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EU IMPLEMENTATION OF THE FINAL BASEL III STANDARD

Impact on the European banking sector and the real economy

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PREFACE

The Final Basel III Standard from December 2017 sets out revised international standards for banking regulation. The package was analysed in a previous report by Copenhagen Economics from 2019.

The package is now about to be implemented in the EU, and the European Commission is expected to publish a proposal this autumn. In preparation for the implementation, different options for implementing the package have recently been put forward.

In light of these options and the potential impact of the COVID-19 crisis, the European Banking Federation has asked Copenhagen Economics to update the 2019 report to assess the impact on the EU banking sector and real economy.

EXECUTIVE SUMMARY

The Final Basel III Standard from December 2017 sets out revised international standards for banking regulation. The package introduces a range of regulatory measures that, according to EBA's most recent estimate, in total will increase capital requirements of EU banks by 19%. We estimate that this will lead to a capital need for the EU banking sector of some EUR 170-230 bn.[1]

This capital need estimate is different from the Minimum Required Capital (MRC) shortfall of EUR 30 bn, which EBA presents in their impact assessments. The MRC shortfall is the amount of capital banks need to just exactly be compliant with minimum capital requirements. However, banks cannot operate exactly on the allowed capital ratio – they need buffers on top of the capital requirements. For example to cope with real-economy fluctuation, such as the recent COVID-19 crisis. Therefore, the actual capital need will be larger than the MRC shortfall presented by EBA.

The increase in required capital comes on top of the impact due to the COVID-19 crisis which, too, has put pressure on capitalisation of the European banking sector. The IMF estimates that the crisis could in total have led to an impact on capitalisation of some EUR 100 bn. In combination with the fact, that banks often are expected to comply with new regulation within a 2-3 year period, this could bring the total capital need for the EU banking sector over the coming years up to EUR 330 bn.

Impact on risk sensitivity

The Final Basel III framework introduces the concept of an output floor, which impacts the minimum level of capital banks are required to hold for each type of asset. This will reduce the risk sensitivity of capital requirements. For example, if a bank is bound by the output floor, exposures to unrated corporates will all be subject to the same capital requirements, no matter the underlying risk. This means that a large international unrated corporate, with decades without default, will have higher capital requirements than a newly opened web shop (SME). This loss of risk sensitivity could distort incentives for banks to provide low-risk lending and thus have an undesirable effect on financial stability.

Impact on bank customers

The higher capital requirements will translate into higher costs for banks, as equity is a significantly more expensive source of finance than debt. In total, we estimate an annual increase in costs associated with lending of 25-30 bn for the European economy.

As acknowledged by a range of international institutions, such as IMF, ECB and Bank of England, these costs will eventually be passed onto customers, resulting in a higher cost of borrowing. Exactly how these costs are being passed on depends on the local competitive situation as well as the pricing strategies of the banks. To illustrate the consequences for banking customers, we have simulated the impact using a generic capital cost allocation model.

[1] Note, that this is only an assessment of the Final Basel III package and does not include any adjustment to discretionarily set capital requirements on national level.

For the EU average, we find that corporate customers will be the most affected with an estimated increase in borrowing costs of some 0.25%-points. For a typical corporate with an annual revenue of EUR 500 million, this would correspond to higher borrowing costs of around EUR 0.6 million per year. SME borrowing costs could, on average, increase by an estimated 0.13%-points. For a typical SME customer with annual revenue of EUR 10 million, this could correspond to an increase borrowing costs of around EUR 3,000 per year. The average spans large national differences – e.g. in the most affected country, we estimate that costs associated with lending could increase by up to 0.5%-points for corporate customers.

Impact on the real-economy

The higher borrowing costs will increase the costs of conducting an investment – in particular for companies that primarily rely on bank finance. This will reduce investment activity, which eventually will lead to a permanent reduction in GDP. Based on a structural macroeconomic model of the European economy, we estimate the package will lead to permanent reduction in GDP of 0.4%. Put in other words, every year going forward, EU GDP will be 0.4% lower than it otherwise would have been.

The package will also bring about benefits in terms of lower risk of a financial crisis triggered by too low capital requirements. However, due to the already implemented post-crisis banking reform, the average capital ratio in EU has increased above the 13%, which was identified as the optimal level by the Bank for International Settlements (BIS) in its LEI report from 2010. Based on this study, we find that the Final Basel III provides societal benefits of some 0.1%, bringing the total net societal costs of the package to 0.3% of GDP.

Spill-over effects from the COVID-19 crisis?

In our main estimate described above, we assume that banks will become compliant with the package through adjustments on the liability side, i.e. they will increase their capitalisation.

However, we know from previous experience that banks – in particular under stress – might adjust to higher capital requirements through deleveraging, i.e. either deaccelerating or even reducing credit exposures.

Based on studies of previous crises, we assess that up to 30% of higher capital requirements could happen through deleveraging, depending on the severity and length of the economic aftermath of the COVID-19 crisis. This would imply a reduction in lending to corporate and retail customers by around EUR 600-700 bn corresponding to around 4%-5% of the total exposure to business and retail portfolios.

Alternative implementation

As stated in the original G20 mandate, the Final Basel III Standard should be completed without further significantly increasing capital requirements. In addition, the current capitalisation of European banks implies limited economic benefits from the higher capital ratios EBA's suggested implementation will lead to.

We therefore propose three sets of recommendations, that would bring the impact of the package more in line with economic considerations, the G20 mandate as well as the structures of the European banking and corporate sector:

- *Parallel stacks approach* when implementing the output floor, meaning that the output floor should apply as a separate requirement only including capital buffers from the original Basel III package. This will make the output floor work primarily as a backstop, largely keeping the link between capital requirements and underlying risks.
- *More granular standardised risk weights* which will further enhance risk-sensitivity of capital requirements. This includes allowing the classification of "investment grade" and a corresponding adjusted risk weight for high-quality corporates and more granularity in standardised risk-weights for mortgages.
- *EU specific implementation:* EBA's impact assessment provides several other initiatives that could reduce the impact, including keeping the CVA exemptions and the European SME supporting factor.

In parallel, we suggest continuing the work to increase transparency, comparability, and precision of internal models of financial institutions. This has for example been the focus of the ECB's targeted review of internal models (TRIM) as well as the ongoing monitoring by the national competent authorities (NCAs).

Ultimately, we suggest that if financial institutions that have (1) solid, verifiable models identifying their risks and (2) can document their solidity, even in very adverse economic conditions, through stress tests, they should be able to use these models in determining their capital adequacy.

CHAPTER 1

IMPACT ON THE EUROPEAN BANKING SECTOR

In December 2017, the Basel Committee agreed on a new regulatory framework to address identified shortcomings of the original Basel III agreement denoted the 'Final Basel III Standard'. How the Final Basel III Standard is implemented in the EU will determine its effect on the European banking sector and the European economy. In a European context, the European Commission has asked the European Banking Authority (EBA) for an impact assessment of its implementation in the EU.

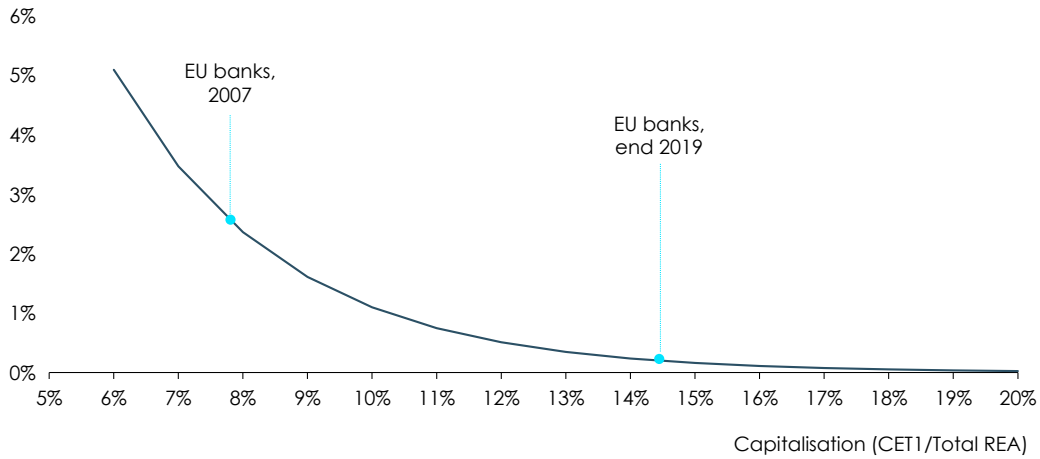
This chapter provides an overview of how the Final Basel III Standard will impact the European banking sector, if the reform is implemented as suggested by EBA (in chapter 3 we present alternatives to this implementation). Section 1.1 provides an overview of the original Basel III framework that was agreed upon in 2010 and the finalisation of the Basel III standard that was agreed upon in 2017. Section 1.2 provides an estimate of the additional capital that banks might have to raise after the reform while Section 1.3 describes one of the main elements of the reform, the so-called output floor, in more detail. Finally, Section 1.4 ends this chapter with an analysis of the potential impact of the COVID-19 pandemic on the need for banks to raise additional capital.

1.1 THE BASEL III REFORMS

The third instalment of the Basel agreements, Basel III, was developed in response to the 2008 financial crisis with the objective of increasing financial sector resilience by increasing bank capital requirements[2] (i.e. the amount of equity banks have to hold). The Basel III measures significantly reduced the risk of a financial crisis arising from insufficient capitalisation of the banking sector; average capitalisation in EU increased from around 8% in 2007 to close to 15%, see Figure 1.

[2] A capital requirement is the amount of equity that a bank is required to hold, relative to the riskiness of its assets. Capital requirements were put in place to ensure that banks hold enough capital to cover unexpected losses and to reduce the systemic risk in the event of a crisis.

Figure 1
Risk of a crisis in the EU given pre and post financial crisis capitalisation
Risk of a crisis in a given year



Note: The figure shows the relationship between the level of capitalisation of banks (horizontal axis) and the probability of a financial crisis in any given year. The higher the level of capital held by banks, the lower the probability of a financial crisis. The level of capitalisation is expressed as CET1 in % of un-floored Risk Exposure Amount (REA). The relationship in the figure is estimated by BIS (2010).
Source: BIS (2010), page 15 and own calculations; ECB(2007) for pre-crisis capital ratio.

In December 2017, the Basel Committee agreed on a revised regulatory framework to finalise the post-crisis reforms denoted the 'Final Basel III Standard'.

A key objective of the reform is to reduce excessive variability of banks' capital requirements. Most large banks estimate a part of their capital requirements using internal models[3] that calculate the level of risk of the different assets the bank holds.[4]

Policymakers' key concern has been that the variation in the risk estimated by the internal models (and by that, variation in capital requirements) is not linked to corresponding variations in the underlying risks. In particularly, policymakers are concerned that modelled risks are underestimating actual risks. This would mean that banks might underestimate potential losses and therefore would not have enough capital to keep the financial system stable in a crisis.

To address this, the Basel Committee has suggested (among other measures)[5] the implementation of a so-called *output floor*, providing a minimum level of capital that a bank must hold (based on the banks' exposures), thus working as a backstop for excessive low estimated risk.

Now, the European Commission is in charge to present a proposal of how to implement the package in the EU, see Figure 2 for an overview of the timeline.

3 Usually, banks with an advanced risk model framework do so.
4 See Box 1 in Copenhagen Economics (2020) *Impact of The Final Basel III Framework in Sweden, Effects on the banking market and the real economy*, from now on abbreviated as "CE 2020".
5 See Copenhagen Economics (2020) and EBA (2019a) for more details.

Figure 2
Timeline of Final Basel III Standard: agreement and implementation

Note: The start of the implementation depends on the duration of the negotiations with the European Parliament and the European Council.
Source: Illustration by Copenhagen Economics, based on publicly available information.

1.2 IMPACT ON BANKS' CAPITAL NEED

The European Banking Authority (EBA) has estimated in its most recent impact study[6] that the finalisation of the Basel III reforms will lead to an increase in capital requirements of 19%-20%[7] in its main implementation scenario.[8] This increase in capital requirements from the Final Basel III Standard means that banks will have to raise more capital to comply with the new rules.

In this study, we estimate the isolated impact of the Final Basel III Standard, similar to EBA's study. It could very well be that the supervisory authorities for the respective banks (i.e. the ECB and other NCAs) would respond to the Final Basel III by lowering their discretionarily set capital requirements on a national level. This is, however, a supervisory/regulatory decision that is not considered in this analysis.

Consequently, we assume that banks after the reform will have to reach the same capital ratios as before, i.e. an average capital ratio for EU banks of around 14.5%[9]. Thus, the increase in capital requirements of 19% due to the Final Basel III Standard will lead to a 19% increase in the capitalisation of EU banks. This corresponds to an additional capital need of around EUR 230 bn CET1 capital (plus another 70 bn if UK banks are included).[10] Of this, the additional capital to restore the minimum required capital (MRC) is only around EUR 30 bn. Banks would have to raise an additional

6 See EBA (2020) *Basel III Reforms: Updated Impact Study*

7 The EBA has set the market risk impact for three G-SIIs equal to 0. If the market risk impact for these banks is included, EBA estimates that capital requirements would increase by around 20%, see EBA (2020) *Basel III Reforms: Updated Impact Study*, footnotes 31 and 36. The impact for Denmark was underestimated due to a data reporting error in the impact study. In this analysis the corrected impact for Denmark is used.

8 The impact is expected to be lower if the Final Basel III Framework will be implemented in a way that is somewhat more tailored to the European banking sector. This is called the EU-specific scenario in EBA's impact assessment and would imply an average increase in capital requirements of around 13% in the EU, see chapter 3 for a description of this scenario.

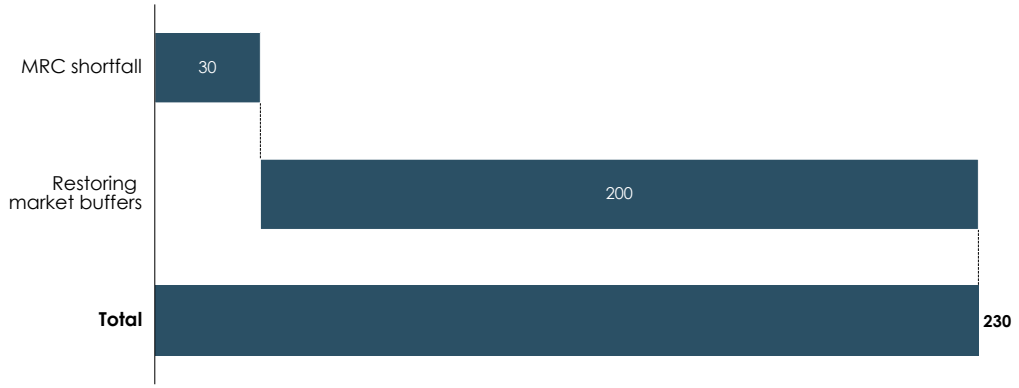
9 Fully-loaded CET1 ratio for the largest European banks covered by EBA's transparency exercise. Data are from December 2019.

10 Based on data for the largest European banks from EBA's transparency exercise as of December 2019.

EUR 200 bn in order to restore the buffers that banks hold on top of this minimum required capital—known as *market buffers*; see Figure 3.

Note that this is an assessment takes the starting point in the reform not (yet) being implemented at all and estimates the impact of full implementation. That fact that some banks might have started to raise some of the EUR 230 bn would not change our estimate. Whatever banks have raised in anticipation of the final Basel III Standard is part of the total impact of the reform.

Figure 3
CET1 capital need due to Final Basel III (main estimate)
EUR bn



Source: EBA (2020) Basel III reforms: updated impact study; EBA transparency exercise (data from December 2019) and own calculations.

This estimation assumes that banks keep the same market buffer relative to risk-weighted assets after the reform. The increases risk-weighted assets due to the reform therefore increases the market buffer in absolute terms from today's level. However, it is also possible that banks keep their current market buffers in absolute terms. The increase in risk-weighted assets then does not affect the absolute market buffers and will decrease the market buffer relative to risk-weighted assets.[11] If banks kept their market buffers at their current absolute level, this would reduce the additional CET1 capital need to around EUR 170 bn (excluding the UK). The new average CET1 ratio after the reform would then be lower, at around 13.8%.

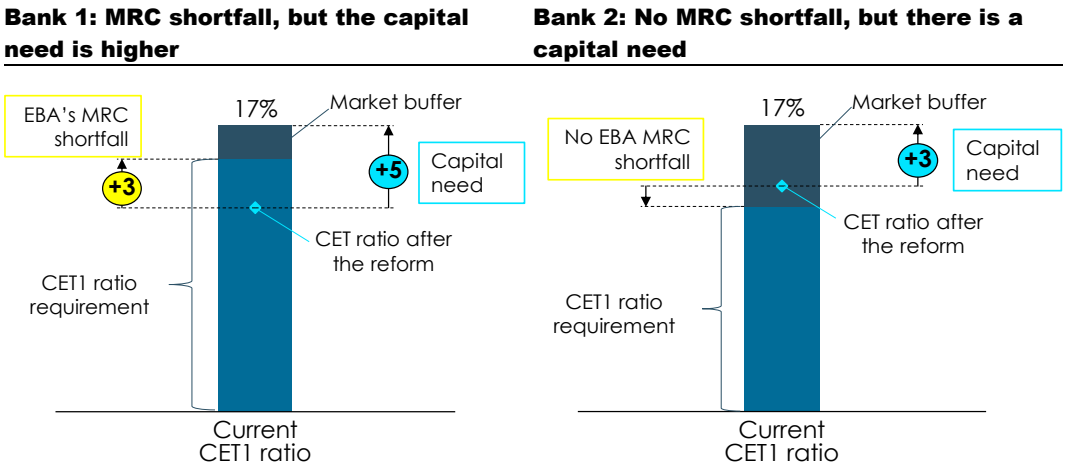
1.2.1 Difference between capital need and EBA's MRC shortfall

The EBA focuses on the *MRC shortfall* of EUR 30 bn in their impact assessment. This is an estimate of how much capital banks would need just to comply with the minimum required capital (MRC). Only if the capital ratio after the reform will be below the MRC will banks have an MRC shortfall. However, banks cannot operate exactly on the MRC – they operate with a buffer to the MRC, currently at around 4%-points, see Section 1.2.2. This difference between actual capital ratio and MRC is what we refer to as *market buffer*.

[11] It could also be the case that some banks have already increased their market buffers in anticipation of the reform. This could be another reason why market buffers might decrease relative to risk-weighted assets after the reform and be kept at their current absolute levels.

In contrast to the MRC shortfall, the measure of *capital need* we apply in this study is an estimate of how much capital banks will have to raise to fulfil both the MRC and to replenish the market buffers they currently hold on top of the MRC. Thus, we estimate the capital needed to restore current CET1 ratios, up from the lower CET1 ratio after the Final Basel III Standard. The difference is illustrated in Figure 4 below.

Figure 4 Illustration of the difference between the EBA's MRC shortfall and the capital need: Two examples
CET1 in % of risk-weighted assets

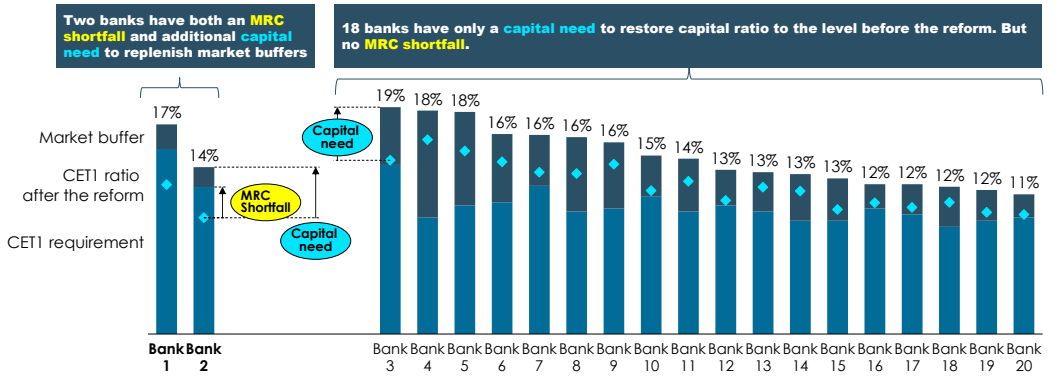


Note: The *CET1 ratio after the reform* refers to the capital ratio banks would have after the reform without any recapitalisation.
Source: Illustration by Copenhagen Economics

Our estimations – subject to uncertainty[12] – show that most of the largest EU banks will not experience an MRC shortfall, i.e. their CET1 ratios after the reform will not fall below the required capital ratio. But they will still have to raise additional capital to restore their market buffers and to sustain their desired capital ratio. This leads to a capital need for these banks, see Figure 5.

[12] Our model estimates on an institutional level are subject to uncertainty due to limitations in the available data. While the impact of the reform on country level is calibrated to the results from EBA's impact assessment, institution-specific estimates might differ. Specifically, our model suggests an MRC shortfall of around EUR 21 bn, EUR 9 bn below EBA's estimate.

Figure 5
Illustrative estimation on bank specific MRC shortfall and capital need for the 20 largest banks in EU
CET1 ratio



Note: Calculations are based on the Basel III scenario and on data as of December 2019. The changed composition of the P2R in CRD V (frontloaded due to the COVID-19 crisis) is not included. The *CET1 ratio after the reform* refers to the capital ratio banks would have after the reform without any recapitalisation.
Source: EBA (2020) – Basel III reforms: updated impact study; EBA transparency exercise (data from December 2019) and own calculations.

1.2.2 Why financial institutions need market buffers

European banks hold on average a market buffer of around 4 percentage points. The reason why banks hold market buffers is twofold: to withstand real-economy fluctuations and to satisfy market expectations.

Real-economy fluctuations

The level of capitalisation of banks can fluctuate as part of business operations. An unforeseen crisis, such as the recent COVID-19 pandemic is one example of such fluctuations. By impairing bank customers' ability to repay their loans, it forces banks to write off more of their loans than expected, inflicting losses that were not factored in by provisions. This puts pressure on banks' capital ratios.

The recent COVID-19 crisis is a good example of why banks need a buffer above the capital requirement. The IMF estimated that capital ratios could decrease by around 1.6 percentage points due to credit losses and changes in risk-weighted assets stemming from a higher risk of exposures during the COVID-19 crisis.[13] If banks operated with a small or no buffer, the 1.6 percentage point decline in capital ratios would have meant that banks would have fallen below capital requirements and suffered the regulatory consequences this entails.[14] A likely consequence of this is deleveraging since banks' focus would shift to strictly restoring capital. The subsequent slowdown in credit supply would lead to negative real-economy repercussions, for instance because bank customers do not receive the funds to carry out profitable investments.

13 Aiyar et al. (2021) *COVID-19: How Will European Banks Fare?* (baseline scenario).
14 Examples for such regulatory consequences include restrictions on the distribution of earnings or share buybacks.

By operating with a market buffer that is sufficiently high, banks can stay sufficiently above their capital requirements to avoid regulatory repercussions in case of business fluctuations and continue to service the real economy on normal terms.

Due to the importance of market buffers, they are in fact partly institutionalised by, for instance, Pillar 2 guidance (P2G). While not being a binding requirement, breaching the P2G will trigger increased scrutiny by the national competent authority (NCA) and can result in fine-tuned measures for the bank.

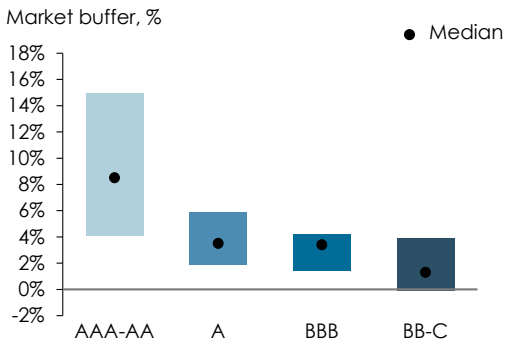
Market buffers to satisfy market expectations

The fact that market buffers serve to withstand real-economy fluctuations and the above-mentioned consequences of breaching the minimum required capital are known to the market (i.e. investors in banks). Therefore, the market also expects a buffer on top of capital requirements for banks to operate.

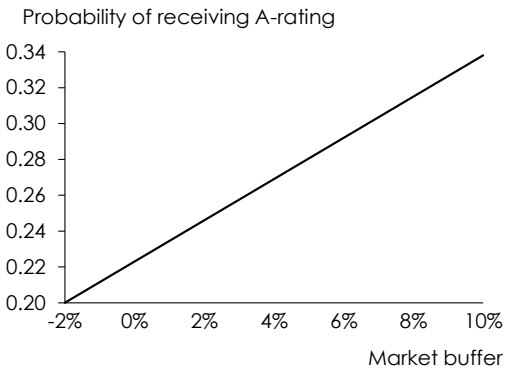
If the level of capitalisation of a bank is below the expected buffer, the bank will be regarded as less safe by the market. This can reduce ratings by rating agencies and have negative impacts on banks' credit risk premia, increasing its funding costs, see Figure 6.[15]

Figure 6 Low market buffers lead to worse credit rating

Higher-rated banks tend to have higher capital buffers than lower-rated banks
Distribution of market buffers across bank credit ratings



Lower market buffers increase the probability of a bank receiving a lower credit rating
Estimated impact of market buffers on the probability of receiving an A-rating



Source: ECB (2020a) *Financial market pressure as an impediment to the usability of regulatory capital buffers*.

To sum up, market buffers are therefore not held voluntary, and banks cannot easily use market buffers to reduce the amount of additional capital they need to raise after the reform. Market buffers are rather a safety cushion built into banks' business models to maintain banks' ability to act

[15] This reasoning is supported by the literature and a number of publications by the ECB, see for example ECB (2020) *Financial market pressure as an impediment to the usability of regulatory capital buffers*, ECB (2020) *Macroprudential capital buffers – objectives and usability*, ECB (2020) *Bank funding costs and solvency*.

also in periods of economic distress, and to satisfy market expectations. Therefore, banks need to keep a buffer to capital requirements after the implementation of the Final Basel III.

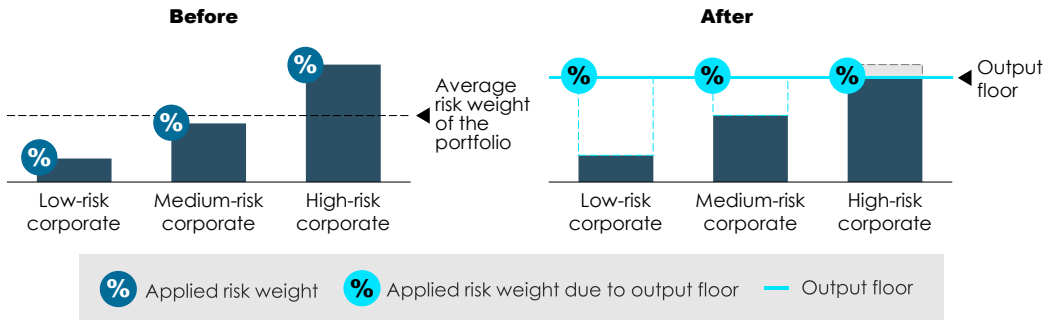
1.3 THE OUTPUT FLOOR AFFECTS CAPITAL REQUIREMENTS AND LIMITS RISK SENSITIVITY

One of the most impactful aspects of the Final Basel III Standard in several countries is the output floor. With the objective of reducing variability in banks' risk-weighted assets, the output floor effectively puts a lower bound of required capital for each type of asset.

To understand how the output floor can set a lower bound on the required capital it is important to look at the riskiness of the banks' businesses activities. This is because the required capitalisation of banks is not only determined by the total amount of exposures but also by the level of risk of these exposures. The level of risk of each exposure is identified by its risk weights which are calculated by most large banks using internal models. The estimation process and outcome are then reviewed and approved by the competent regulatory authority – for banks supervised by the European Central Bank in particular through the TRIM exercise. The resulting risk weights are used to determine the banks' risk-weighted assets, which determine the overall amount of capital banks must hold.

The output floor effectively incorporates a lower bound for the banks' risk-weighted assets in order to provide a backstop for banks' internally modelled risk weights. In practice, this is equivalent to banks having to apply a minimum risk weight to each category of assets (e.g. rated corporate, SME retail or retail mortgage), instead of applying a risk weight to each asset based on the estimated risk of that asset using internal models. That means that below the output floor, low-risk exposure for banks bound by it will effectively be subject to the same risk weight as higher risk exposures within the same portfolio, see Figure 7. In other words, below the output floor the same risk level is applied to exposures, independently of their actual risk.

Figure 7
Illustration of application of output floor
Estimated level of risk



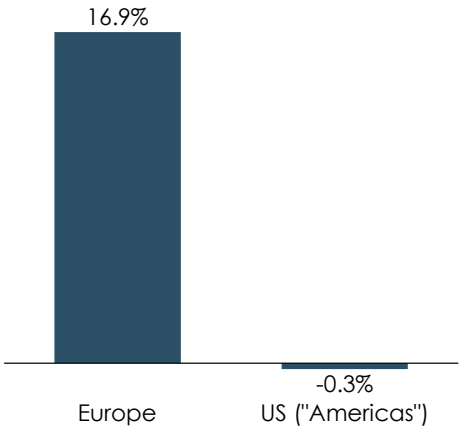
Note: The figure above illustrates how the output floor would increase risk weights for certain assets. As an example, we show how risk-weights for low- and medium-risk corporates will increase, because the risk estimated by banks' models is lower than when the output floor is applied (and binding). The risk weights for the high-risk corporate will actually be lower with a binding output floor, because the internal models set a risk weight above the output floor. It should be noted that the output floor is one floor applied on the totality of risk-weighted assets that a bank holds. However, the effect in practice has a different impact on different categories of assets, as illustrated in the figure below. Please note, that there are different risk weights applied to different categories of borrowers (e.g. unrated corporates, rated corporates, SMEs, etc), so the purpose of the figure is merely to illustrate the effect of the output floor.
Source: Illustration by Copenhagen Economics.

The resulting loss of risk sensitivity of capital requirements could distort incentives for financial institutions. Using internally modelled risk weights, there is a clear incentive for banks to reduce the risk within each asset class; if the risk of an asset increases, the capital requirement for that particular asset will also increase, and the bank will be required to hold more (costly) capital. However, with the output floor, increased risk-taking will not lead to higher capital requirements for riskier exposures (when below the output floor). Consequently, risk-taking becomes "cheaper".

1.3.1 The impact of the output floor on US capital requirements is close to zero

The impact of the Final Basel III on capital requirements in the United States (US) is very different: while the Bank for International Settlements estimates minimum required capital (MRC) for EU banks to increase, on average, by 16.9% following the Final Basel III, for US banks the MRC would almost remain unchanged, see Figure 8.

Figure 8
Impact on capital requirements from the Final Basel III
% of MRC



Note: The country group "Americas" also contains Canadian, Brazilian and Mexican banks, but is dominated by US banks in the sample. The impact in the Americas is therefore indicative of the impact in the US. The results stated here are the numbers for highly capitalised, internationally active banks (Group1 banks). No US bank is represented in the sample of Group 2 banks.
Source: BCBS (2020) "Basel III monitoring report"

The large difference in the impact of the Final Basel III on capital requirements can be attributed to difference in structure of the banking and corporate sector. We highlight four key drivers below:

First, mortgage loans are to a larger extent removed from US banks' balance sheets. The majority of mortgages that US banks issue are sold to Government Sponsored Entities and securitisation is more common in general. Conversely, mortgage loans largely remain on the balance sheet of European banks until maturity. Since mortgage loans in general have a very low-risk profile, this significantly reduces the average risk-weights in EU banks, and therefore the output floor has a higher impact on these banks.

Second, dual recourse is not common in the US. In Europe, the dual recourse to both the borrower and the property is a central element of mortgage lending. This significantly reduces the losses on mortgages compared to the US where non-recourse lending is more common. Again, this leads to lower risk-weights and therefore a larger impact of the output floor.

Third, capital markets play a larger role in the US for credit supply to corporates. In the US corporate credit is to a much larger extent granted through capital markets. This is especially relevant for low-risk business which can benefit from favourable funding conditions on capital markets. Therefore, more companies are also rated in US. In Europe, on the other hand, the vast majority of lending to businesses is granted by banks. This implies that the Final Basel III reform will have a much larger impact on the corporate portfolio in the EU than in the US.

Fourth, US banks have fewer capital buffers. This suggests that the impact on capital requirements in absolute terms is lower than in the EU even if the output floor is binding.

1.4 IMPACT OF THE COVID-19 CRISIS

The impact of the Final Basel III Standard in the EU might be compounded by the ongoing COVID-19 pandemic which has caused one of the most severe global economic contractions in recent history and continues to suppress economic activity in the EU**.** Associated lower company earnings, increased unemployment and economic uncertainty, among other things, expose European banks to the risk of higher future losses.

This puts pressure on banks' solvency ratios through two channels: *First,* higher default rates by corporate and retail customers due to economic hardship inflicted by the crisis will increase banks' credit losses. The associated losses decrease their capital levels (numerator of the solvency ratio) and thereby reduce solvency ratios. *Second,* higher risk weights from internal models due to a higher uncertainty about the ability to repay of those customers that have not defaulted will increase banks' risk-weighted assets (the denominator of the solvency ratio). This will also decrease banks' solvency ratios.

In our analysis we focus on the first of these channels since we expect that the impact on risk weights has large overlaps with the impact of the output floor in the Final Basel III Standard.[16]

The impact of expected credit losses

To counterbalance the pressure on capital ratios due to elevated credit losses, banks will have to raise additional capital in accordance with additional losses. We estimate that the COVID-19 crisis could lead to *additional* credit losses of around **EUR 45-65 bn**. This is based on above-average observed credit impairments in 2020 that capture the extraordinary impairments due to the pandemic. We also include forecasted losses in 2021 in our estimate, see Figure 9. Realising these estimated credit losses corresponds to a decline in the average CET1 ratio of around **0.5-0.8%-points.**

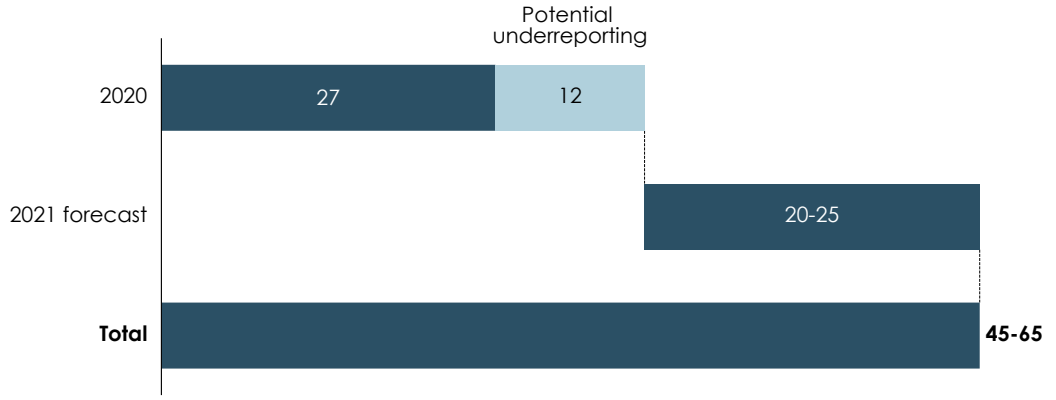
In our estimation, we take into account that the economic outlook for 2021 is better than in 2020 which decreases estimated credit losses compared to 2020.[17] Our upper-bound estimate takes into account that impairments might currently be underestimated and thus do not fully reflect projected credit losses.[18]

[16] A recent study by the IMF estimates that higher risk weights as a consequence of the COVID-19 crisis could reduce CET1 ratios by around 0.4% in their baseline scenario, see Aiyar et al. (2021) COVID-19: *How Will European Banks Fare?*

[17] In particular, we scale down credit losses in 2020 by the difference in the output gap between 2021 and 2020.

[18] See for example Financial Times article "ECB warns banks are 'all over the place' on bad loan preparations". The ECB estimates that actual credit losses might be 50% larger than currently reported impairments, see ECB (2020c) *Global Financial Stability Review (November 2020)*, p. 65

Figure 9
Estimated "above-average" credit losses due to the COVID-19 crisis
EUR bn



Source: S&P Global Market Intelligence database, ECB (2020c) *Global Financial Stability Review (November 2020)*, OECD economic outlook database and own calculations.

A broader view on the impact on capitalisation

The estimated impact on capitalisation described above only considers the impact through elevated credit losses. However, the COVD-19 crisis will most likely also affect bank profitability in a broader way, thereby further putting pressure on capital ratios.

A study by the International Monetary Fund (IMF)[1] takes a broader view on the impact on profitability, including the impact of macroeconomic conditions on banks' net operating income such as net interest income. Adding this to the impact stemming from credit losses, the IMF estimates a decline in the CET1 ratio by around 1.2%, corresponding to around EUR 100 bn.[19]

In the updated impact assessment published in December 2020, the EBA estimated the impact from the pandemic at between 1.8-2.9%-points of CET1[20], based on the 2018 EU-wide stress test and data mostly stemming from the end of 2019. However, the crisis turned out less severe than potentially expected in May 2020 when the methodology for the analysis was published[21]; for instance due to extensive public help packages. The study by the IMF takes into account a wider range of policies that were put in place to tackle the economic crisis inflicted by the pandemic and is more up to date. We therefore implement the estimate from the IMF in our analysis.

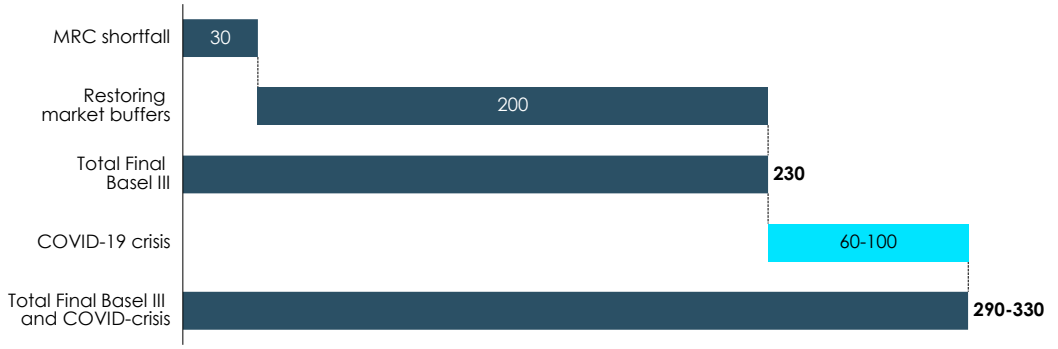
Taken together, the capital need resulting from the Final Basel III Standard coupled with the pressure on bank capitalisation stemming from the ongoing COVID-19 crisis could mean that banks will have to raise capital to the tune of EUR 290-330 bn, see Figure 10.

[19] Based on risk-weighted assets from EBA's transparency data from December 2019. The IMF estimate corresponds to the baseline scenario for the euro area banks that is most comparable to the coverage of banks in EBA's analysis. Our estimate of EUR 100 bn assumes that the large non-euro area banks in EBA's transparency exercise follow the average impact for euro area banks. The impact running through increasing risk weights is again excluded from this estimate.

[20] EBA (2020) *Basel III Reforms: Updated Impact Study*.

[21] See EBA (2020) *The EU Banking Sector: First Insights Into the COVID-19 Impacts*

Figure 10
Capital need due to Final Basel III and Covid-19 crisis
EUR bn



Source: EBA (2020) – Basel III reforms: updated impact study; Aiyar et al. (2021) *COVID-19: How Will European Banks Fare*; EBA transparency exercise; S&P Global Market Intelligence database, ECB (2020) *Financial Stability Review November 2020* and own calculations.

The current economic crisis therefore has the potential to compound the impact the Final Basel III Standard will have on customers and the real economy. This impact is the topic of the subsequent chapter.

CHAPTER 2

IMPACT ON BANK CUSTOMERS AND THE REAL ECONOMY

In this chapter, we analyse how customers of European banks are likely to be affected by the Final Basel III reform, if implemented as in EBA's main scenario, and how this will impact the real economy in the EU. Section 2.1 focuses on the impact on bank customers which will have to pay more for bank services. Section 2.2 describes what the package entails for the real economy overall. Section 2.3 zooms in on the potential consequences of the interaction between the Final Basel III reform and the ongoing COVID-19 pandemic.

2.1 IMPACT ON BANK CUSTOMERS

The higher capital requirements, from the Final Basel III Standard, will translate into higher costs for banks, which we expect to eventually be passed on to bank customers in terms of higher borrowing costs, i.e. interest rates on bank loans and fees.[22] This is widely accepted in the economic literature, e.g., from Bank of England, IMF and ECB; banks' investors cannot be expected to accept permanently lower earnings due to changed financial regulation.[23]

The dynamics can be explained as follows: higher capital requirements mean that banks have to hold more equity for each loan they grant. Equity is a significantly more expensive source of funding than debt: it typically has a required return from investors in the range 10%-15% whereas debt funding costs are usually around 1%-2%.[24] The main reason is that equity is subordinated to debt in case of default, i.e. holding equity entails higher risk, giving rise to a higher required return.[25] Higher capital requirements therefore mean higher costs for banks.

We estimate that the annual increase in capital costs for banks could amount to between EUR 25-30 bn. Exactly how these costs are being passed on to the different customer segments is uncertain and depends on the local competitive situation as well as pricing strategies of the banks. To illustrate the consequences for bank customers, we have simulated the impact using a generic capital cost allocation model, assuming that the price increase for different customers is proportional to the increase in capital requirements.

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22 We refer to these costs of borrowing from banks collectively as 'borrowing cost' below.

23 See, for instance, BIS (2010), Miles et al. (2011), The Riksbank (2011), IMF (2016), ECB (2016) and Bank of England (2016). Note, that this is a long-run consideration – in the short to medium run pass-on can be influenced by competitive dynamics in the banking market, see discussion in Copenhagen Economics (2020) *Impact of the Final Basel III Framework in Sweden*

24 In this study, we assume an average cost of equity funding after taxes of 10%, corresponding to a before-tax cost of equity of around 13%. This number is based on the European banking study by ZEB (2018), covering the 50 largest European banks. The debt funding rate for the European banks in our sample is around 1.3% and is calculated on a bank level using data on bank interest expenditure and total financial liabilities from EBA's transparency exercise.

25 A mitigating effect is that higher share of equity funding leads to lower required return, both for debt and equity because a higher capitalisation makes a bank less risky. This is known as the Modigliani-Miller effect and is included in our results. See Copenhagen Economics (2020) "*Impact of the Final Basel III Framework in Sweden*" for further discussion.

Our estimations[26] suggest that banks' business customers are among the most affected. We find that the reform will increase borrowing costs for large business customers by around 0.24 percentage points on average. Smaller and medium companies might face an increase in borrowing costs of around 0.13 percentage points, see Figure 11.

Between business customers, the impact of the package varies significantly. Newly established SMEs with high leverage (and risk) could experience little impact from the output floor. In contrast, large corporates that have not been rated by credit rating agencies (typically because the corporate has no need to access debt capital markets) and with a long track record of no default will be highly affected.

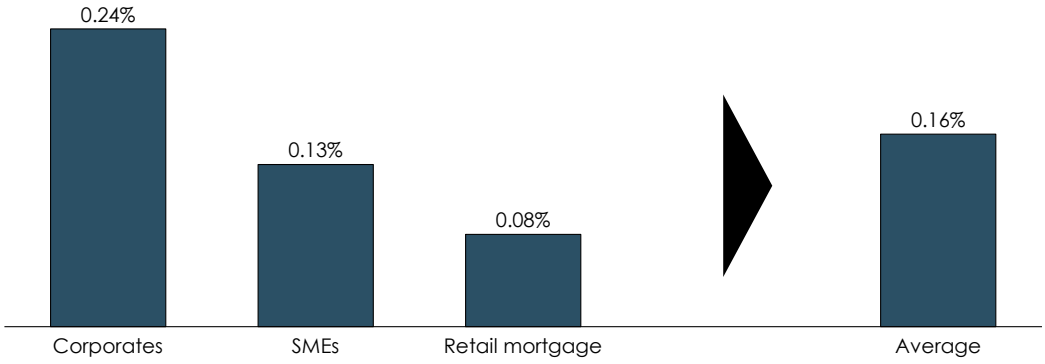
The pronounced increase in the borrowing costs for larger businesses stems mainly from the fact that corporate ratings are less common in the EU. Exposures to unrated large businesses carry a risk weight of 100% in the Final Basel III reform if the output floor is binding. In contrast to that, internal models would typically estimate considerably lower risk weights for lending to large businesses, due to a long credit history without default, solid business models and in many cases the availability of collateral.

Retail mortgage customers will also be affected by the package. We estimate that on average the reform will increase borrowing costs for retail mortgage customers of around 0.08 percentage points for banks using the whole loan approach. For banks applying the loan-splitting approach[27], the increase could be considerably larger, depending on the loan-to-value (LTV) ratio of the loan.

[26] Our estimates are conservative in the sense that we only consider increases in core equity (CET1) and don't include increases in other capital instruments to comply with total capital requirements. Furthermore, potential funding cost increases due to the MREL/TLAC requirement are also not included in these estimates.

[27] In the whole loan approach, standardised risk weights prescribed by the regulator apply to the entire mortgage loan, depending on the loan-to-value ratio. In the loan-splitting approach the part of the loan above 55% of the property value will receive a considerably higher flat risk weight (75% for retail customers) in the revised framework.

Figure 11
Estimated increase in borrowing costs from the Final Basel III Standard
Percentage points



Note: The estimations take into account the so-called Modigliani-Miller effect which suggests that higher capital requirements could lead to a reduction in the banks' cost of equity. The average cost of equity is assumed to be 10% after tax; average debt funding costs for European banks are around 1.3%.
Source: EBA (2020), EBA transparency exercise (data as of December 2019) and own calculations.

Case examples for the impact on the three main customer types

To make the increase in borrowing costs more palpable we illustrate below what the impact of the reform could practically mean for a corporate, SME and mortgage customer.

In the first case we consider a large corporate with a turnover of EUR 500 million and bank debt of EUR 250 million. For such a business the average increase in borrowing costs of 0.24 pp. could increase interest expenditures by around EUR 0.6 million per year. In the most affected countries, where borrowing costs for large businesses could increase by up to 0.5 percentage points, additional borrowing costs could reach up to EUR 1.2 million.

For a typical SME customer with a turnover of EUR 10 million and bank debt of around EUR 2.5 million, borrowing costs could increase on average by around EUR 3,000 per year and by around 8,000 in the countries where SME lending is most affected by the reform.

For a new homeowner buying a house worth EUR 250,000 and with a loan-to-value ratio and maturity corresponding to the EU average[28], total interest expenditures could increase by around EUR 2,000 on average and by up to 3,500 in the most affected countries.

In addition to the direct costs, the Final Basel III reform could distort companies' funding incentives, through two main channels:

- *First*, increased borrowing costs from banks provide a strong incentive to bypass the traditional banking system and seek financing elsewhere. This is especially the case for large unrated corporates that often are considered quite low-risk exposures, which could for instance issue more corporate bonds to bypass the banking system.

[28] The average loan-to-value (LTV) ratio is around 75% and the average maturity around 25 years; see European Mortgage Federation (EMF) (2020) *A Review of Europe's Mortgage and Housing Markets*

- *Second*, there is also a risk that credit will flow to less-regulated institutions, often referred to as shadow banking. This could include credit hedge funds and limited-purpose finance companies.

Note here that there appears to be no economic or financial stability rationale for such reallocation of businesses' financing channels, pushing corporate customers to the bond market and less-regulated finance providers. Thus, we find it unlikely that such reallocation will improve financial stability or economic efficiency.[29]

2.1.1 Interaction with additional tier 1, tier 2 and MREL capital requirements

The above estimations of increase in borrowing costs, is solely a result of increase in core equity (CET1). In addition, the Final Basel III package will increase requirements for additional tier 1 and tier 2 capital as well as other loss-absorbing debt instruments compliant with the *Minimum Requirement for own funds and Eligible Liabilities* (MREL).[30] These are not included in our estimation.[31]

The higher requirements for MREL compliant debt instruments and additional tier 1 and tier 2 capital could further increase borrowing costs as both are subordinated to other liabilities in case of default, and therefore is a more expensive source of finance (depending on the extent of Modigliani-Miller effects for these instruments – see CE (2020) "*Impact of the Final Basel III Framework in Sweden*" for a more thorough discussion of these effects).

2.2 NET IMPACT ON THE REAL ECONOMY

The pass-on of banks' higher funding costs increases borrowing costs for their customers. Higher borrowing costs, in turn, reduce credit demand which curbs investment activity. This causes an overall decline in productivity which, eventually, reduces GDP, see Figure 12.

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29 See Plantin (2014): *Shadow Banking and Bank Capital Regulation*, ESRB (2018) *EU Shadow Banking Monitor* and Hansson et al. (2014) *Shadow Banking from a Swedish Perspective*.

30 The increase in risk-weighted assets as a consequence of the Final Basel III Standard will lead to an increase in MREL for many banks since the MREL requirement set relative to the banks' total risk-weighted assets can be expected to be binding. Banks can use part of the increase in the capital need due to the Final Basel III Standard simultaneously to cover MREL. However, if MREL increases by more than the additional capital need, banks will have to raise additional capital (as opposed to normal debt) to comply with MREL. The associated higher costs for banks will add to the increase in borrowing costs for bank customers and compound the impact on banks and their customers.

31 MREL was introduced as a bank-specific requirement to ensure an orderly resolution of banks in case of bank failure, and a bank can use different types of liabilities to comply with the requirement.

Figure 12
Higher capital requirements decrease GDP, productivity and average wages

Source: Illustration by Copenhagen Economics

To estimate the impact on the economy, we use a modelling framework that was initially developed by the Canadian Central Bank and is similar to the analytical framework used during the development of the original Basel III package.[32]

Our results suggest that if the Final Basel III Standard is implemented according to EBA's main scenario, GDP in the EU will be around 0.4% lower permanently compared to what it would have been without the reform. This corresponds to around EUR 60 bn per year. In other words, we estimate that GDP will every year be around 0.4% lower than in a scenario without the Final Basel III reform.

On the other hand, a higher capitalisation has a positive impact on the stability of financial institutions and the financial system as it makes banking crises less likely. However, the benefits from higher capitalisation are declining with the level of capital and are rather small at the current capital level of European banks. We estimate that the benefits from the reform correspond to a permanent increase in GDP of around 0.1% due to the higher capital requirements from the Final Basel III Standard that reduce the risk of a banking crisis.[33]

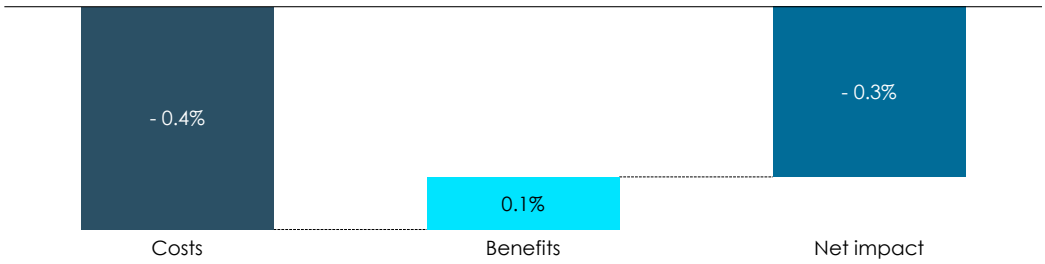
Taken together, we estimate that the Final Basel III Standard will result in a permanent net cost of 0.3% of GDP, see Figure 13. The effects are estimated using a model framework similar to the analytical framework behind the original Basel III reform.[34]

[32] See Copenhagen Economics (2019) and Copenhagen Economics (2020), Chapter 3 as well as Appendix B at the end of this study for details.

[33] This result is based on estimates from the original analytical framework behind the Basel III reform (known as the LEI report), see Basel Committee on Banking Supervision (BCBS) (2010): *An assessment of the long-term economic impact of stronger capital and liquidity requirements*

[34] See BCBS (2010) *An assessment of the long-term economic impact of stronger capital and liquidity requirements* and Meh and Moran (2010) *The role of bank capital in the propagation of shocks*. For details on the model framework see also Copenhagen Economics (2019) *EU implementation of the Final Basel III Framework* and the appendix in this report.

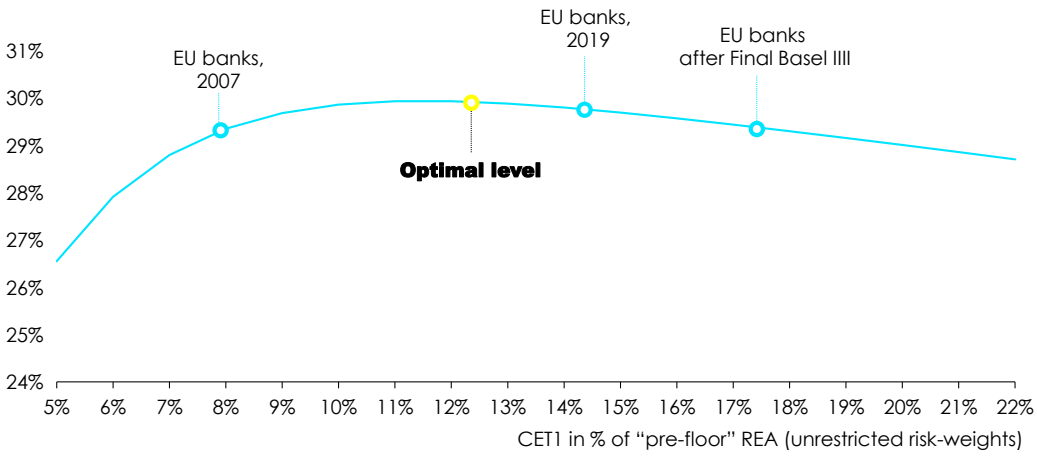
Figure 13
Economic costs and benefits of the Final Basel III Standard
% of long-run GDP



Source: Copenhagen Economics. See Appendix B in Copenhagen Economics (2020) for details on the estimations.

Consistent with this result, studies on the optimal level of capitalisation suggest that European banks have already reached or are above the optimal level of capitalisation. Based on estimation behind the original Basel III package (BIS (2010)), the current CET1 ratio of around 14.5% (end 2019) is around 2-3%-point above the optimal level of capitalisation, see Figure 14. This finding is confirmed in a literature review by BCBS[35] from 2019, which suggests that the average capitalisation of the EU banking sector is either above or within the optimal level.

Figure 14
Optimal capital ratio
Net benefit, % of long-run GDP



Source: Own calculations based on BCBS (2010) *An assessment of the long-term economic impact of new regulatory framework.*

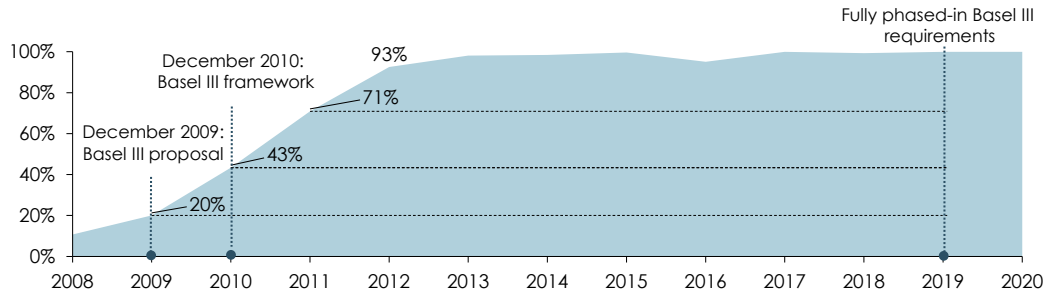
[35] See Table 1 in BCBS (2019) *The costs and benefits of bank capital – a review of the literature for an overview of studies.*

2.3 INTERACTION OF THE FINAL BASEL III REFORM WITH THE COVID-19 CRISIS

The decision on the implementation strategy for the Final Basel III Standard coincides with one of the most severe economic downturns in recent history. This section will therefore take a closer look at the potential of the reform to compound the negative repercussions from the COVID-19 pandemic on the European economy.

The first aspect to note in this respect, is that the rather long phase-in period of the reform does not remedy the risk of a double-dip recession; there is strong evidence that banks adjust to capital requirements shortly after the announcement of a reform, for instance due to market expectations.[36] As such, EU banks very well de facto need to satisfy the Final Basel III requirements, while the COVID-19 crisis still affects EU financial markets and the real-economy. For instance, after the proposal and announcement of the Basel III framework in 2009 and 2010, respectively, most European banks already complied with Basel III capital requirements in 2012 (while they were to be fully phased in 2019 only), see Figure 15.

Figure 15
Banking assets compliant with Basel III CET1 capital requirements
Percent of total EU bank assets



Note: The minimum CET1 capital requirements under Basel III assumed here are the ones mentioned in the original publication on Basel III from December 2010. This implies a fully phased in CET1 requirement of 9.5%, assuming a countercyclical capital buffer equal to the maximum value of 2.5%.
Source: S&P Global Market Intelligence database; BCBS (2009) – Strengthening the resilience of the banking sector, BCBS (2010) – Basel III: A global regulatory framework for more resilient banks and banking systems

This means that EU banks could very well need to adhere to the Final Basel III while the COVID-19 crisis is still in effect. As evidenced from previous crisis, this could lead banks to satisfy the increase in capital requirements through deleveraging, i.e. scaling down credit supply, which, in turn, could exaggerate the negative real-economy consequences of the package.

Broadly speaking, banks can increase their capital ratios in two ways[37]:

[36] See for instance ECB (2015) *The impact of the CRR and CRD IV on bank financing* and JRC (2016) *Drivers behind the changes in European banks' capital ratios*.
[37] See Worldbank (2012) *Bank deleveraging*; Cohen et al. (2014) *Banks and capital requirements: channels of adjustment* and ECB (2012) *EU Bank Deleveraging – Driving Forces and Strategies* for details.

1) **Adjusting the liability side**: Banks can raise additional capital by issuing equity, converting hybrid debt or retaining earnings. This is also known as the "static balance sheet assumption" and is how banks adjust to the Final Basel III in our main scenario explained above as well as in EBA's main scenario.
2) **Adjusting the asset side:** Banks can also adjust through scaling down assets, including lending to business and retail customers. The EUR 230 bn CET1 capital could support assets of around EUR 4,200 bn after the reform, corresponding to around EUR 2,900 bn of lending to business and retail customers (given the current asset composition). If banks fully adjusted on the asset side, it would imply a scaling down of that amount.

There is evidence that banks to a larger extent respond to increases in capital requirements[38] by decelerating or reducing lending during crisis and post-crisis periods compared to normal times.[39] The COVID-19 crisis therefore constitutes a risk that the capital need due to the Final Basel III Standard could put pressure on the banks' ability to provide credit to the real economy, in the recovery from the crisis.

Based on studies of previous crises, we assess that up to 30% of the adjustment to higher capital requirements could happen through deleveraging[40] in our risk scenario.

This would imply a temporary reduction in lending to corporate and retail customers of around EUR 600-700bn corresponding to around 4%-5% of the total exposure to business and retail portfolios.[41] In that scenario, we assume that banks adjust assets symmetrically over their portfolio. If banks were to reduce particularly lending to business and retail customers, the impact on these portfolios would be higher.

Based on a previous study by ECB, deleveraging of that amount could temporarily depress GDP by an additional 1.5 percentage points (compared to a situation without deleveraging) accumulated over the next three years. Thus, this would delay the recovery after the COVID-19 pandemic, see Figure 16.[42]

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38 Gropp et al. (2018) *Banks Response to Higher Capital Requirements: Evidence from a Quasi-Natural Experiment*.

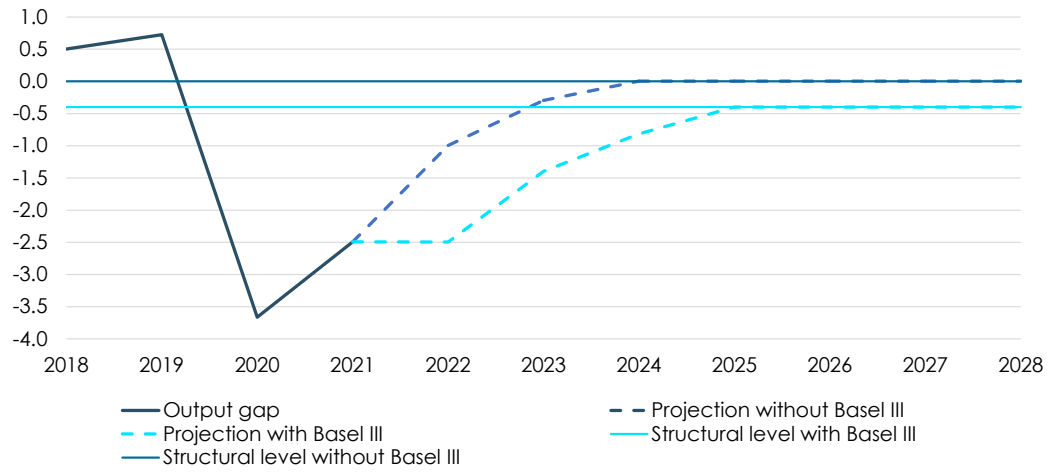
39 See ECB (2015) *The impact of the CRR and CRD IV on bank financing* and JRC (2016) *Drivers behind the changes in European banks' capital ratios*.

40 Gropp et al. (2018) - Banks Response to Higher Capital Requirements: Evidence from a Quasi-Natural Experiment.

41 A decline of 4-5% in lending is consistent with, findings in other studies, see for instance ECB (2015) *The impact of CRD IV and CRR on bank financing* and Mésonnier & Monks (2015) *Did the EBA Capital Exercise Cause a Credit Crunch in the Euro Area?*

42 Based on estimates by ECB (Gross et al. (2016) *The impact of bank capital on economic activity*)

Figure 16
Illustration of the potential development of the output gap
Output gap, per cent



Note: The output gap is defined as the difference between actual GDP less potential GDP as a percent of potential GDP. A negative output gap implies that the economy is operating below its potential. In this illustration we assume the entire shock to GDP due to the deleveraging to happen in one year (2022). In the estimation, we assume that the output gap converges towards the new structural level including Final Basel III. It could be that actual GDP converges to a structural level, only partially including Final Basel III. In that case, the GDP level will then gradually decline towards -0.5% as the permanent effects of Final Basel III reaches the full effect.

Source: IMF Word Economic Outlook database, April 2021 and own calculations.

CHAPTER 3

ALTERNATIVE IMPLEMENTATION OF THE FINAL BASEL III STANDARD

The impact of the Final Basel III Standard in Europe depends on how the package is implemented, e.g. to which the degree the EU-specificities will be taken into account. The impact outlined in the previous two chapters, follows EBA's main scenario. Here, the package is assumed to be implemented somewhat one-to-one in the EU and results in an increase in capital requirements of around 19%. In contrast to this, it is stated in the original G20 mandate[43] that the Final Basel III Standard should be completed without further significantly increasing capital requirements.

To shed light on the impact of an alternative implementation of the reform, this chapter will evaluate different options for implementation. In particular, Section 3.1 will describe and analyse specific options to tailor the reform to the European banking sector and the economy. Section 3.2 concludes the report by outlining a possible way forward for the implementation.

3.1 DIFFERENT OPTIONS FOR IMPLEMENTATION

There are several aspects of the reform that could be better tailored to the European economy. This would decrease the impact of the reform on the European banking sector and real economy, thus making the implementation more aligned with economic considerations as well as with the impact globally. These changes to the implementation in EBA's main scenario can be divided in three categories, which we will outline in the following:

1) Maintaining or extending EU-specific arrangements already in place,
2) An alternative implementation of the output floor
3) Higher granularity in the standardised risk weights.

1) Maintaining EU-specific arrangements

As EBA highlights in its impact assessment, there are currently several EU-specific regulations incorporated in the Basel III framework which can be maintained in order to reduce the impact of the reform:

- **Maintaining the SME supporting factor**: The Final Basel III Framework introduces a preferential risk weight for SME exposures of 85% and 75% for corporate and retail SMEs, respectively. Keeping the current SME supporting factor would further reduce risk-weighted assets up to a certain amount of lending to SMEs on top of the preferential treatment.
- **Ensuring an appropriate setup for the historical loss component in the operational risk framework**: In the Final Basel III framework, the calculation of capital for operational risk REA might be based on their past losses, depending on the jurisdiction the bank operates in. An alternative implementation of the reform could ensure that the regulation does not impose a charge for past losses for which the causes have already been addressed, no matter the jurisdiction.
- **Keeping the Credit Valuation Adjustment (CVA) exemptions**: In the current European framework, specific exemptions are in place for the CVA capital charge, for

[43] See the G20 Communiqué from March 2017.

instance with respect to transactions with non-financial corporations that use derivatives to hedge financial risks.

In its impact assessment, the EBA has estimated the impact of the reform when these options are implemented at around 13%, i.e. more than 5 percentage points lower than in its main scenario.

The parallel stack approach to the output floor

In several European countries a large part of the impact of the reform stems from the output floor. In its standard design – the *single stack approach* – the risk-weighted assets calculated under the output floor (called floored risk-weighted assets)[44] are applied to all capital requirements. This approach overlaps with EU-specific local buffers and substantially limits risk-sensitivity of capital requirements.

However, there is another way of interpretating the implementation of the output floor, dubbed the *parallel stacks* approach, where only internationally agreed buffers[45] are used to calculate capital requirements based on the *floored* risk-weighted assets. In addition, banks need to comply with a second stack of capital requirements, where the *non-floored* risk-weighted assets are applied to all capital requirements. The higher of the two capital requirement stacks is the binding one.

This way of implementing the output floor would mean that the output floor will not be binding for most banking assets, thus keeping the risk sensitivity of capital requirements.[46]

According to EBA's impact assessment, this way of implementing the output floor could further reduce the increase in capital requirements by around 5 percentage points on top of the EU-specific implementation.

More granular standardised risk weights

We also suggest considering refinements to the standardised risk-weight framework, to mitigate the reduction in risk-sensitivity of capital requirements in situations where the output floor is binding. This would more generally limit the extent to which capital requirements are being pushed above underlying risks. In particular, we suggest considering two types of changes:

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44 The risk-weighted assets under the output floor are calculated as the total risk-weighted assets using only the standardised approaches, multiplied by 72.5%.

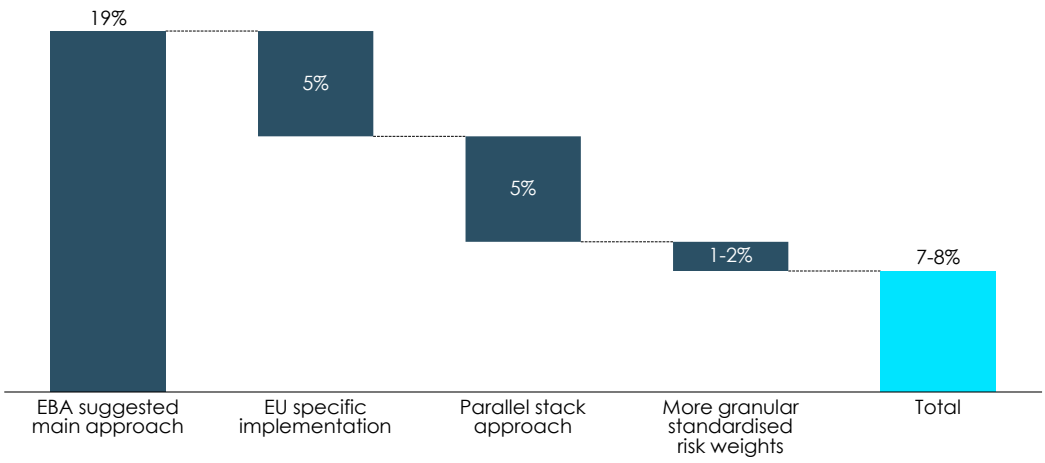
45 This includes the minimum Pillar 1 requirement of 4.5%, the capital conservation buffer, the countercyclical capital buffer and the buffer for global systemically important institutions.

46 Note that the parallel stack approach also provides a backstop against excessively low risk weights, just at a less strict level.

- **Investment grade risk-weight for unrated corporates:** Corporates without a credit rating carry a risk-weight of 100% which is substantially higher than what current internal models would suggest for large, typically rather low-risk exposures to big companies. The Basel III Framework provides the possibility for a lower risk-weight of 65% for companies known as *investment grade corporates*[47], applicable to listed companies in jurisdictions where external credit ratings are not allowed to be considered in the prudential framework. Because only a small fraction of businesses in Europe is listed on a stock exchange, the investment grade classification is mainly unavailable in Europe. One way of alleviating this problem would be to allow the investment grade classification for all high-quality unrated corporates in the EU, irrespective of the jurisdiction and of whether they are listed or not.
- **More granular risk weights for real estate lending:** Another option is to implement more risk sensitive and granular standardised risk weights for mortgage loans. Such refinements could be considered for both the whole loan and the loan-splitting approach.[48] This would allow capital requirements to better reflect the riskiness of the loan and somewhat reduce the loss of risk sensitivity if the output floor is binding.

If all of these alternatives for implementation are factored in, the increase of capital requirements due to the reform could go down to around 7-8%, see Figure 17.

Figure 17
Impact on MRC with the different options for implementation
% of original MRC



Source: EBA (2020) *Basel III Reforms: Updated Impact Study;* EBA transparency exercise (data as of December 2019) and own calculations.

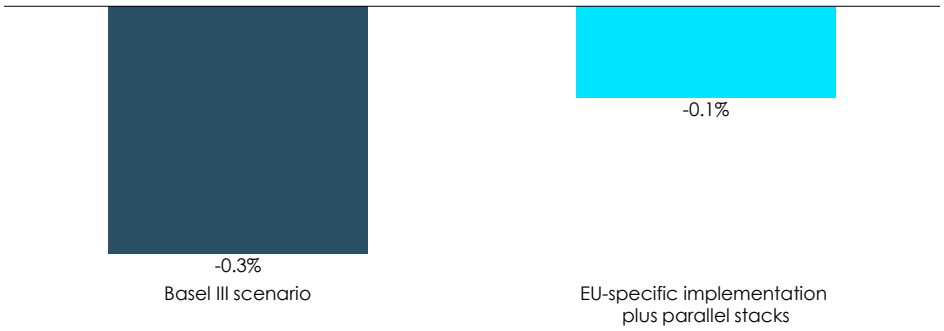
47 An investment-grade corporate is an entity with "adequate capacity to meet its financial commitments in a timely manner and its ability to do so is assessed to be robust against adverse changes in the economic cycle and business conditions" (EBA (2019a), p. 74).

48 In the whole loan approach, standardised risk weights prescribed by the regulator apply on the entire mortgage loan, depending on the loan-to-value ratio. In the loan-splitting approach the part of the loan above 55% of the property value will receive a considerably higher flat risk weight of 75% in the revised framework.

The lower increase in capital requirements when the Final Basel III Standard is implemented in the EU according to the recommendations mentioned above leads to a smaller net cost from the reform. We estimate net societal costs corresponding to around 0.1% when the reform is implemented with the recommendations, see Figure 18. This is around one third of the impact if the reform is implemented as in EBA's main scenario.

In addition to the abovementioned recommendations, we suggest paying close attention to the upcoming calibration of the trading book and Counterparty Credit reviewed standards. Although outside the scope of this study, the calibration can have significant impact on the required capital for European investments banks and it is therefore important to ensure it too adequately reflects underlying risks.

Figure 18
Net impact on long-run GDP of recommended implementation
% of long-run GDP



Source: Copenhagen Economics. See Appendix B at the end of this study for details on the estimations.

3.2 A WAY FORWARD

This paper has highlighted different paths the implementation of the Final Basel III can take. We suggest taking into account the EU specificities when implementing the reform and to implement the output floor in the way of the parallel stacks approach. Both from an economic as a well as a financial stability perspective, we find that this alternative suggested implementation would be the best suited option for the European economy, due to two main reasons:

- It will lead to a smaller impact on capital requirements, with resulting smaller impact on borrowing costs and therefore fewer real-economy costs;
- It will largely keep the link between capital requirements and underlying risk for assets, i.e. risky lending remains more expensive for banks, which ensures incentives for banks are better aligned with financial stability considerations.

Finally, we suggest continuing the ongoing work to increase transparency, comparability, and precision of internal models of financial institutions. This has, for example, been the focus of the ECB's targeted review of internal models (TRIM) as well as the ongoing monitoring by the national competent authorities (NCAs) and the European Banking Authority within its mandate to provide guidelines for and assessments of internal models.

Ultimately, financial institutions that have (1) solid, verifiable models identifying their risks and (2) can document their solidity, even in very adverse economic conditions, through stress tests, should be able to use these models in determining their capital adequacy.

REFERENCES

Bank of England (2016) *Pass-through of bank funding costs to lending and deposit rates*

Basel Committee on Banking Supervision (BCBS) (2010) *An assessment of the long-term economic impact of stronger capital and liquidity requirements*

BCBS (2013) *Analysis of risk-weighted assets for credit risk in the banking book*

BCBS (2016) *Analysis of risk-weighted assets for credit risk in the banking book*

BIS (2010) *An assessment of the long-term economic impact of the new regulatory framework*

BIS (2019a) *Basel III Monitoring Report*

BIS (2019b) *The costs and benefits of bank capital - a review of the literature*

Cannata, F., Casellina, S. & Chionsini, G. (2020) *Time to Go Beyond RWA Variability for IRB Banks: An Empirical Analysis*

Cohen, B. & Scatigna, M. (2014) *Banks and capital requirements: channels of adjustment*. BIS Working Paper No 443

Copenhagen Economics (2016) *Cumulative impact of financial regulation in Sweden*

Copenhagen Economics (2019) *EU Implementation of the Final Basel III Framework, Impact on the banking market and the real economy*

Copenhagen Economics (2020) *Impact of The Final Basel III Framework in Sweden, Effects on the banking market and the real economy*

Danmarks Nationalbank (2008) *Financial stability 2008*

EBA (2017) *Results from the 2016 High Default Portfolios (HDP) Exercise*

Eikon Refinitiv database

European Banking Authority (EBA) (2019a) *Basel III Reforms: Impact Study and Key Recommendations*

European Banking Authority (EBA) (2019b) *Basel III reforms: Impact study and key recommendations – Macroeconomic assessment, credit valuation adjustment and market risk*

European Banking Authority (EBA) (2020) *Basel III Reforms: Updated Impact Study*

European Central Bank (ECB) (2007) *EU Banking Sector Stability*

European Central Bank (ECB) (2012) *– EU Bank Deleveraging – Driving Forces and Strategies*

European Central Bank (ECB) (2015) *The impact of the CRR and CRD IV on bank financing*

European Central Bank (ECB) (2016) *The impact of bank capital on economic activity*

European Central Bank (ECB) (2020a) *Financial market pressure as an impediment to the usability of regulatory capital buffers*

European Central Bank (ECB) (2020b) *Buffer use and lending impact*

European Central Bank (ECB) (2020c) *Financial Stability Review, November 2020*

European Central Bank (ECB) (2021) *TRIM report*

European Investment Bank (EIB) (2019) *EIB Investment Survey Denmark*

European Systemic Risk Board (ESRB) (2018a) *EU Shadow Banking Monitor*

ESRB (2018b) *Adverse macro-financial scenario for the 2018 EU-wide banking sector stress test*

Eurostat (accessed in 2020), selected statistics

G20 Communique, March 18th, 2017, available at http://www.g20.utoronto.ca/2017/170318-finance-en.html

Gropp, R., Mosk, T., Onega, S. & Wix, C. (2018) *Banks Response to Higher Capital Requirements: Evidence from a Quasi-Natural Experiment*

Gross, M., Kok, C. & Zochowski, D. (2016) *The impact of bank capital on economic activity – Evidence from a Mixed-Cross-Section GVAR model*

Hansson, Oscarius and Söderberg (2014) *Shadow banking from a Swedish perspective*

IMF (2016) *Benefits and Costs of Bank Capital*

IMF (2017) *Heterogeneity of Bank Risk Weights in the EU*

Join Research Centre (JRC) (2016) *Drivers behind the changes in European banks' capital ratios*

Mésonnier, J-S.; Monks, A. (2015) *Did the EBA Capital Exercise Cause a Credit Crunch in the Euro Area?*

Miles, Yang and Marcheggiano (2011) *Optimal bank capital*

Plantin (2014) *Shadow Banking and Bank Capital Regulation*

Worldbank (2012) *Bank deleveraging*

ZEB (2018) *European Banking Study*

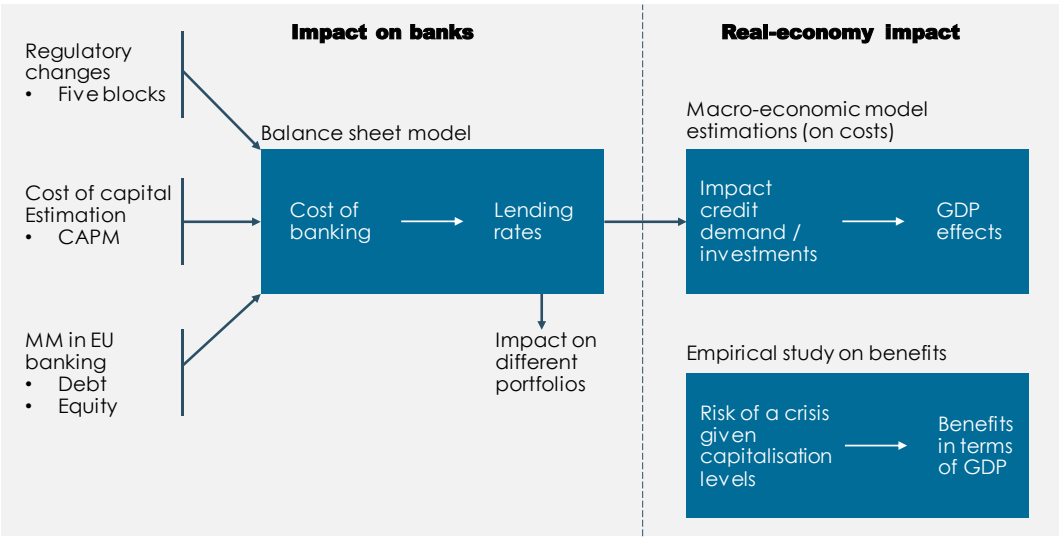
APPENDIX A

THE BANKING BALANCE SHEET MODEL

The appendix describes both the balance sheet model we use to estimate the impact of The Final Basel III Standard on different customers as well as the impact on demand, investment and GDP estimated with our macroeconomic model (see Figure A.1 for an overview).

In Appendix A, we explain our estimations within the balance sheet model. The estimation of the macroeconomic effects is described in Appendix B.

Figure A.1
Overview of the model framework



DATA AND SAMPLE

For our estimations, we use three primary sources of data:

- **The results from the EBA transparency exercise:** the EBA transparency exercise contains detailed information on the regulatory capital for 111 banks across 24 European countries. The data includes information on original exposures, exposure values (exposure at default in BIS terminology) and risk-exposure amounts (REA) for credit risk split across different asset classes. It also contains data on own funds, total assets and liabilities as well as data from the banks' income statements. This data forms the basis for the calculations within the balance sheet model. The data are from end December 2019.

- **EBA impact assessments:** the EBA impact assessments provide a detailed analysis of the expected impact of the Final Basel III Standard. We closely follow the results obtained in the EBA impact assessments in that we calibrate the country-average impact obtained in our model to the numbers estimated by EBA for all countries but Denmark.[49] We mainly use data from EBA's updated impact assessment[50] published in 2020 that uses data from December 2019 as well. When specific data needed for the analysis was only available in the first update of the impact assessment[51] or in the original impact assessment from 2019[52], we resorted to either of these impact assessments.

Additionally, we use data from the European Systemic Risk Board to obtain information on additional European capital buffers currently in place (e.g., the countercyclical capital buffer or the systemic risk buffer).[53] We assume that with the updated framework introduced by CRD V the O-SII buffer will replace the systemic risk buffer for Danish banks (which is currently at around 2.5% on average for the Danish banks in our sample).

ESTIMATION OF THE IMPACT ON CAPITAL REQUIREMENTS OF THE FINALISATION OF BASEL III

The finalisation of Basel III can impact banks' capital requirements through different channels such as the revision of the standardised approach to credit risk (CR-SA) as well as the internal ratings-based approach, adjustments in the calculation of CVA, market risk and operational risk capital requirements and the output floor.

Our estimation is carried out in five steps:

- Step 1: Original exposure values and risk exposure amounts
- Step 2: Implementing the measures of the package, except output floor
- Step 3: Implementing output floor
- Step 4: Calibration to EBA country-specific MRC impact
- Step 5: Simulating impact on interest rates.

Step 1: Original Portfolios

First, we calculate the exposure values, risk exposure amounts (REA) and average risk weights for our portfolios (both for exposure classes under the CR-SA and the IRB approach):

- **SME**: including SME retail exposure, SME mortgage exposure as well as exposure to SME corporates.
- **Mortgage** is only composed of mortgage exposure to households.

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49 The impact for Denmark has been underestimated in the most recent EBA study due to an error in the reported data. We therefore calibrate our model to the Danish FSA's corrected calculation which estimates an increase in risk exposure of Danish banks of around 36% in the Basel III scenario.

50 EBA (2020) – Basel III Reforms: Updated Impact Study (Results based on data as of 31 December 2019)

51 EBA (2019b) – Basel III Reforms: Impact Study and Key Recommendations (macroeconomic assessment, credit valuation adjustment and market risk)

52 EBA (2019a) – Basel III Reforms: Impact Study and Key Recommendations

53 In our estimations we apply a countercyclical capital buffer of 2%, which is the buffer banks faced at the end of 2019. That buffer was subsequently reduced to 0% to mitigate the impact of the COVID-19 pandemic. However, we expect this to be a temporary measure and that the countercyclical capital buffer will be increased back up to 2% once the pandemic is overcome.

- **Corporate**: exposure to corporates excluding corporate SMEs.
- **Public sector:** exposures to central banks, central government and other public sector entities.
- **Bank:** exposures to financial institutions.

The remaining credit portfolios (equity, securitisation and non-credit-obligation assets) are left unchanged and correspond to the exposure classes in the EBA transparency exercise.

Apart from the credit-risk portfolios we also include REA for market risk, operational risk, CVA as well as other remaining non-credit-risk portfolio REAs.

Step 2: Impact of the measures other than the output floor

In this part of the calculation, we estimate the impact on the individual banks' REA of the revision of the standardised as well as the IRB approach, adjustments in the calculation of CVA, market risk and operational risk capital requirements.

In a first step, we estimate the revised standardised risk weights due to the finalisation of Basel III. Specifically, the current SA risk weights are calculated as the ratio of portfolio REA over portfolio exposure for each bank (giving the current portfolio risk weight) and are then adjusted according to the increase in exposure class standardised REA estimated in EBA's impact study.

The impact of the revision of the IRB approach is based on the portfolio impact of EBA's impact study and is calibrated to match the total change in REA due to the IRB revision on an EU level. We conduct these calculations for each of the different portfolios in our model.

The increase in REA due to CVA, market risk and operational risk is approximated by using the EU-average impact provided in the EBA. This implies that CVA REA increases by 572% for each bank in the implementation of the framework, as recommended in the EBA impact study. Market risk and operational risk are assumed to increase by 200% and 139%, respectively.

We calibrate the overall country impact of all the measures except the output floor to the results in EBA's updated impact assessment.

Step 3: Implementing the output floor

The output floor is implemented as the last requirement and it provides a lower bound for risk weights estimated using internal models for the determination of banks' risk exposure amount by restricting risk exposure amounts to be at least 72.5% of the risk exposure amounts calculated under the standardised approaches. The output floor is applied on an aggregate level.

For assumptions regarding risk weights under the output floor, see appendix in CE (2020): "*EU implementation of the Final Basel III Framework*".

To determine the impact of the output floor, we calculate the 'hypothetical' REAs by applying the above risk weights to the banks' IRB exposures and then floor total REA by multiplying by 72.5%. The binding REA will be the largest of either the output floor REA or the pre-floor REA from step 2.

Step 4: Calibration to EBA country-specific MRC impact

In a fourth step, we calibrate the new REA obtained from our model to the country-average results in the EBA report usind data from December 2020. In particular, we calibrate the increase in REA to the increase in MRC in the respective country (except for Denmark where we calibrate to the Danish FSA's corrected impact).

Step 5: Impact of a change in capital requirements on interest rates

The impact on the portfolio borrowing costs is a consequence of the change in the bank-funding structure after the implementation of the Final Basel III Standard. Due to the increase in the capital need following the banking package, banks will need to finance a larger share of their credit portfolio with equity, which is more expensive than debt. We assume that banks keep the same CET1 ratio as before the implementation of the Final Basel III Standard. This means that banks are not able to use any buffer they might hold on top of the capital requirements to compensate for the increased capital requirements due to the Basel III revisions.

In general, the impact on funding costs for a portfolio is calculated as:

Increase in risk weight • capital ratio • (equity cost rate – debt cost rate)

We make the simplifying assumption that the percentage point increase in funding costs will lead to an equivalent percentage point increase in borrowing costs, i.e. that banks fully pass on higher costs to their customers. In the calculations, we assume a required return on equity of 13% (10% after taxes) which is in line with an estimate in a recent study conducted by the EBF, covering the 50 largest banks in Europe.[54] In comparison, the assumed cost of equity in BIS (2010) is higher than what we assume, namely at 14.8%.

The debt-funding cost rate is estimated for each bank using data on bank interest expenses and financial liabilities from EBA's transparency exercise.

In our estimation, we also account for so-called 'Modigliani-Miller' effects (MM-effects). We assume that when the capital ratio increases by 1 percentage point, the cost of equity decreases by around 0.15 percentage points. The impact on borrowing costs from an increase in capital is thus mitigated by MM-effects. For a discussion on MM-effects, see Appendix B and Copenhagen Economics (2016a): "*Cumulative impact on financial regulation in Sweden*".

Finally, we distribute the impact on operational risk REA across credit portfolios according to the share of the respective credit portfolio REA in total banks' credit risk REA.

[54] See ZEB (2018).

APPENDIX B

ESTIMATION OF THE MACROECONOMIC EFFECTS OF THE FINAL BASEL III FRAMEWORK

MACROECONOMIC COSTS

To estimate the macroeconomic costs, i.e., the impact on GDP and investments, we use a model developed by Meh and Moran (2010). It is a so-called Dynamic Stochastic General Equilibrium (DSGE) model, which is a structural macroeconomic model. The model has a well-specified financial sector, which enables us to analyse the effects of higher banking costs.

There are several reasons why Meh and Moran (2010) is our preferred macro model:

1. The micro-foundation enables a modelling of banks' response to changing financial regulation. This includes adjustments, both on the asset and liability side, as well as the effects on lending rates.
2. The general equilibrium effects of the model allow for continuous feedback between the real economy and the financial sector. When higher capital requirements are introduced, this increases lending costs, which reduce investments and hereby compress GDP. This, in turn, decreases asset values, making lending even more costly, which reduces investments and thereby GDP further. This cycle continues until the economy has reached a new equilibrium. This is the so-called financial accelerator mechanism.
3. Finally, the paper by Meh and Moran (2010) is respected in academic literature, with numerous citations. The framework constitutes the theoretical foundation of applied models in many economic institutions. For instance, the Swedish Riksbank has used the framework to estimate the effects of Basel III in a paper from 2011. The method is thus a proven way to analyse the relationship between the real economy and changes in the capitalisation of banks.

The model can be calibrated to fit national economies, as described in the appendix of Copenhagen Economics (2016a) - *Cumulative impact of financial regulation in Sweden*.

How our macroeconomic model works

In the model, there is a moral hazard issue between the households that hold deposits in the banks and the owners of the banks, called 'bankers'. The households cannot monitor whether the bank is monitoring their loans. If the bank does not monitor their loan, there is a risk that borrowers will choose a bad investment project which has a higher risk of default. Monitoring implies a cost to the bankers. Therefore, the households demand that the bankers hold equity to ensure that they have an incentive to monitor their loans – that they have 'skin in the game'.

If the monitoring costs increase, the incentive for the bankers not to monitor their loan increases (since it is costly) – therefore, the capital requirements from the households increase to ensure that the bankers have enough 'skin in the game' to monitor the loans. As a result, the capital requirement in the model can be increased through increasing the monitoring costs.

Capital requirements and cost of capital

Fundamentally, a bank has two sources of finance, namely equity and debt. Of these, equity has the highest required return. If capital requirements increase, banks are forced to hold more of the expensive equity and their funding costs increase. The increase in funding costs is mitigated by – viewed in isolation – a decline in the required return on both equity and debt, since more equity implies a lower risk of bank failure.

In fact, taking a very simplistic view on finance – disregarding taxes, asymmetric information and regulation – if the capital requirements increase, the required return on debt and equity is reduced exactly so much that the overall funding costs of banks are unchanged. This is the so-called Modigliani-Miller irrelevance theorem. However, when tested empirically, this simplistic perception does not hold true, *cf. Box B.1 below*.

Box B.1 Why the Modigliani-Miller theorem does not hold true

1. **Tax shield**
   In contrast to equity, debt payments are tax exempt, and shifting to more equity will increase funding costs. Put simply, a bank needs to provide a larger return on investment simply to pay more in corporate taxes.

2. **Explicit guarantees**
   Through the deposit guarantee, the risk to private depositors is guaranteed, i.e., the required return on this part of the debt will not react to the funding structure.

3. **Implicit guarantees**
   When banks are too big to fail, the government implicitly takes on a part of the default risk, especially for 'unsecured' debt and equity holders. However, we think this plays a minor role now because banks are fairly well-capitalised.

4. **Creditors value bank debt highly**
   Liquidity production is a major element of banks' business models. Creditors tend to value bank debt highly due to its high liquidity, which implies that debt is a relatively cheap source of funding for banks. When banks are forced to replace debt with equity, this is undermined.

Thus, when capital requirements increase, the required return on debt and equity might decline, but overall funding costs will increase. The extent to which funding costs increase depends on factors such as the initial capitalisation level of the bank and the economic activity:

- *With low levels of equity*, an increase in equity will represent a significant reduction in the risk of bank failure. This will imply a significant reduction in the required return on equity and debt, which will curb the increase in the overall funding cost.
- *With high levels of equity*, the reduction in the risk of failure is already quite small and the required return will not decline very much. Equity finance will nevertheless still be more expensive than debt finance due to aforementioned reasons and the overall funding cost will increase.

The required return also depends on the level of activity in the economy:

- *In normal times*, the required return is hardly affected by higher capitalisation as investor sensitivity to default risk is low. Acquiring new equity or readjusting the portfolio is more costly than taking on debt leading to an increase in overall funding cost.
- *In crisis times*, a reduction in default risk can have a large impact on funding costs. Investors will, to a larger extent, discipline banks, as they are less prone to take on risks. Consequently, higher capital requirements will be somewhat offset by the decline in overall funding costs.

In general, the results in the literature are very fragmented and dependent on the data sample used. A study including banks in a 'normal situation' provides results different to one including thinly capitalised banks during the financial crisis. When including the latter, the stressed banks might have a strong influence on the overall results.

A main conclusion from the literature is that higher capitalisation has a distinct, non-linear impact on overall funding costs; above a certain threshold, investors will not consider a bank less risky if it increases the level of equity so overall funding costs will rise.[55]

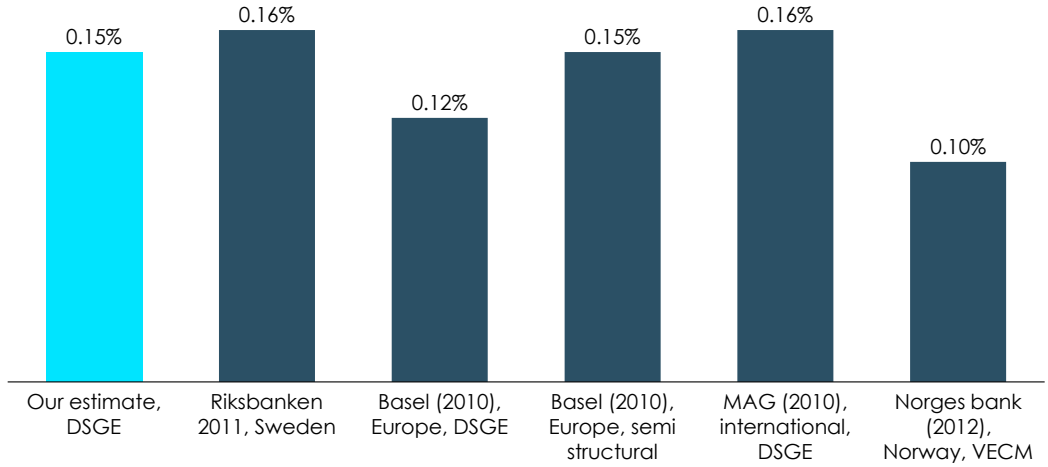
Adjustment of macro-model impact

Our model impact on GDP from higher capital requirements might be in the high end. First, it does not include any Modigliani-Miller effects and second, and perhaps more importantly, there are no alternative funding sources that companies can switch to when banking financing becomes more costly. As discussed, this is particularly important for large corporates that can more easily switch to bond financing.

To incorporate this, we adjusted our macro-model estimate of 20% downward, giving rise to an estimate of a 0.15% decline in GDP for an increase in CET1 ratio requirement of 1 percentage point.

[55] See the appendix of Copenhagen Economics (2016): Cumulative impact of financial regulation in Sweden, for a more thorough discussion of the topic.

Figure B.1
Our estimate compared to those of other institutions
Decline in long-run GDP due to 1 percentage point increase in CET1 ratio requirements



Source: Copenhagen Economics.

MACROECONOMIC BENEFITS

The macroeconomic benefit arises from reducing the risk of a crisis due to too low capital ratios.

To estimate the benefits, we need an estimate of 1) the impact of higher capital requirements on the risk of a crisis and 2) the macroeconomic costs of a crisis if it were to occur. The macroeconomic benefits can then be estimated as:

GDP benefit = 'Reduction in risk of crisis' • 'GDP cost of a crisis'

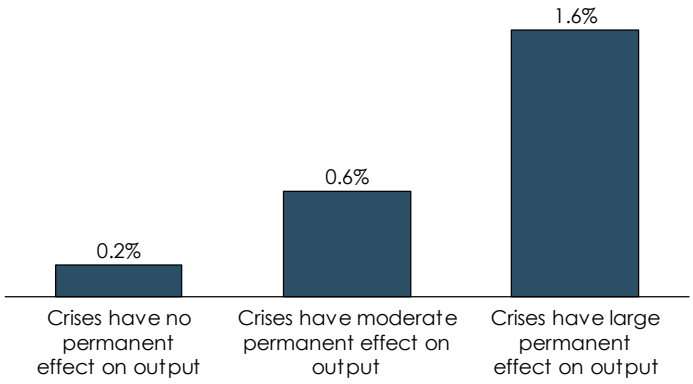
1) Cost of a crisis

The estimated benefits of reducing the risk of a crisis naturally depend on the assumed social and economic costs of a financial crisis. Although it is clear that the costs are immense, they are difficult to estimate and depend on several assumptions.

The estimated benefits of reducing the risk of a financial crisis depend largely on the assumptions made about the long-run effects on productivity. Standard macroeconomic theory suggests that shocks to the economy only have temporary effects and that the economy will eventually recover to its structural long-run level (i.e., that there is a 'steady-state' path unaffected by financial crises).

Basel (2010) summarises the results from several papers. They find that the benefit of reducing the risk of a crisis by one percentage point corresponds to a permanent increase in GDP of around 0.19% to 1.58%, depending on the assumptions, cf. Figure B.2 below:

Figure B.2
Benefit of reducing the risk of a financial crisis by one percentage point
% of GDP



Source: Basel (2010).

In our estimations documented in chapter 3, we have assumed that financial crises have moderate permanent effects on the output (estimate of 0.6%). This entails that after a crisis, GDP will at some point pick up the pre-crisis growth rate *but at a lower level*. The permanent loss in output stems partly from a lower level of business innovation during the crisis, due to an elevated number of bankruptcies and a deteriorated credit transmission impairing investment infrastructure.[56]

2) Risk of a crisis

Our results, described in section 3.2, is based on work from BIS (2010). BIS estimates the relationship between the probability of a banking crisis and the sector-wide average capital ratio. They find a clear non-linear relationship, with benefits converging towards zero. Given the capitalisation of the current EU banking sector, they find that an additional percentage point increase in the capital ratio decreases the risk of a crisis by 0.08 percentage points.

The estimations are based on six different statistical models, which, overall, reduce the risk of outlier results. Nevertheless, it should be mentioned that all six models are (at least to some extent) based on historical correlations under Basel I and II rules. This increases the uncertainty when the estimated relationships are used to assess capital adequacy under Basel III (which is higher and thus out of sample).

[56] See OECD (2012): Innovation in the crisis and beyond.