pose risks of system-wide stress), by leaning against its build-up phase (constraining the supply of credit through the additional capital requirement in hand), and by unwinding such requirement in downturns, thus ensuring a more consistent credit flow to the economy.

For this reason, CCyB rates are biannually revised by the macroprudential authorities of each country, and the institution specific rate is a weighted average of the countercyclical buffer rates that apply in the countries where the credit exposures of that institution are located (the CCyB

set by EU or EEA Member States are mutually and automatically reciprocated by each institution's country, the others being reciprocated upon recognition).

However, as of 2017, only Sweden, Iceland, Norway, Czech Republic, Slovakia and Hong Kong had defined a CCyB rate higher than zero. Therefore, this buffer's weight in the capital requirements of the SSM's SIs is still insignificant.

2.4.1.2.3 Systemic Risk Buffers (SRB)

The systemic risk buffer is a supplementary capital add-on which aims to prevent and mitigate long term non-cyclical systemic or macroprudential risks not covered by CRR. It is set at national level, and therefore differs across institutions or jurisdictions, having no maximum limit.

In can be cumulated with the Other Systemically Importance Institutions' buffer (O-SII), defined at national level, or with the Global Systemically Important Institutions' (G-SII) buffer, defined at a European level by the European Systemic Risk Board (ESRB), the European Union's macroprudential authority.

According to paragraph 14 of article 131 of CRD IV, in case these buffers are cumulated, only the highest of the three applies.

2.4.2 Pillar 2 guidance (P2G)

As we saw earlier, P2R is a mandatory add-on aimed at addressing risks not covered or not sufficiently covered by Pillar 1 and by the combined buffer capital requirements.

P2G, on the contrary, is not mandatory, rather addressing the supervision authorities' expectations for such institution to hold capital in excess of OCR, in a forward-looking perspective (for instance, taking into account the results of the worst year of the adverse stress

tests, the anticipation of the full impact of Basel IV and IFRS 9 rules in the quantification of regulatory capital, or the anticipation of the full load of currently phasing-in capital buffers). It is thus intended as a reference guideline for the evolution of an institution's capital.

Since P2G is not mandatory, it is also not considered a breach of minimum capital thresholds, namely for MDA purposes. Also, unlike other capital buffers, it is usually not publicly disclosed by the credit institutions.

2.4.3 The quality of capital

All the abovementioned capital requirements must be met with Core Equity Tier 1 capital, except the P1 requirement, whose 8% ratio can be met up to 3.5 percentage points with Additional Tier 1 capital, and up to 2 percentage points with Tier 2 capital.

Common Equity Tier 1 capital (CET1) is the highest quality capital, in the sense that it must legally be available to the institution, for unrestricted and immediate use, to cover risks or losses as soon as these occur, according to article 28 of CRR.

It is therefore primarily made up of paid-up capital instruments, share premium, retained earnings and reserves, net of prudential filters and regulatory deductions.

Such deductions include goodwill and other intangible fixed assets, the surplus between expected losses and value adjustments, significant investments in CET1 instruments of other parties in the financial sector, and deferred tax assets that rely on future profitability.

On the other hand, Additional Tier 1 capital (AT1) is primarily made up of preferred shares and high contingent convertible securities (CoCos), which are therefore not so unrestrictedly and immediately able to be used to cover risks or losses as CET1 capital instruments, and is subject to similar deductions as CET1. Along with CET1, AT1 composes the Tier 1 capital.

Lastly, the Tier 2 capital (T2), which has the lesser loss absorption capacity, is primarily made up of subordinated liabilities issued and not financed by the institution, or related parties.

3 Literature Review

The literature on banks' capital requirements is both abundant and recent, and gives some insight on the aspects covered herein.

According to GOLDSTEIN (2017), in the context of US banks, the optimal (weighted average) leverage ratio should be in the neighbourhood of 15 percent, ranging from 10 to 18 percent (with lower leverages for smaller banks, and higher leverages for bigger systemically important institutions). Although the author acknowledges the official consensus for a much lower capital ratio, said consensus lies in an overfocus on the average/median of the sample, rather than to paying more attention to (relevant) extreme observations.

Moreover, the author identifies market pressure as one of the reasons for banks to operate above minimum capital requirements, and considers that excess capital is not only used as solvency protection, but rather as liquidity protection. Omitting market pressure is, in the author's opinion, the aspect that leads to the theoretical conclusion that banks can operate (after credit losses), with near-zero capital ratios.

However, there is no sense in pretending that estimates of optimal capital carry a high degree of precision. In fact, *"the consensus uses historical databases on the unconditional annual probability of a systemic banking crisis (in a large group of advanced and developing countries) to drive its estimate of the benefits of higher capital ratios. This probability is typically assumed to be in a range of 2 to 5 percent. With such a low probability, it does not take much capital before the reduction of the probability of a crisis induced by higher capital ratios hits zero. At*

that point the marginal benefit from higher capital ratios also hit zero, because that benefit is the product of the change in the crisis probability and the output cost of a crisis".

Also the author identifies some characteristics that the primary capital standard for bank regulation should have (distinguish sick from healthy banks; be easy to understand, inexpensive to compute, and difficult to manipulate; and possess superior loss absorbency), in order to conclude that the existing risk-based measures of capital do not have these characteristics, which would be better achieved with leverage ratio as the primary measuring rod for capital adequacy.

However, the solution is not to simply increase capital requirements. In fact, the author acknowledges that heightened capital requirements for banks could induce increased migration to the shadow banking system, where regulation is laxer, with potential unhappy consequences for financial stability.

In this respect, also JONGHE, DEWACHTER and ONGENA (2016), admit that microprudential capital requirements may affect bank activity and lending, if raising capital internally or externally is costly. Whether this is the case is a widely debated issue, as it would imply that there are costs or frictions associated with bank capital that lead banks to pass up on otherwise profitable loans. However the authors conclude that overall, despite the unintended consequences of microprudential capital requirements on credit supply are present, they are deemed small.

BREWER and KAUFMAN (2008) modelled banks' capital structure as a function of important public and bank regulatory characteristics of the home country, as well as of bank specific variables, country macroeconomic conditions and country level financial characteristics, and concluded that banks maintain higher capital ratios in home countries in which the bank sector is relatively smaller, as well as in countries that practice prompt corrective actions more

actively, have more stringent capital requirements, and have more effective corporate governance structures.

REPULLO and SUÁREZ (2013) showed that the risk-based requirements of Basel II are more prone to cause significant cyclical swings in the supply of credit than under the flat requirement of Basel I. However, Basel II was considered to overcome Basel I in welfare terms. The authors also show that the optimal capital requirements are lower and more cyclically varying than the requirements of Basel II if the social cost of bank failure is low, and higher and less cyclically varying if it is large. The authors conclude that conditional on assessing that the social cost of bank failure is large (as the recent crisis might have confirmed), Basel III may be considered a move in the right direction: the new capital conservation and countercyclical buffers would assume the role of making the effective capital requirements faced by banks less sensitive to the cycle (in particular, less prone to produce credit rationing at the arrival of recessions) than the Basel II requirements.

According PAKRAVAN (2014), however, the Basel framework is unlikely to enhance the safety of the financial system and prevent future crisis, due to its complexity, variations in measurement of risk-weighted assets across banking institutions, ability to game the system, and amplification of systemic risk. The author also qualifies the fact that major banks meet or exceed the minimum required capitalization levels, as an illusion of safety, guaranteed solely by the framework's quantitative and model-driven approach, that are quickly undone by financial crisis. Therefore, and alike part of the literature, the author defends that regulators should revert to a simple tangible common equity leverage rule.

FLANNERY and GIACOMINI (2015) argue that governments need a qualitatively new mechanism for assuring adequate capitalization at large banks. The authors provide support for the argument that book capital measures overstate a troubled firm's ability to absorb further losses,

and consider both that the regulatory definition of "adequate capital" should be expanded to reflect current market assessments of equity value, and that supervisors should be willing to force share issuances while the firm remains solvent in the opinion of market investors. Indeed, the most important implication of the authors' analysis that the historic system of relying on book capital rules and supervisory (Pillar 2) discretion to maintain adequate capital in banks needs to be replaced.

4 Methodology

4.1 Data

For the purposes of this research, we identified the capital ratios of the 128 significant institutions directly supervised by the ECB in the 1st January 2017, as well as the corresponding components of the overall capital requirements applicable to each institution in the same financial year.

The abovementioned collected capital ratios included the phased-in CET1 ratio, the T1 ratio, and the total regulatory capital ratio, as publicly disclosed in each of said institution's annual report or Pillar III disclosures regarding 2016 and 2017.

The reason for using the year of 2017 in this analysis lies not only in the fact that it is the more recent complete financial year, but also because it was the year in which CCB and SRB entered in force in almost every jurisdictions. Moreover, following EBA's opinion of 16 December 2015, the disclosure of 2016 SREP results (particularly the P2R for 2017) became widespread, since *"Competent Authorities should consider using the provisions of Article 438 (b) of the CRR to require institutions to disclose MDA-relevant capital requirements* […], *or should at least not prevent or dissuade any institution from disclosing this information"*.

Whenever the ratios concerning the 31st December 2017 were not yet available at the 30th of April 2018, which happened in six cases, the most recent financial data was used instead (either the latest quarterly or mid-year interim report available, the public presentation of results, or the key figures factsheet, if more recent).

Whenever the financial year did not coincide with the civil year, which happened in two cases, the collected ratios refer to the end of 2017, even if more recent financial data was already available. In fact, considering the phasing-in of both the reckoning rules of capital ratios, and the phasing-in of the new capital buffers (especially CCB and SRB), such procedure was considered preferable, for comparability sake.

On the other hand, the minimum capital requirements included all the components of the overall capital requirements, as detailed in the previous chapter. Although some institutions do not disclose their P2R, they do disclose their total CET1 requirement, which allowed the P2R add-on to be inferred, subtracting to the total CET1 both the P1's CET1 requirement, and the CBR, which are publicly disclosed.

Since 22 significant institutions did not disclose neither their total CET1 requirement, nor their P2R, said institutions were excluded from the data analysis.

The four significant institutions that were subject to a resolution measure, or that entered into a liquidation procedure in the course of the financial year of 2017, were not included in this exercise.

Also, the data concerning the four institutions that were merged with other SIs during 2017 was only considered in the context of the consolidated accounts of the latter, except for Banco BPI, SA, which was included in the data analysis, autonomously from CaixaBank Group, in order to keep the sample of Portuguese banks slightly more meaningful.

In fact, in every other cases, consolidated financial data was used whenever available, which did not occur in only one case. In fact, since the minimum capital requirements are set in a consolidated basis (which from a risk-based approach makes perfect sense), the use of consolidated ratios for the purposes of this study is the only way to ensure that the analysis is neutral vis-à-vis the diverse financial groups' structures, bearing in mind that there are prudential rules and practices in place, preventing the commingling of financial and non-financial activities within the same corporate group.

Lastly, the five institutions that had not yet disclosed any financial or prudential information concerning 2017 – namely the French public agencies, or subsidiaries of third country conglomerates – were also excluded from the exercise.

4.2 Operations

The analysis of the collected data set involved computing the averages of the effective capital ratios of the said significant institutions of the SSM (CET1 ratio, T1 ratio, and total regulatory capital ratio), as well as the averages of each of the capital components of the minimum capital requirements.

The several minimum capital ratios were also subtracted to the effective capital ratios of the institutions, in order to obtain what we call the marginal capital ratio or excess capital ratio, whose mean was also computed. For this purpose, we used the phasing-in capital ratios, since minimum capital requirements are also phasing-in, taking into account the regulatory capital reckoning transitional rules. Moreover, since the phasing-in is ongoing at least until 2019, using fully-loaded ratios would be out of touch with reality (it would, for instance, artificially bring several institutions below the MDA threshold).

For general comparison purposes between the Portuguese significant banks and its SSM peers, and later on for comparison between the banks of the four biggest countries of the SSM and its SSM peers, we carried out a two-sample *t*-test for equal means, according to the procedure set out by SNEDECOR and COCHRAN (1989), in order to determine if the means of the idiosyncratic component of the capital requirements (P2R) of the SSM's SIs, of the Portuguese SIs, and of Germany, Spain, Italy and France combined, are equal.

For this purpose, all country's SIs were included in the reckoning of the mean of the SSM, and the formulas assume non-paired data among the two populations and unequal variances, the hypothesis being:

$$H_0: \mu_1 = \mu_2$$

$$H_A: \mu_1 \neq \mu_2$$

And the Test Statistic: $$T = \frac{\bar{Y}_1 - \bar{Y}_2}{\sqrt{\sigma_1^2/N_1 + \sigma_2^2/N_2}}$$

Where N_1 and N_2 are the sample sizes, $\bar{Y}_1$ and $\bar{Y}_2$ the sample means, and σ_1^2 and σ_2^2 the sample variances.

Therefore, for a significance level: $\alpha = 0.05$

The null hypothesis is rejected if: $|T| > t_{1-\alpha/2,v}$

Where $t_{1-\alpha/2,v}$ is the critical value of the *t*-distribution with v degrees of freedom, where:

$$v = \frac{\left(\sigma_1^2/N_1 + \sigma_2^2/N_2\right)^2}{\frac{(\sigma_1^2/N_1)^2}{N_1 - 1} + \frac{(\sigma_2^2/N_2)^2}{N_2 - 2}}$$

5 Results and discussion

The data collected and analysed herein shows that the minimum capital requirements of the significant institutions of the SSM are on average lower than the recommended by the more conservative literature. In fact the minimum ratios required by the financial supervision authorities correspond to 7.89%, 9.39% and 11.39% for CET1, T1 and total capital, respectively, whereas conservative literature considers that the minimum leverage ratio should be up to 18%, for greater systemic importance banks.

Table 3: SSM SIIs' average capital ratios and requirements in 2017

Effective capital ratio			Minimum capital requirements										
			Pillar 1			Pilar 2	Buffers				Total		
Total (A)	T1 (B)	CET1 (C)	Total	T1	CET1		CCB	CCy	SII/O-SII	Total	Total (D)	T1 (E)	CET1 (F)
20,69%	19,00%	**18,05%**	8,00%	6,00%	4,50%	2,08%	1,43%	0,02%	0,39%	1,64%	**11,39%**	9,39%	**7,89%**

However, unlike the Modigliani-Miller's theorem with taxes would foresee, said institutions operate well above the minimum capital requirements. Even if we account for the fact that these capitalization levels are veiled by its risk-weighting, and for the fact that the corresponding leverage ratios actually show lower capitalization levels (which could confirm some authors' views on the convenience of qualifying leverage ratio as the primary source of prudential regulation, in order to prevent further complexity and custom-made quantifications of the solvability of banks), still the effective capital ratios correspond to an average 18.05%, 19.00% and 20.69%, for CET1, T1 and total capital, respectively, meaning that European banks tend to operate with comfortable excess capital, vis-à-vis the minimum amount required.

Table 4: SSM's SIIs average marginal capital ratio and leverage ratio in 2017

Marginal capital ratio			Leverage ratio
Total (A)-(D)	T1 (B)-(E)	CET1 (C)-(F)	
9,30%	9,61%	**10,16%**	6,60%

In any case, the fact that European banks operate with such marginal capital requirements can be attributed to a number of reasons. Banks can voluntarily opt for operating with more capital than required, because they are complying with the undisclosed P2G buffers set by the financial supervision authorities on a forward-looking basis, namely taking into account the results of the stress tests; because they have a more prudent approach on the risks they face than said authorities themselves; because they are anticipating the full load of phasing-in macroeconomic capital buffers, and the full load of the rules of capital ratios' reckoning under IFRS 9 and Basel IV; because they are anticipating the rules on TLAC and MREL; because they do not wish to curtail its expansion potential in the event of the increase in the growth cycle; because it allows them to project an image of financial strength and soundness, which can make part of the marketing strategy; because they cannot leverage more (for instance, because they cannot attract additional deposits without increasing their interest rates, thus reducing their operational margin); because leveraging less increases its rating or reduces its financing costs (especially for banks whose business model is not particularly reliant on deposits).

The latter two reasons could disproof the Modigliani-Miller's theorem with taxes. Still, they are only two reasons among many other, and one of them relies on the assumption that the bank is not particularly reliant on deposits to ensure its financing, in which case it would not quite be a bank.

In the case of significant Portuguese banks, however, financial theory is corroborated.

Table 5: Portuguese SIIs' capital ratios and requirements in 2017

Institution	Effective capital ratio			Minimum capital requirements										
				Pillar 1			Pilar 2	Buffers				Total		
	Total (A)	T1 (B)	CET1 (C)	Total	T1	CET1		CCB	CCy	SII/O-SII	Total	Total (D)	T1 (E)	CET1 (F)
BPI	**14,60%**	13,20%	**13,20%**	8,00%	6,00%	4,50%	2,50%	1,25%	0,00%	0,00%	1,25%	**11,75%**	9,75%	**8,25%**
NB[1)]	**13,00%**	12,80%	**12,80%**	8,00%	6,00%	4,50%	2,47%	1,25%	0,00%	0,00%	1,25%	**11,72%**	9,72%	**8,22%**
BCP	**14,80%**	13,20%	**13,20%**	8,00%	6,00%	4,50%	2,40%	1,25%	0,00%	0,00%	1,25%	**11,65%**	9,65%	**8,15%**
CGD	**15,70%**	15,10%	**14,00%**	8,00%	6,00%	4,50%	2,50%	1,25%	0,00%	0,00%	1,25%	**11,75%**	9,75%	**8,25%**

1) Since NB is the only Portuguese SI that does not disclose its pillar 2 capital requirement, its add-on was assumed to correspond to the average of its Portuguese counterparts.

In fact, excess total capital ratios range from an estimated 1,28%, in the case of Novo Banco, to 3,95%, in the case of Caixa Geral de Depósitos, which are much lower than their SSM counterparts:

Table 6: Portuguese SIIs marginal capital ratio and leverage ratio in 2017

Institution	Marginal capital ratio			Leverage ratio
	Total (A)-(D)	T1 (B)-(E)	CET1 (C)-(F)	
BPI	**2,85%**	3,45%	**4,95%**	7,40%
NB	**1,28%**	3,08%	**4,58%**	8,10%
BCP	**3,15%**	3,55%	**5,05%**	6,50%
CGD	**3,95%**	5,35%	**5,75%**	4,02%

However, in this conclusion, we have to account for the fact that Portuguese banks' leverage ratio do not seem that different from the SSM's average, which suggests that this difference in the marginal capital ratio might emerge from the Portuguese banks' asset allocation (*i. e.*, risk exposure), or from the corresponding risk assessment methods.

In any case, and focusing solely in the scope of this study, we also have to account for the fact that the idiosyncratic component of minimum capital requirements (P2R) of the significant Portuguese banks was deemed statistically significantly higher than the average of their counterparts for a 95% confidence level (*i. e.*, the null hypothesis of both means being statistically equal is rejected):

Table 7: Two-sample t-Test for equal means of the P2R applied to the Portuguese SIs, and to their SSM counterparts

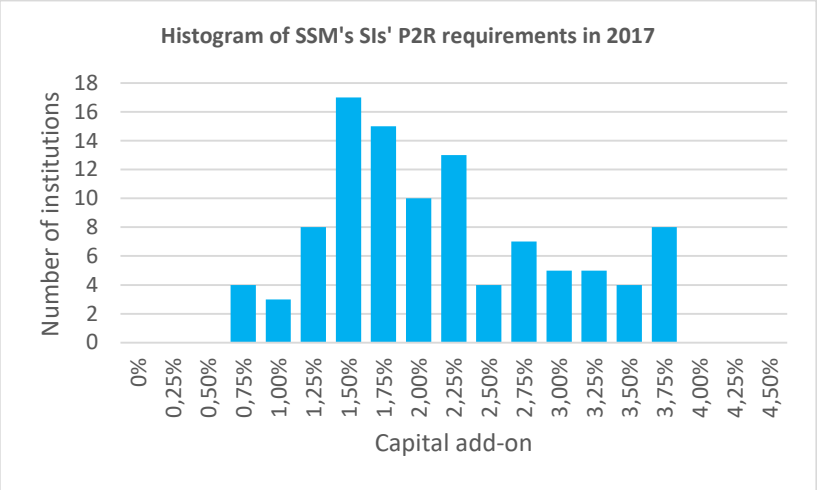
Statistic	SSM	PT
Mean	2,08%	2,47%
St. Deviation	0,7524%	0,0408%
Variance	0,00005661	0,00000017
Test statistic	-5,10	
Degrees of freedom	101	
Significance level	0,05	
Critical value (two tail)	1,98	

Table 8: Summary of statistics of the P2R applied to the Portuguese SIs, and to their SSM counterparts

Statistic	SSM	PT
Kurtosis	-0,415374	1,500000
Skewness	0,495806	-1,414214
Minimum	0,75%	2,40%
Maximum	3,75%	2,50%
Observations	106	4

Moreover, the plotting of the P2R of the SSM significant institutions in 2017 shows some positive skewness and some peaks that suggest that the same might be happening with other

jurisdictions, one being more likely to find strong correlations across the banks of a certain country, rather than across the banks of comparable risk profile, size and business model.



Indeed, if we take the four biggest countries of the SSM, in number of SIs (Germany, Spain, Italy and France), which account for around half of the population, such conclusion is confirmed: the data shows that the average P2R of this group of countries is statistically significantly lower than the average of their counterparts for a 95% confidence level (*i. e.*, the null hypothesis of both means being statistically equal is also rejected):

Table 9: Two-sample t-Test for equal means of the P2R applied to the German, Spanish, Italian and French SIs, and to their SSM counterparts

Statistic	SSM	DE|ES|IT|FR
Mean	2,08%	1,86%
St. Deviation	0,7524%	0,5704%
Variance	0,00005661	0,00003253
Test statistic	2,01	
Degrees of freedom	129	
Significance level	0,05	
Critical value (two tail)	1,98	

Table 10: Summary of statistics of the P2R applied to the German, Spanish, Italian and French SIs, and to their SSM counterparts

Statistic	SSM	DE|ES|IT|FR
Kurtosis	-0,415374	-0,002394
Skewness	0,495806	0,491447
Minimum	0,75%	0,75%
Maximum	3,75%	3,25%
Observations	106	52

6 Conclusion

The collection and analysis of the financial and supervisory data of the 128 significant institutions of the SSM shows that in 2017, on average, the minimum capital ratios required by the financial supervision authorities were lower than the minimum ratios that the literature finds advisable for greater systemic importance banks. However, the fact that European banks tend

to operate with comfortable excess capital, vis-à-vis the minimum amount required, is reassuring as to the financial soundness of the system.

While there are numerous reasons for that to occur, the fact is that such excess capital ratios are not comparable across the several jurisdictions of the SSM, nor are the corresponding minimum capital requirements.

In fact, a two-sample *t*-test for equal means conducted according to the procedure set out by SNEDECOR and COCHRAN (1989), showed that the idiosyncratic component of minimum capital requirements (P2R) of the significant Portuguese banks was deemed statistically significantly higher than the average of their counterparts for a 95% confidence level, and that, on the other hand, the idiosyncratic component of minimum capital requirements (P2R) of the significant banks of Germany, Spain, Italy, and France combined (which account for around half of the population), was deemed statistically significantly lower than the average of their counterparts for the same confidence level

This suggests that the same might be happening with other jurisdictions, one being more likely to find strong correlations across the banks of a certain country, rather than across the banks of comparable risk profile, size and business model.

Although this effect might be partially explained by the fact that banks' risks are also linked to macroeconomic circumstances, *i. e.*, that quantification of the major two risks covered by P2R (IRRBB and concentration risk) is also accounting for national variables, it seems more likely that the SREP scores and methodology are not fully mitigating level-playing asymmetries among countries. Still, paraphrasing GOLDSTEIN (2017), *"a sensible guideline for crisis prevention is to hope for the best but prepare for the worst. A poor substitute is to hope for the best but prepare for the global average"*.

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