The economic impact of Basel III: applying the BIS analysis to the eurozone

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In November 2016 the Bank for International Settlements (BIS) published an updated economic impact study of Basel III and the ongoing reforms, suggesting the existence of some room for manoeuvre in the creation of additional capital buffers. We demonstrate in this analysis that this room no longer exists in the eurozone, where the dominant role played by banks in financing increases the economic cost of new regulatory requirements and reduces the optimal bank solvency ratio, above which the economic cost exceeds the estimated benefit of tighter regulation.

By revealing the deficiencies of the banking system the financial crisis of 2007-2008 highlighted the need for a deep overhaul of prudential regulation of banks. With a mandate from the G20, from 2009 onwards the banking regulators issued a series of recommendations to make the banking system more stable. The consolidation of the prudential framework and the gradual introduction of the two parts (solvency and liquidity) of Basel III have resulted in an unprecedented improvement in the solidity of the European banking system. The question now arises as to whether further strengthening of solvency requirements will provide an economic benefit greater than the economic cost it will incur. The economic impact study published by the BIS in November 2016 (Fender and Lewrick [2016]) suggests that, on the global scale, the optimal solvency ratio remains slightly higher than the ratio required to meet current regulatory requirements that will soon by applicable to all banks. Unfortunately, this 'global' conclusion does not hold true for the eurozone. Our economic impact analysis uses the methodology of the BIS study, adapting certain parameters to the European context. Our results indicate that the average regulatory solvency ratios, and even more the average effective ratios of European banks, are now above their optimal level. Consequently, any increase in regulatory requirements, and notably the concrete application of the measures contained under the unofficial name 'Basel IV', will have an economic cost greater than the expected economic benefit.

An unprecedented regulatory shock

The 'Basel III' framework has two complementary aspects: a solvency part which seeks to strengthen banks' capacity to absorb potential losses, and a liquidity part whose twin goals are the reduction in maturity mismatch and the strengthening of banks' resilience in the face of possible tension in the bank liquidity market.

Strengthening banks' ability to absorb losses

The latest Basel requirements for bank solvency are not limited, indeed far from it, to the increase in the regulatory threshold from 4% (*Core Tier 1* Basel II) to 7% (*Common Equity Tier 1* (CET1) Basel III). On the one hand, the scope of the numerator in this ratio has been virtually limited to common stock (i.e. lower-quality securities that were previously eligible are now excluded) and retained earnings, whilst the deductions included in the calculation of CET1 have been considerably increased. On the other hand, the denominator of the ratio, consisting of risk-weighted assets, has been expanded under the influence of the increased weighting applicable to the trading book ('Basel II.5') in 2011 and the inclusion of counterparty risk on over-the-counter derivative transactions (Basel III) since 2014.

In addition, the largest systemically important banks will see a capital surcharge applied of up to 2.5% of risk-weighted assets in 2016, whilst the introduction of a 3% leverage ratio, – the ratio of Tier 1 capital to

unweighted assets[1] – is planned for 2018. Lastly, heightened leverage requirements are under discussion. The BIS believes that all of these measures equate to a global regulatory threshold of between 8.2% and 8.9% of risk-weighted assets across the banking system. The combination of the increase in the regulatory threshold (from 4% of risk-weighted assets under Basel II to the above-mentioned figure of between 8.2% and 8.9% under Basel III), the tighter definition of the ratio's numerator (substitution of Common Equity Tier 1, consisting mainly of common stock, for Core Tier 1 which had a much broader definition) and the expansion of risk-weighted assets results in an approximately threefold increase between Basel II and Basel III regulatory requirements.

According to figures from the "*Basel III Monitoring Report",* published by the Basel Committee in September 2016, CET1 capital for a sample of 90 major banks rose by 65% between 30 June 2011 and 30 June 2015, with that for a sample of 69 medium-sized banks rising by 59.5%.

The introduction of international liquidity ratios

For the first time, the Basel Committee has introduced two new liquidity standards, where previously banking liquidity requirements had, for lack of agreement, escaped the process of international harmonisation of prudential regulation that began in the 1980s. The finalised version of the Basel Committee's recommendations on the short-term liquidity ratio, or *Liquidity Coverage Ratio* (LCR), was published in January 2013. The LCR relates eligible *high quality liquid assets* (HQLA) – consisting primarily of sovereign debt and reserves held at central banks – to theoretical net cash outflows over thirty days in the event of a severe liquidity shock. Respecting the LCR thus guarantees the bank's ability to withstand a major liquidity shock. Within the European Union, the calendar for the gradual introduction of the LCR, established by the Capital Requirements Regulation (CRR), has been maintained by a delegated act. Initially set at 60%, the minimum coverage of liquidity requirements will gradually rise to 100% in 2018. According to details published by the European Banking Authority (EBA [2016]), the liquid assets of the 171 banks that took part in the exercise rose from approximately EUR 1,330 billion in June 2011 to around EUR 2,520 billion in December 2015, an increase of nearly 90%.

The final recommendation, on long-term liquidity ratio, or Net Stable Funding Ratio (NSFR), was published by the Basel Committee in October 2014. The aim of this long-term liquidity ratio, which can be considered more as a stable resources ratio, is to protect banks from the consequences of a liquidity shock by forbidding the financing of bank assets (loans or securities) with a maturity of more than six months or one year, depending on category, using resources maturing within this period and susceptible to not being renewed. The ratio therefore requires that assets maturing in more than one year (weighted) and certain off-balance sheet items are 100% covered by available stable resources. The ratio reduces transformation risk at the cost of a limitation on banks' ability to transform maturities. A NSFR of 100% will be required within the European Union two years after the effective date of the regulation presented to the Parliament and Council by the European Commission on 23 November 2016, which, among others, modifies the CRR and the Capital Requirements Directive (CRD) adopted in 2013.

European Banking Authority calculations (EBA [2016]) reflect a steady increase in NSFR within the European Union even before this becomes a legal requirement. On average for the major European banks making up Group 1, this rose from 88% in June 2011 to 106% in December 2015, whilst the stable resources deficit for banks with a ratio below 100% has fallen from EUR 1,330 billion to just over a tenth of that figure at EUR 142 billion. These changes have come from the increase in stable banking resources (numerator) and, to a lesser extent, a reduction in the assets requiring stable resources (denominator).

Our re-evaluation based on the latest BIS impact study (November 2016)

Necessary as it is, prudential regulation of banks comes at an economic cost. Obscured for the time being by the extremely accommodating nature of monetary policy, particularly in the eurozone, the higher cost of bank financing will become apparent when monetary policy normalises. The mission given by the BIS to the Long-term Economic Impact Group (LEI [2010]) was precisely to compare the economic benefit (from avoiding banking crises) of the application of the new rules over the very long term to their economic cost (impact of lower financing volumes). The expert group concludes that the economic benefits are greater than the economic costs across a very broad range of solvency ratios, suggesting that the regulator has considerable scope to increase requirements. In order to take into account the additional measures in the Basel III package, whether already introduced (capital surcharge for G-SIB banks since 2016), about to be introduced (leverage ratio in 2018, TLAC[2] for large banks in 2019), or in the process of being calibrated (specific leverage ratio for G-SIBs), Fender and Lewrick (2016) updated an analysis of the economic impact of new regulatory standards published last November by the BIS. Despite the new elements introduced, the conclusion remains the same: notwithstanding the substantial tightening of prudential requirements since the original impact study (LEI [2010]), these remain below the optimal solvency ratio, giving the relevant authorities scope to increase requirements within the framework of the new instruments given to them (countercyclical buffer).

The specific features of the eurozone have nevertheless caused us to revisit this latest impact analysis from the BIS authors. First, economic impacts were tested econometrically through models using different definitions of the solvency ratio, which needed to be harmonised. These diverse definitions were brought to a single definition (TCE/RWA[3] 'Basel II') using a transitional matrix drawn up by the BIS. The TCE/RWA solvency ratios thus obtained were then expressed under the 'fully-loaded' Basel III definition (i.e. assuming full application, rather than the phased-in application set out in the regulatory timetable) by using a conversion factor. For a given Basel II TCE/RWA ratio, the optimal 'Basel III' CET1 ratio rises as the conversion factor rises. It should therefore be noted that this conversion factor increased considerably between the initial LEI analysis in 2010 (x 0.66) and that published by BIS in November 2016 (x 0.78). Our calculations suggest a slightly lower conversion factor for European Union banks (x 0.71).

Finally, and most importantly, the median economic cost of a 1 percentage point increase in the solvency ratio is higher in the eurozone than the central hypothesis adopted by the BIS report for all the economic zones considered. In the central hypothesis taking account of the effects of TLAC, the adaptation of the BIS method implies an optimal fully-loaded Basel III CET1 ratio of 8.4% in the eurozone, compared to the 9.9% in the BIS analysis of November 2016, which is not focused on a particular geographical region. It therefore appears that the average CET1 solvency ratio resulting from the addition of current requirements to those that will become applicable in the near future (minimum requirement, 'universal' leverage ratio, G-SIB specific leverage ratio) calculated by BIS (of between 8.2% and 8.9%) is extremely close to the optimal level for the eurozone. From this level, a tightening of prudential regulations remains technically possible, but the expected economic benefit (avoiding the loss of GDP associated with a banking crisis) is less than the economic cost incurred (reduction in GDP from lower financing volumes).

Review of BIS methodology

The economic analysis of the long-term impact of Basel III (LEI [2010]) compares the economic costs and benefits for the new regulatory framework. The central hypothesis is that the effects are seen only in the level of GDP and not in the long-term growth rate. Lastly, the long-term costs and benefits were not quantified for given variations or ratio levels. These were expressed *in abstracto* for a broad range of ratios. The main conclusion was that the net economic benefit (i.e. economic benefits minus economic costs) remained positive for a broad range of capital ratios.

Similarly, Fender and Lewrick (2016) did not give precise details on the level of the optimal ratio in each of the hypotheses but concluded that *"the net economic benefits (measured by the impact on the level of GDP per year) of higher capital requirements would be exhausted only after a very substantial increase from the baseline level of 5.5% of the CET1/RWA ratio – even if one uses the lower pre-crisis estimate of the cost of a financial crisis".*

A questionable assessment of the long-term economic benefits

The economic benefit was understood to mean the reduction in the expected value of the loss of GDP caused by banking crises (the product of the probability of a banking crisis and the net present value of its cost expressed in terms of GDP). The probability of a banking crisis was evaluated by crossing the results of six different models, most of which were developed by central banks. Two models covered 13 or 14 OECD countries between 1980 and 2008, the first by the Financial Services Authority (FSA) and the National Institute of Economic and Social Research (NIESR), and the second by the Bank of Japan. Two further models, the so-called "bank portfolio" models (BIS and LEI), were based on the financial statements of the world's 51 largest banks, for the year 2007 for the BIS model and between 2000 and 2008 for the LEI model. The last two models were based on data for the five largest UK banks (Bank of England) and the six largest Canadian banks (Bank of Canada), with no indication of the time period considered. According to LEI calculations, the probability of a systemic banking crisis associated with a capital ratio of 7% (using the LEI definition, i.e. Basel I/II) was 3.3%, which is approximately equivalent to a banking crisis every 30 years. An increase in the CET/RWA capital ratio from 7% to 10% would reduce this probability from 3.3% to 1.2% (if the NSFR is also respected). Similarly, the median cost of a banking crisis was estimated based on the median results derived from several empirical studies.

The net present cost of a banking crisis according to the BIS report

In our eyes, this evaluation of the cost of a banking crisis remains very tenuous. Measured in terms of the cumulative present value of potential future losses of GDP, expressed as a percentage of GDP, the economic cost varies considerably from one estimate to the next. The most frequently used approach in empirical literature are logit-type equations[1] linking the frequency of financial crises within a selection of countries over a given time period with bank liquidity and leverage ratios. The biggest criticism of these impact studies relates to the diversity of crises taken into consideration, regardless of their primary cause. For foreign exchange crises or crises arising from inappropriate monetary policy that degenerate into banking crises, it seems highly unlikely that strengthening prudential regulations would reduce the probability of their occurrence.

In the November 2016 report, the BIS authors used three alternative hypotheses for the cost of a banking crisis, in each case expressed in terms of the net present value of cumulative losses of GDP. **The first hypothesis** was that used in the LEI report of 2011 (63% of GDP in the central hypothesis of a moderate permanent effect: part of the initial impact is absorbed, but GDP remains definitively below its initial trend). **The second hypothesis** stems from the expansion of the scope of empirical studies to include the 2007-2008 crisis, the consequences of which were more serious, resulting in an increase in the net present value of a crisis to 100% of GDP according to the BIS calculations. For example, in a 2010 speech, Haldane put the net present cost of the most recent crisis in a range of between 90% and 350% of GDP. The huge range reflects the degree of uncertainty about the consequences. Since then, the BIS report suggests that Ball (2014) confirmed these orders of magnitude, estimating the weighted average of impacts in OECD countries at around 180% of GDP. Taking a net present cost of 63% of GDP for earlier crises and 200% of GDP for the 2007-2008 crisis (the average of the Ball and Haldane figures), and weighting these estimates by the distribution of observations relating to

earlier crises (75%) and the most recent crisis (25%), the BIS authors adopt a weighted average estimate of the net present cost of a banking crisis at 100% of GDP.

The two estimates of economic losses cited above and on which this expansion of the net present cost is based nevertheless present results which are amongst the highest. In an update of their 2008 work, Laeven and Valencia (2012) estimated the net present cost of banking crises at 'just' 23% of GDP on a global scale between 1970 and 2011. They are also the only authors to distinguish between banking crises and other types of crisis. Their analysis suggests a median GDP loss of 25% for countries affected by the 2007 crisis (0% for those unaffected). Meanwhile, Cline (2016) puts the long-term damage of a banking crisis at 64% of GDP in the year preceding the crisis.

Lastly, the third hypothesis is an attenuation of the second, which takes account of the benefits of TLAC, the buffer of capital securities and eligible debt securities available to absorb losses. According to the BIS study, TLAC reduces the probability of a crisis by 26% and its net present cost by 5.4 points of GDP, due to a reduced need for public sector support. The arithmetic suggests that this last hypothesis is equivalent to a net present cost of 70% of GDP = 100% (1 – 26%) x (1 – 5.4%).

The economic cost

The determination of the economic cost of new capital and liquidity requirements under Basel III, in terms of long-term GDP, is based on a palette of economic models developed by the experts from the Macroeconomic Assessment Group (MAG), which was appointed to evaluate the economic impact of Basel III during the transition period only. These are based both on a direct method, directly inputting the capital ratio where models contained this explanatory variable to simulate the impact on GDP of a 1 percentage point increase in the ratio. Where models did not contain this variable, experts used an indirect method. As a first stage the impact of a 1 percentage point increase in the capital ratio on the interest rates of client loans was evaluated, assuming that the NSFR long-term liquidity ratio was also respected. It was assumed that banks would pass on part of the higher cost of resources to the bank lending rates applied to customers, in order to offset the negative impact on their return on equity (ROE). This increase in financing costs was in turn used as the input in models not containing capital ratios as a variable, thus allowing them nevertheless to be used to evaluate the long-term impact on GDP.

Thus on the basis of the work of MAG/LEI[4] and a conversion factor of TCE/RWA to Basel III CET1/RWA of 0.78, the economic cost associated with a 1 percentage point increase in the Basel III CET1/RWA ratio is assessed at 0.12% of GDP (=0.09%/0.78), to which should be added a fixed cost of around 0.08% of GDP, inherent in the respect of the liquidity requirements of Basel III, and a slight reduction in weighted assets.

Secondly, and to the extent that effects are linear in most models, the predicted impact of an increase in capital ratios was calculated by multiplying unitary impacts by the size of the increase in capital ratios. The latter is the difference between the average CET1 ratio resulting from the cumulative application of various standards – both those already in force and those due to be introduced in the near future, *see below* – and a TCE/RWA ratio of 7% under the LEI definition (equivalent to a fully loaded Basel III CET1 ratio of 7% x 0.78 ≈ 5.5% after application of a conversion factor of 0.78).

The net economic benefit and the optimal capital ratio

For each of the hypotheses of the net present cost of a banking crisis (100% of GDP, 63% of GDP and 94.6% of GDP with TLAC and a 26% reduction in the probability of a crisis) the BIS report determines the net economic benefit as a function of the CET1/RWA ratio as the difference between economic cost and benefit. Starting with an initial CET1/RWA Basel III ratio of 5.5%, the net economic benefit rises so long as the marginal economic benefit remains greater than the marginal economic cost (or 0.12% of GDP) and

then decreases. The optimal CET1/RWA ratio, which balances marginal economic costs and benefits and for which the net economic benefit is maximal, is 9.7% under the hypothesis of a net present cost of a banking crisis at 63% of GDP; 9.9% where the net present cost is 100% of GDP and the benefits of TLAC are included; and 10.7% under the hypothesis that the net present cost is 100% of GDP and no account is taken of TLAC (Chart 1).

The BIS then compares these optimal levels with the CET1 ratios that would result from the cumulative application of regulations. Thus the minimum CET1 requirement of 7% of risk-weighted assets implies a rise of the CET1 ratio of 1.5 percentage points from the initial level of 5.5%. Furthermore, the introduction of leverage ratio of 3% would take the CET1 ratio to 7.7%, an increase of 2.2 percentage points (again on the level of 5.5%). The additional application of 'higher loss absorbency' in the form of a specific capital surcharge for G-SIBs would take the average CET1 ratio for the banking system to 8.1% (+2.6%). Lastly, the CET1 ratio "required" would be 8.2% (+2.7%) with a G-SIB leverage surcharge of 0.5%, and 8.9% with a G-SIB leverage surcharge of 2%.

Observing that these average capital requirement levels, expressed in terms of "CET1 equivalent" (between 8.2% and 8.9% with the G-SIB leverage surcharge), are below the optimal capital ratios (between 9.7% and 10.7%), the BIS report concludes that *"ample room is available for national authorities to further raise regulatory capital."* They go on to say: *"This should provide policymakers with sufficient flexibility to activate countercyclical capital buffers and similar requirements, as needed."*

Over and above the unsuitability to the eurozone of the 'global' optimal ratio, we believe that this is a hasty conclusion for at least two reasons. First, no bank only target a capital ratio which just meets the minimum applicable requirements. In addition, the removal of the prudential filters on the occasion of Basel III may have acted to increase the "margin of security" between the target ratio and the level that was strictly required; it matters little whether this difference comes from a 'target' ratio that the banks set for themselves or an implied market requirement (the former, moreover, being subject to influence from the latter).

Secondly, the existing or proposed demands of Pillar 1 established by the banking regulator do not reflect the demands set by the supervisory authority. Thus according to the European Central Bank (ECB), the average CET1 capital ratio for 2016 and 2017 of banks placed under its direct supervision as part of the Supervisory Review and Evaluation Process (SREP) was 10%[5].

Our application of the BIS method to the eurozone

The BIS global approach does not apply in concrete terms to any specific economic region. It uses median or average parameters for all economic regions taken together. Our approach does not question the method used, but rather takes the BIS analysis and makes two adjustments to the BIS analysis to reflect the specific context of the eurozone.

The first concerns the conversion factors between the Basel II and Basel III capital ratios. We base our calculations on studies of the quantitative impact carried out by the EBA (European Union) rather than those conducted by the Basel Committee (worldwide). The second modification reflects the view that the economic cost of identical capital and liquidity ratios will be greater in the eurozone because of its higher levels of bank intermediation. As a result, the economic cost indicated by models that look only at the eurozone is higher than the economic cost suggested by all models used by the BIS.

Optimal Basel III CET1 ratio ranges from 9.7% to 10.7% according to BIS report

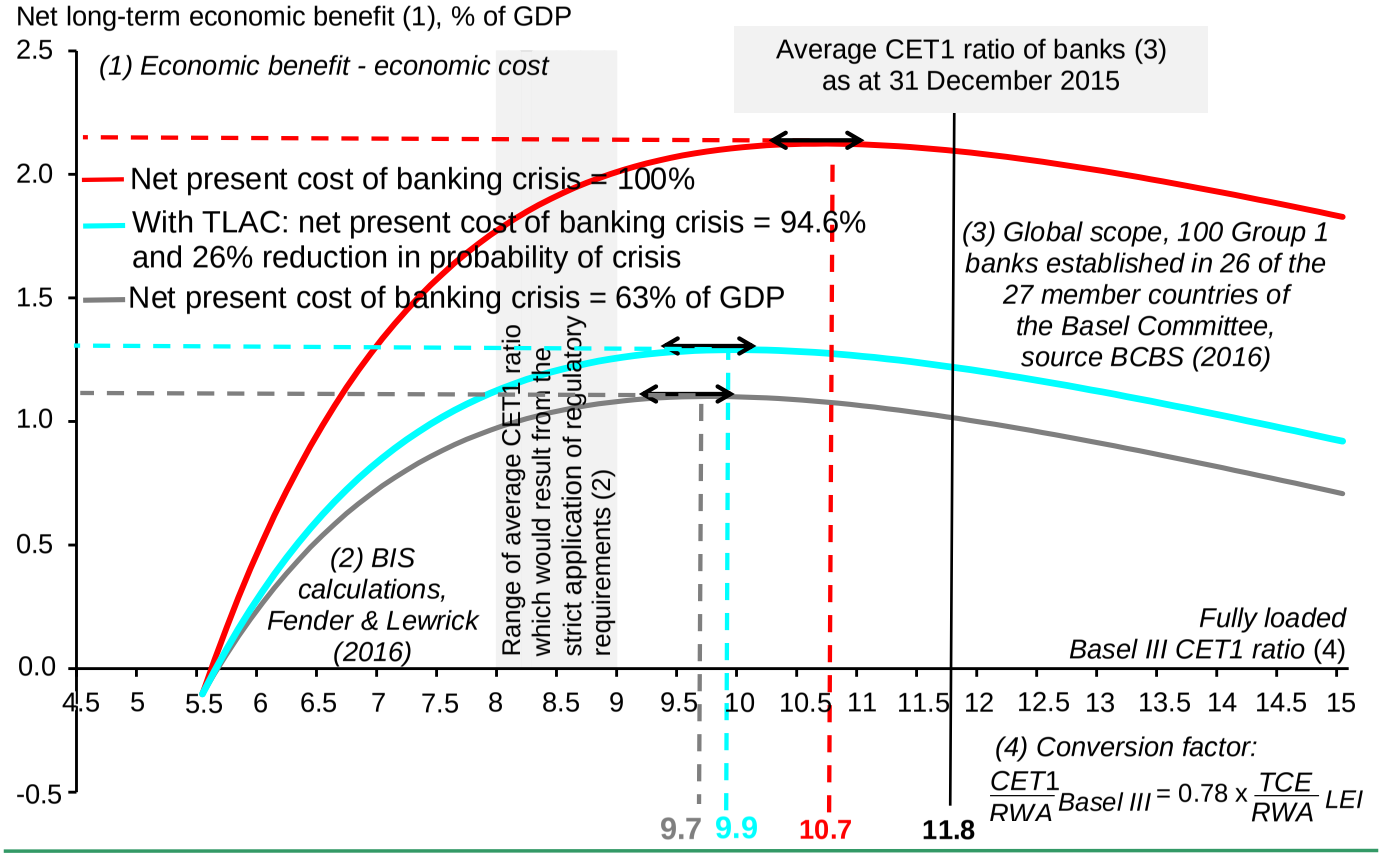


Chart 1

Sources: Fender & Lewrick (2016), BCBS (2016)

The economic benefits associated with a stronger prudential framework (lower probability of banking crises) were evaluated using the overall set of countries. Consequently, we had no choice but to transpose LEI's overall estimates with those for the European Union. Moreover, LEI only published the marginal effects of the increase in capital ratios for ratios ranging between 7% (considered the historical average) and 15% according to the LEI definition (Basel I/II), which is approximately equivalent to levels of between 4.6% and 9.9% using the fully-loaded Basel III definition. Since these levels are significantly lower than currently observed capital ratios, we extended the calculation of the supposed economic benefits to include higher capital ratios (see box 1).

Box 1:

Economic benefits as a function of the Basel III CET1 ratio

The BIS report measures economic benefits in terms of the reduction in the expected value of economic costs associated with a banking crisis. The expected value is the product of the probability of a banking crisis and its economic cost. It would therefore be more accurate to describe it as an economic cost avoided, rather than as a true economic benefit. In its report of 2010, the LEI published a table which gave the probability of a banking crisis for each "full" TCE/RWA capital ratio (LEI definition) ranging from 6% to 15%. The higher limit is equivalent to a Basel III CET1 ratio of 11.7% using the BIS report's conversion factor of 0.78, or 10.7% using the conversion factor of 0.71 that we recommend when considering European banks. This limit is below the average ratios currently observed (12.4% in the European Union at 31 December 2015). Moreover, in order to determine the optimal ratio at a precise level rather than within an approximate range limited by the ratio values for which the LEI gives probabilities of a banking crisis, we have expressed the probability of a crisis as a continuous function of the CET1/RWA capital ratio.

In graphical terms, the 10 points of the probability of a banking crisis associated with the 10 values of the TCE/RWA[6] ratio describe a concave decreasing function with a horizontal asymptote. The marginal reduction in probability therefore decreases and the probability of a crisis can be described as a function of the probability of the immediately preceding ratio (the increments being of 1 point):

$$\frac{TCE}{RWA} = a \times P\left(\frac{TCE}{RWA} - 1\right) + b$$

The econometric regression based on the values for the probability of a crisis for the 10 TCE/RWA ratios (with the NSFR liquidity ratio being respected) gives:

$$P\left(\frac{TCE}{RWA}_{LEI\,i}\right) = 0.67678 \times P\left(\frac{TCE}{RWA}_{LEI\,i-1}\right) + 0.06384 \qquad (87.6) \qquad (3.7) \text{ with } \frac{TCE}{RWA}_{LEI\,i-1} = \frac{TCE}{RWA}_{LEI\,i} - 1$$

(the Student t is in parentheses).

This is an arithmetico-geometric sequence, in which the first term is $P(6)=4.8$ *and the nth term can be written:*

$$P\left(\frac{TCE}{RWA}_{LEI_n}\right)=0.67678^{n-1}\times\left(4.8-\frac{0.06384}{1-0.67678}\right)+\frac{0.06384}{1-0.67678} \quad with \quad n=\left(\frac{TCE}{RWA}_{LEI_n}\right)-5$$

In addition, $$n=\frac{TCE}{RWA}_{LEI_n}-5 <=> \quad n-1=\frac{TCE}{RWA}_{LEI_n}-6$$

Ultimately, the probability of a banking crisis can be expressed as a function of the ratio $\frac{TCE}{RWA}$ *using the LEI definition:*

$$P\left(\frac{TCE}{RWA}_{LEI}\right)=0{,}67678^{\frac{TCE}{RWA}_{LEI}-6}\times 4.60249+0.19751 \quad \forall\left(\frac{TCE}{RWA}_{LEI}\right)\geq 6$$

Applying the conversion factor of 0.78 recommended by Fender and Lewrick (2016), we can initially express the ratio $\frac{CET1}{RWA}_{BaselIII}$ *as a function of the ratio* $\frac{TCE}{RWA}_{LEI}$: $\frac{CET1}{RWA}_{BaselIII,CF=0.78}\approx 0.78\times\frac{TCE}{RWA}_{LEI}$,

and then the probability of a banking crisis as a function of the Basel III CET1 ratio $\frac{CET1}{RWA}_{BaselIII,CF=0{,}78}$:

$$P\left(\frac{CET1}{RWA}_{BaselIII,CF=0.78}\right)=0.67678^{\left(\frac{\frac{CET1}{RWA}_{BaselIII,CF=0.78}}{0.78}-6\right)}\times 4.60249+0.19751 \quad \forall\left(\frac{CET1}{RWA}_{BaselIII,CF=0.78}\right)\geq 4.68$$

Alternatively, by applying the conversion factor we obtain by adapting the BIS calculation method to European banks (0.71), the probability of a crisis becomes the following function of the Basel III CET1 ratio $\frac{CET1}{RWA}_{BaselIII,CF=0.71}$:

$$P\left(\frac{CET1}{RWA}_{BaselIII,CF=0.71}\right)=0.67678^{\left(\frac{\frac{CET1}{RWA}_{BaselIII,CF=0.71}}{0.71}-6\right)}\times 4.60249+0.19751 \quad \forall\left(\frac{CET1}{RWA}_{BaselIII,CF=0.71}\right)\geq 4.26$$

The substitution of a conversion factor suitable to the eurozone for the 'global' factor used by the BIS

In their latest impact studies, the BIS authors (Fender and Lewrick [2015], Fender and Lewrick [2016]) use a conversion factor of 0.78 to get from the Basel I/Basel II TCE/RWA ratios to the fully loaded Basel III CET1 ratios, even though the factor used in the initial study (MAG [2011]) was 0.66. In particular, the calculations are based on the quantitative impact study of Basel III carried out by the Basel Committee in September 2014 on the basis of data at 31 December 2013. It should be remembered that the "quantitative impact" – as distinct from the economic impact – measures the regulatory deductions which would result from Common Equity Tier 1 (before deductions), on the one hand, and the increase in risk-weighted assets on the other hand, following the full application of Basel II.5 and Basel III on the date in question. The quantitative impact study published by the Basel Committee in September 2014 concludes that for Group 1[7] banks, regulatory deductions would represent an average of 20% of CET1 before deductions and an 8.3% increase in risk-weighted assets. The resultant conversion factor is a global median, which does not apply to any specific geographical region. However, the quantitative impact study carried out at the same time by the European Banking Authority indicated not only higher regulatory deductions (23.1% of CET1) but also a larger increase in risk-weighted assets (10.3%) for the European Union's Group 1 banks; this suggests a lower conversion factor for the banks of the eurozone and the European Union (Box 2).

Box 2:

Calculating a conversion factor

The Tangible Common Equity ratio TCE/RWA under the Basel I/Basel II definition (or "LEI definition") is the benchmark capital ratio used by the Long-term Economic Impact group (LEI) in its economic impact study after conversion of different 'historic' capital ratios to this single metric.

In order to assess the economic costs and benefits associated with a fully loaded Basel III CET1 ratio, it was therefore necessary to use a conversion factor. To calculate this, experts from the BIS drew in part on a transitional matrix (whose parameters were obtained by regression) from the TCE/RWA capital ratio under the LEI definition to the Tier 1 ratio under the Basel II definition, and in part on the results of quantitative impact studies. The value of the conversion factor therefore depends substantially on the date of the quantitative impact study used in the calculation.

1. From TCE/RWA to Basel II CE/RWA

The LEI calculations (LEI [2010], table A5.1 p.57) express the Basel II CE/RWA ratio as a function of the Basel II TCE/RWA ratio used as the reference ratio in its economic impact study.

$$\frac{CE}{RWA}=\frac{CE}{TA}\times\frac{TA}{Tier1}\times\frac{Tier1}{TCE}\times\frac{TCE}{RWA}=\frac{CE}{TA}\times\frac{TA}{Tier1}\times\frac{Tier1/RWA}{TCE/RWA}\times\frac{TCE}{RWA}$$

This meant, for US banks:

$$\frac{CE}{RWA}=7.6\times\frac{1}{7.6}\times\frac{13.2}{12}\times\frac{TCE}{RWA}=1.1\times\frac{TCE}{RWA} \qquad (1_{US})$$

and for eurozone banks:

$$\frac{CE}{RWA} = 5.6 \times \frac{1}{7.4} \times \frac{16.2}{12} \times \frac{TCE}{RWA} \approx 1.02162 \times \frac{TCE}{RWA} \qquad (1_{EA})$$

Fender and Lewrick (2016) used an average conversion factor for all banks within the scope of the Basel Committee, such that:

$$\frac{CE}{RWA} \approx \frac{1.1+1.02}{2} \times \frac{TCE}{RWA} \approx 1.06 \times \frac{TCE}{RWA} \qquad (1_{BCBS})$$

2. From TCE/RWA to Basel II CE/RWA

The BIS report draws here on the results of the Basel III Monitoring Report, published by the Basel Committee, on the basis of data as at 31 December 2013 collected from 101 Group 1 banks established in 21 of the 27 member states of the Basel Committee (BCBS [2014]).

According to tables A.12 and A.13 (page 40 of the report) the regulatory deductions for the calculation of Basel III Common Equity Tier 1 represent 20% of Common Equity before deductions, whilst the cumulative effect of Basel II.5 and Basel III translates to an 8.3% increase in risk-weighted assets relative to Basel II standards.

The fully loaded Basel III CET1/RWA ratio can therefore be expressed as a function of the Basel II CE/RWA ratio:

$$\frac{CET1}{RWA}_{Basel\,III} = \frac{1-0.20}{1+0.083} \times \frac{CE}{RWA}_{Basel\,II} \approx 0.73869 \times \frac{CE}{RWA}_{Basel\,II} \qquad (2_{BCBS})$$

For our part, we have used the results of the Basel III Monitoring Exercise specific to the 39 Group 1 banks of the European Union published by the European Banking Authority (EBA [2014]). According to tables 5 (p. 27) and 6 (p. 29) regulatory deductions under Basel III would have been equivalent to 23.1% of Common Equity before deductions if Basel III had been fully applied at 31 December 2013, whilst risk-weighted assets would have been 10.3% higher than under Basel II.

$$\frac{CET1}{RWA}_{Basel\,III} = \frac{1-0.231}{1+0.103} \times \frac{CE}{RWA}_{Basel\,II} \approx 0.69719 \times \frac{CE}{RWA}_{Basel\,II} \qquad (2_{EBA})$$

3. From Basel II TCE/RWA to Basel III CET1/RWA

The combination of the two equations (1_{BCBS}) and (2_{BCBS}) gives us the final calculation of an approximation to the conversion factor ratio from the Basel II TCE/RWA to the fully loaded Basel III CET1/RWA, used by the BIS report, for banks in the BCBS scope:

$$\frac{CET1}{RWA}_{Basel\,III} \approx 0.73869 \times \frac{CE}{RWA}_{Basel\,II} = 0.73869 \times 1.06 \times \frac{TCE}{RWA}_{Basel\,II} \approx 0.78 \times \frac{TCE}{RWA}_{Basel\,II}$$

Similarly the combination of equations (1_{EA}) and (2_{EBA}) gives the equivalent conversion factor for European banks alone:

$$\frac{CET1}{RWA}_{Basel\,III} \approx 0.69719 \times \frac{CE}{RWA}_{Basel\,II} = 0.69719 \times 1.02162 \times \frac{TCE}{RWA}_{Basel\,II} \approx 0.71 \times \frac{TCE}{RWA}_{Basel\,II}$$

It should also be stressed that the increase in risk-weighted assets calculated in the Monitoring Exercise of September 2014 reports the increase in risk-weighted assets that would result from the full application of Basel III on the date of the data collected from banks (i.e. 31 December 2013) relative to risk-weighted assets under the regulations applicable on that date. However, this second figure already included the increase under Basel II.5 (applied from 31 December 2011, including in the European Union). The Basel Committee and the European banking authority thus used only risk-weighted assets calculated under Basel II[9] to measure the cumulative quantitative impact of Basel II.5 and Basel III on risk-weighted assets.

Lastly, banks had begun to take corrective measures (reallocating portfolios towards assets with the lowest regulatory weights, withdrawing from the most onerous activities, such as derivatives, limiting certain holdings that would require substantial prudential deductions) as soon as the initial Basel recommendations were published in 2010; this served to gradually reduce the "quantitative impact" in the strict sense of the term. It is therefore hardly surprising that the quantitative impacts fall as we draw closer to the date of full application of the new system; this is indeed reflected in the results of successive exercises (Chart 2). In the end, the economic impact of a fall in financing volumes as the result of discretionary reductions in certain elements of bank balance sheets (hedging derivatives, trading portfolios), is comparable to the fall in financing volumes due to an increase in bank capital and the subsequent increase in lending rates (*see* "Econometric models suggest a greater increase in the cost of credit in the eurozone"). In the end, it matters little whether banks renounce certain activities, for which they believe pricing has become excessive given the requirement to remunerate additional capital, or whether demand for the corresponding transactions falls due to this higher pricing: the resulting fall in volume is liable to have a negative impact on economic activity. For this reason, the results of the Monitoring Exercises, which already include transformation of business portfolios in response to Basel III, always give a measurement of the residual quantitative impact of Basel III (i.e. that which is still to come), but cannot properly be used to evaluate the quantitative impact "with a constant business structure".

Adjustment to bank balance sheets gradually reduces the quantitative impact of regulatory changes (1)

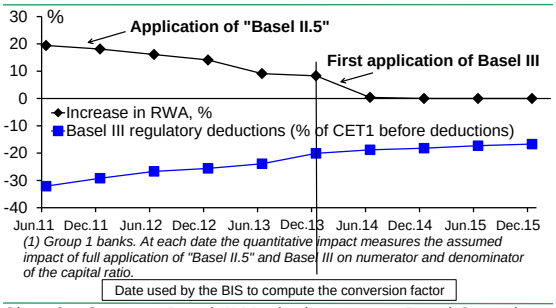


Chart 2 Sources: Basel III Monitoring reports, Basel Committee

In the light of the above, the conversion factor of 0.78 used in the BIS report, and its equivalent of 0.71 that we have calculated for the eurozone, represent extremely conservative hypotheses, which tend to inflate the conversion factor, the fully loaded Basel III CET ratio resulting from its application and thus its optimal level. Although it seems fairly close to the figure we recommend for eurozone banks, the conversion factor used by the BIS report would nevertheless lead to a 100-basis-point overestimation of the optimal CET1 ratio for European banks taken alone if it were applied to them. By way of illustration, within the eurozone and under the central hypothesis incorporating the effects of TLAC, the optimal CET1 ratio would be 9.2% using the "global" conversion ratio of 0.78. It would fall to 8.4% with the specific "local" ratio of 0.71. Under the hypothesis where the net present cost of a banking crisis is 63% of GDP, the overestimate inherent in using a factor of 0.78 for the CET1 ratio is close to 80 basis points (9.0% against 8.2%).

Econometric models suggest a greater increase in the cost of credit in the eurozone

The second proposed modification consists of using the average unit impact of eurozone-specific models, rather than that for the entire set of models regardless of the geographic region to which they apply.

For the same 1 percentage point increase in the TCE/RWA capital ratio, the averages of the median impacts on GDP are systematically higher for eurozone-specific models (see table 1). For models which incorporate capital ratios, the same increase in capital ratios would have twice the impact in the eurozone than in the United States. This impact differential is very consistent and reflects regional differences in financing structures, with the banking channel predominating in the eurozone and the financial markets in the United States. By taking account of the overall economic impact, regardless of economic regions and their specificities, the MAG/LEI expert working groups suggest that the economic cost is situated within the interval of results for the US models, but they apparently underestimate the cost for the eurozone. The median economic cost for all regions taken together (as a percentage of GDP) associated with a 1 percentage point increase in the fully-loaded CET1/RWA ratio is some 27% to 36% lower than that which would be seen in the eurozone, when using the "global" conversion factor of 0.78. This gap rises to between 33% and 41% when we use the specific conversion factor of 0.71.

Since the unit costs were linear in most of the models used (i.e. for a 1 percentage point increase in the TCE/RWA capital ratio), we simply expressed the loss of GDP (in %) as a function of the TCE/RWA ratio for the eurozone (for TCE/RWA above 7%, in line with the LEI approach), using the average of the median unit impacts of the DSGE models with and without bank capital variables, or 0.13% of GDP[10]. We also assumed compliance with NSFR, adding an additional GDP loss of 0.093%, equal to the average of the median impacts between the two types of models cited above:

$$Loss\ of\ GDP\left(\frac{TCE}{RWA}^{LEI}\right)=0.129\times\left(\frac{TCE}{RWA}^{LEI}-7\right)+0.093$$

where $\frac{TCE}{RWA}^{LEI}$ designates the capital ratio based on the LEI definition (i.e. Basel I/II) expressed in %; *TCE*, common equity and assimilated instruments minus intangible assets and goodwill; and *RWA*, the risk-weighted assets.

The initial value of the TCE/RWA ratio of 7%, which represented the starting point of the cost function for the LEI (2010), was replaced by an initial Basel III CET1 ratio of 5.5% (≈7%×0.78) by the BIS report (Fender and Lewrick [2016]), to take account of the conversion factor of 0.78. We could have chosen to start with the same 7% TCE/RWA ratio giving a fully-loaded Basel III CET1 ratio of 5.0% (≈7×0.71) after application of our conversion factor of 0.71. However, to simplify the legibility and comparability of our results, we opted instead for an initial CET1 Basel III ratio of 5.5%, similar to that used by the BIS report (but which in our case corresponds to a TCE/RWA ratio of around 7.7%). On this point, it is important to remember that the starting point does not affect the optimal ratio, merely the net benefit calculated (as a percentage of GDP).

Applying our conversion factor of 0.71, the economic cost can be expressed as a function of the fully-loaded Basel III CET1/RWA ratio:

$$Loss\ of\ GDP\left(\frac{CET1}{RWA}_{Basel\ III\ ,CF=0.71}\right)=0.182\times\left(\frac{CET1}{RWA}-5.5\right)+0.093$$

with 0.182 = 0.129/0.71

Finally, the higher economic cost of a 1 point increase in the fully-loaded Basel III CET1 ratio (Table 1 and Chart 3, page 16) results not only from the higher economic cost inherent in a 1 percentage point increase in the TCE/RWA ratio in the eurozone-specific models, but also on a lower conversion factor. A 1 percentage point increase in the TCE/RWA ratio is "converted" into a greater rise in the "equivalent" CET1/RWA ratio for the eurozone (+1 point / 0,71≈ + 1.41 points) than in the combination of economic regions considered by LEI (+1 point / 0,78 ≈ +1.28 points).

Long-term economic cost by geographic region

Impact of a 1-point increase in the Basel III CET1 ratio [1] on baseline GDP[2]

Eurozone [3]		United States [4]		UK, Italy [3]	Median estimate
DSGE models[5] with bank solvency	DSGE models[5] without bank solvency	DSGE[5] and VECM[5] models with bank solvency	DSGE[5] and VECM[5] models without bank solvency	Semi-structural models[5] without bank solvency	All geographic regions combined [4] (figures used by the regulator)
-0.194%	-0.17%	-0.073%	-0.182%	-0.20%	-0.11%
Average: -0.182%		Average: -0.127%			
Impact of NSFR compliance[6]					
-0.067%	-0.12%	-0.117%	-0.130%	-0.153%	-0.08%
Average: -0.093%		Average: -0.123%			

[1] Common Equity Tier 1 ratio, fully loaded using the Basel III definition
[2] Including international externalities (exchange rates, commodity prices, trade flows)
[3] TCE/RWA to fully-loaded Basel III CET1/RWA conversion ratio of 0.71 calculated by us by applying the BIS method to European data (EBA [2014]).
[4] TCE/RWA to fully-loaded Basel III CET1/RWA conversion ratio of 0.78 used by the BIS report.
[5] DSGE, VECM and semi-structural models: dynamic stochastic general equilibrium models (DSGE) are so-called "real cycle" models which are based on microeconomic fundamentals. They postulate the rational expectations of agents (a coherent vision of the future). Vector error correction models (VECM) can be used to specify simultaneously a stable long-term relationship and short-term dynamics for one or more variables. Semi-structural models are hybrids combining DSGE models with VAR models based on the simple statistical interdependence between temporal series.
[6] LEI considers that this analysis also applies, to a certain extent, to LCR. We also used a conservative hypothesis of a decline in weighted assets.

Table 1 Sources: BNP Paribas calculations based on LEI (August 2010), Fender and Lewrick (2016), EBA (2014).

The economic cost of raising bank capital ratios is higher in the eurozone

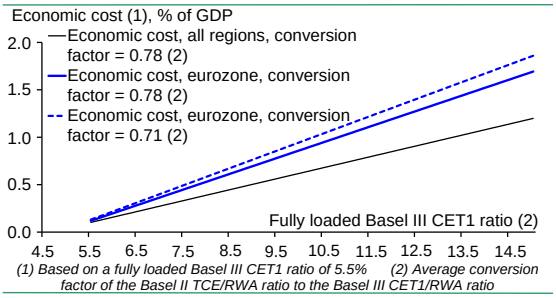


Chart 3 Sources: BNP PARIBAS calculations based on MAG/LEI, BIS, European Banking Authority

The optimal capital ratio for the eurozone has now been exceeded

The combination of a "steeper" economic cost function in the eurozone and a slightly reduced TCE/RWA to fully-loaded Basel III CET1 conversion factor causes considerable changes in the net economic benefit function, which, for the eurozone, results in an optimal capital ratio between 1.5 and 1.7 points below that calculated by the BIS for all of the main economic regions taken together (Charts 1 and 4). Our calculations suggest an optimal CET1 ratio of between 8.2% and 9.0% (8.4% in the central 'TLAC' hypothesis) for the eurozone, whilst the optimal ratio given by the BIS report is between 9.7% and 10.7% (9.9% in the central 'TLAC' hypothesis) across all the economic regions considered. According to the EBA, the fully-loaded Basel III CET1 ratio observed for major banks in the European Union in December 2015 was 12.4%. This is comparable to the 12.6% published in July 2016 as part of the results of the stress tests carried out on 51 eurozone banks.

Optimal Basel III CET1 ratio in the eurozone ranges from 8.2% to 9%

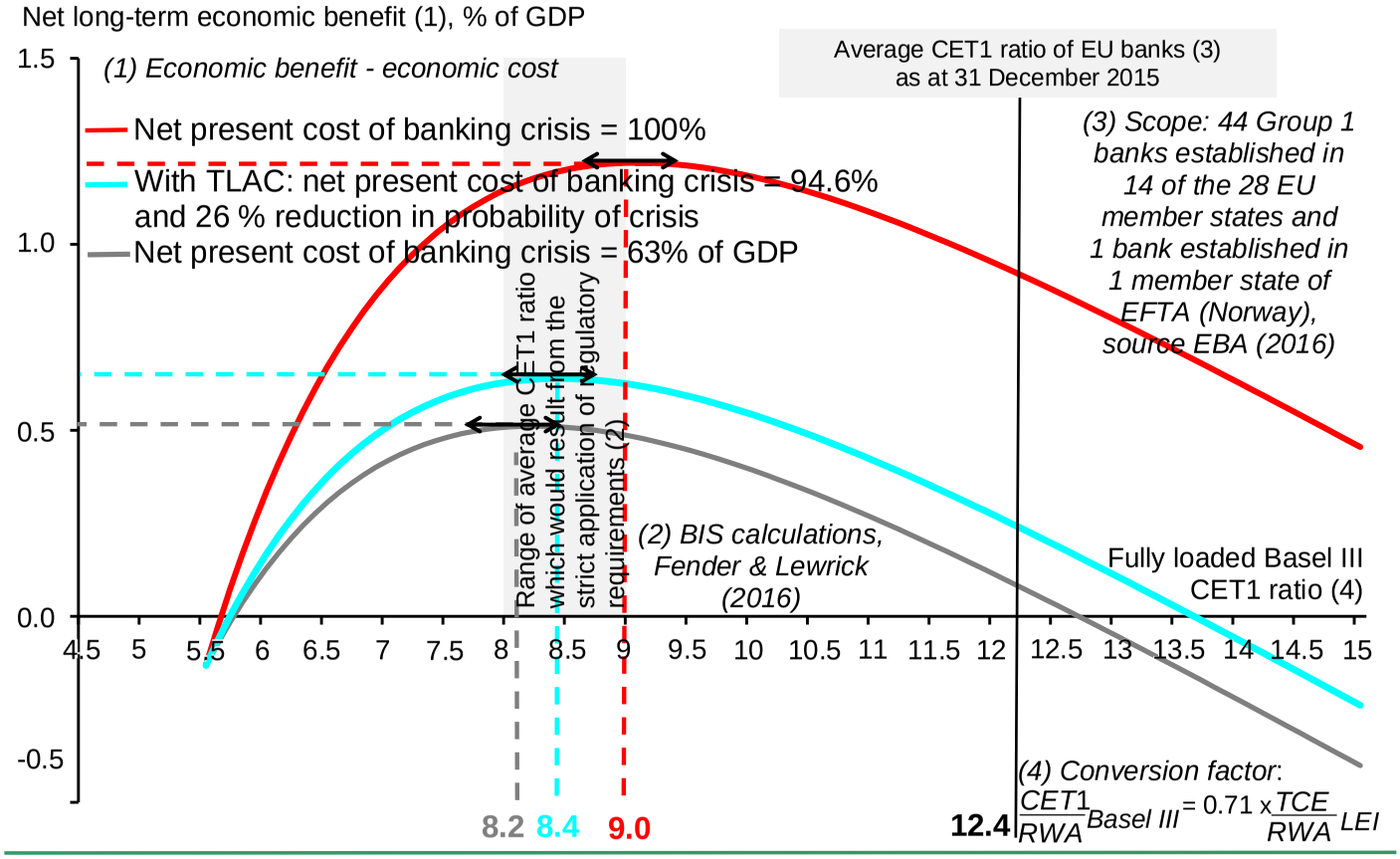


Chart 4 Sources: BNP Paribas calculations based on Fender & Lewrick (2016), EBA (2014 & 2016)

In November 2016, the BIS published an update of the 2010 economic impact study carried out by LEI experts in response to the introduction of a series of new hypotheses. On the basis of recent empirical studies expanded to include the economic consequences of the 2007-2008 financial crisis, the hypothesis of the net present cost of a banking crisis was raised from 63% to 100% of GDP, which automatically increases the economic benefit associated with any given capital ratio. Then the conversion factor from the Basel II TCE/RWA ratio to the Basel III ratio was increased from 0.66 to 0.78, so that a given optimal TCE/RWA ratio is now 'equivalent' to a higher fully-loaded Basel III CET1 ratio. The cumulative effect of these changes was an increase in the optimal 'global' capital ratio of around two points. Conversely, taking account of the benefits of TLAC (reducing both the probability and cost of a banking crisis) reduces it by 1 percentage point. Overall, the optimal ratio therefore rises from around 9% in the initial BIS economic impact study to around 10% in the updated version, published in November 2016 for all economic regions.

However, the generic nature of these results constitutes their principal limit. Based as they are on median hypotheses for "all regions taken together", they are not applicable to any one specific economic area. From this observation it follows that it is necessary to revisit the BIS approach in order to calculate the optimal ratio relevant to the eurozone alone. We have adopted the methodology used in the report, together with the new hypotheses of a net present cost of a crisis of 100% of GDP and for the economic benefits of TLAC. However, we have substituted eurozone-specific parameters (higher economic costs, lower conversion factor) for the 'global' parameters used by the BIS. On the basis of these more pertinent hypotheses, we show that the optimal, fully-loaded CET1 capital ratio in the eurozone is probably around 8.5%.

Over and above the discussion of an optimal capital ratio according to the economic region in question, we believe that the BIS report's conclusions are skewed. The report examines the optimal average CET1 ratio, resulting from a strict respect of regulatory requirements already in force or due to come into effect soon (between 8.2% and 8.9%) rather than the observed fully-loaded CET1 ratio, which is significantly higher. The security buffer which has always existed between regulatory requirements in their strict sense and the observed level of capital ratios, which results from implied market requirements and from the target ratios set by banks for themselves, is therefore simply ignored. In the medium term, and looking beyond the measures yet to be introduced but included in the BIS report's analysis (leverage ratio, G-SIB specific leverage ratio), the work now under way in the Basel Committee (talked of by insiders as 'Basel IV', but considered by the regulator as a 'finalisation' of Basel III) could lead to a significant increase in risk-weighted assets (the denominator of the capital ratio). In other words, the redefinition of RWA under Basel IV would reduce the optimal capital ratio. However, if the required capital ratio would not be adjusted (i.e. lowered) accordingly, this would imply that the positive gap between the target capital ratio and the optimal capital ratio would under Basel IV even be bigger than is currently the case under Basel III. As a result, the gap between the latter and effective CET1 ratios will be further increased. As the implementation of Basel III has demonstrated, if demonstration was needed, a tighter definition of capital ratios does not reduce the implicit requirements of the market (which, it is true, have been influenced by the increase in regulatory requirements, particularly for the G-SIBs, and by the introduction of the leverage ratio). Increasing capital requirements in EUR without increasing capital ratios (as a percentage of RWA) has the negative effect of muddying the waters around improved bank solvency, which is generally understood in terms of higher capital ratios rather than increases in capital. And yet, the change in definition that will come under 'Basel IV' will be the equivalent of an increase in capital ratios at constant definition, sufficient to wipe out the net, long-term economic benefit of these prudential reforms within the Eurozone because well beyond optimal ratio. This will be the consequence of an

increase in financing costs which is currently obscured by the exceptionally accommodating monetary policy stance of the ECB and the (continuing) historically low level of long-term interest rates, despite their recent jump following the election of Donald Trump as US President and his announcement of plans for fiscal stimulus. In the near term, the secondary effects on bank lending of a fresh increase in capital requirements could counteract the objectives of monetary policy at a time when loan books have returned to positive growth in the eurozone since 2015.

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NOTES

[1] The denominator of the capital ratio includes, among other things, off-balance sheet items and is restated for accounting differences between European and US standards.

[2] Total Loss Absorbing Capacity. The final recommendations were published by the Financial Stability Board (FSB) on 9 November 2015. http://www.fsb.org/2015/11/tlac-press-release/

This requirement, which applies only to global systemically important banks (G-SIBs) sets a minimum quantity of resources to be mobilised in the event of a 'bail in' during resolution. These resources must be at least 16% of risk-weighted assets (6% of leverage exposure) from 1 January 2019, rising to 18% (6.75%) from 1 January 2022. They can consist of capital instruments or unsecured subordinated debt with a residual maturity of more than one year. Senior debt with maturity of over one year is eligible up to a limit of 2.5% (ratio of 16%) and then 3.5% (18%) of risk-weighted assets.

[3] *Tangible Common Equity/Risk-Weighted Assets*. Tangible Common equity is equal to Common Equity before regulatory deductions and less any goodwill and intangible assets.

[4] See LEI (2010), table 7, pages 25 to 27.

[5] See European Central Bank, "The Supervisory Review and Evaluation Process in 2016". https://www.banking supervision.europa.eu/banking/srep/2016/html/index.en.html

"*Overall, the amount of Common Equity Tier 1 (CET1) capital that directly supervised banks are expected to hold, as determined by the SREP, will be broadly stable from 2016 to 2017. It remains at an average and median of around 10 % of total risk-weighted assets."*

[6] The values of capital ratios are already expressed as a percentage, i.e. a ratio of 8.5% corresponds to a value of 8.5.

[7] Group 1 banks are those with excess Tier 1 capital of EUR3 billion or more and which are active internationally.

[8] See Fender and Lewrick (2016), note 11 page 5: *"Calculations are based on BCBS (2010), Table A5.1 (average for US and euro area banks) and BCBS (2014), Tables A12 and A13. The adjustment reflects an increase in RWA, given the more stringent rules for calculation, and a decline in capital, given the more restrictive eligibility criteria for regulatory capital."*

[9] See BCBS (2014), note 1 under table A13, page 40.

[10] LEI (2010), table 7 page 27: the first step is to calculate the median impact of a 1 point increase in the TCE/RWA ratio for each family of models. For DSGE models with a bank capital variable, the unit median impact is 0.1375% (= (0.29% / 2 + 0.53% / 4 + 0.81%/6) /3). For DSGE models without a bank capital variable, the unit median impact is 0.1208% (= (0.24% / 2 + 0.49% / 4 + 0.72% / 6) /3). This gives an average median impact for the two families of models of ((0.1375% +0.1208%) /2) or approximately 0.13% of GDP.

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