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EU IMPLEMENTATION OF THE FINAL BASEL III FRAMEWORK

Impact on the banking market and the real economy

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PREFACE

The Basel Accord of December 2017, also called the 'Final Basel III Framework', is one of the most debated regulatory frameworks in recent years. The accord was supported by the G20 Finance Ministers and Central Bank Governors Meeting, under the condition: "*We confirm our support for the Basel Committee on Banking Supervision's (BCBS) work to finalise the Basel III framework without further significantly increasing overall capital requirements across the banking sector, while promoting a level playing field.*"

The accord sets out revised international standards, which are now to be implemented on a European level. A recent impact assessment from the European Banking Authority (EBA) has shown that the Final Basel III Framework could lead to a significant increase in capital requirements for European banks. Furthermore, economic research has shown that significant shifts in capital requirements can entail significant real-economy costs and benefits.[1]

Thus, it is important that EU legislators and stakeholders make decisions about the implementation of the Final Basel III Framework on a well-informed basis. This includes considering the economic costs and benefits of the different options of implementation, to ensure that the package delivers net economic benefits to society.

Against this backdrop, the European Banking Federation and a group of banking associations have invited Copenhagen Economics to analyse the impact of the Final Basel III Framework on European households, businesses and the real economy. In doing so, we will evaluate the implementation against two criteria:

1. Does the implementation fulfil the original spirit of the G20 mandate?
2. Does the implementation deliver net benefits to society, based on an economic cost-benefit analysis?

Finally, we will examine different options for implementation that could increase net economic benefits.

[1] See for example BIS (2010), MAG (2010) or Miller et al. (2012).

EXECUTIVE SUMMARY

In December 2017, the Basel committee agreed on a new regulatory framework denoted the 'Final Basel III Framework' including, e.g., so-called capital floors defining a minimum level of capital for different types of portfolios. The main purpose of the framework was to address a perceived misalignment between assumed risks in banks' internal models and the actual risks facing banks.

Based on a mandate from the European commission, the European Banking Authority published an impact assessment and recommendations for transposing the final Basel III framework into EU law in August 2019. Our assessment is that the proposed solution is not consistent with three key principles that the G20 provided as guidance for implementation at a global level:

1. **Support better alignment of risk assessments:** BIS, EBA and IMF have documented that internal risk models by and large capture risks accurately and that any model variability is not biased towards lower capital requirements. Hence, the output floor will, for a very large number of EU banks, lead to a widening – not narrowing – of gaps between probable future losses and capital requirements. This is also evidenced by the fact that the capital requirements will increase the most for banks with the lowest historical losses.
2. **Should not lead to a significant increase in capital requirements:** EBA's main scenario will lead to an increase in minimum required capital across EU banks of 24%, and significantly higher for low-risk portfolios. This corresponds to EUR 91 bn. core equity. On top comes additional capital expected if banks are to keep their current capital ratios, bringing the total core equity need as high as 300-400 bn, i.e. a very significant increase.
3. **Aim for a level playing field at global level:** The increase of 24% in the EU should be seen against almost unchanged average capital requirements in the US. If this was the result of a much larger misalignment of internal models in the EU, it would be consistent with a level playing field. However, as argued above, there is no evidence for the need of a substantial increase in risk weights for the many EU banks that use internal models.

We also document that **the framework will bring fewer benefits than costs for the EU economy**. With the level of recapitalisation that EU banks have achieved since the crisis, any additional layer of capital adds only insignificant improvements to the financial stability; even in the most adverse economic scenarios, research by IMF and others suggests that banks will not run into likely insolvency scenarios. By contrast, the higher levels of required capital will increase the borrowing costs for European households and businesses, leading to a permanent reduction in GDP, as well as giving rise to job losses in the short to medium term. Households and SMEs are likely to be most affected as they cannot seek funding through capital markets. Using methods used by, e.g., BIS, we suggest that the net loss to the EU could correspond to a permanent reduction in GDP of 0.4%.

As a result, we recommend that the EU aims for a better balance between economic costs and benefits with two sets of actions:

1. Implementation of the Final Basel III Framework: We have defined 4 concrete alternatives to the implementation, e.g. focusing on lending to unrated corporates and SMEs, as well as proposing that the output floor should apply as a separate requirement only including capital buffers from the original Basel III package. Other elements of the framework could

also be recalibrated, to avoid significant increases in capital requirements as requested by the G20, e.g. specialised lending and equity exposures.

2. Ensure that the results of the work undertaken by ECB and EBA to further solidify internal models with respect to quality of data and methods are reflected in European and international discussions on capital requirements, including at the BIS level.

MAIN FINDINGS

Background for our study and key focus

In December 2017, the Basel committee agreed on a new regulatory framework denoted the 'Final Basel III Framework'. The accord was subsequently supported by the G20 Finance Ministers and Central Bank Governors Meeting. The background for the framework was notably an identified variability in internal capital adequacy models that was not seen as being driven by a corresponding variation in underlying risks facing different banks. In other words, banks might not have enough capital to keep the financial system stable in a crisis because they underestimate potential losses.

To address this, the Basel Committee proposed to, e.g., implement floors on the risk weights of banks, providing a minimum capital requirement for different exposures. In this way, the variability of the risk weight estimation is reduced, as it gives a lower bound for the required capital.

Based on a mandate from the EU Commission, the European Banking Authority (EBA) provided a first assessment in August 2019 of how the Basel agreement could be implemented in the EU.

In their main scenario, EBA estimates that the package would increase *minimum capital requirements* by some 24% for the EU average, equivalent to a shortfall of core equity (CET1) of EUR 91 bn. EBA also provides some options for implementation that would lead to a lower impact on capital requirements.

The actual increase in capital that would be needed to maintain current levels of financing following the framework can be expected to be substantially higher than the EUR 91 bn. Banks typically operate with capital buffers, e.g. as capital ratios fluctuate as part of the daily business and due to expectations from supervisors as well as investors. If banks kept their current level of capital buffers, it would require additional capital of up to EUR 400 bn. – a much larger sum. This is an upper estimate, as banks to a certain degree have started to raise capital in anticipation of the framework. Nonetheless, it seems safe to say that the amount of additional capital needed would be significantly larger than what EBA expects.

The focus of the study is to review whether the implementation of the Basel approach as proposed by the EBA fulfils two key principles:

- Does it fulfil the original spirit of the G20 mandate?
- Will it deliver net benefits to society, taking into account an impact on lending rates and the real economy as well as financial stability?

Consistency with the G20 mandate

The G20 mandate clearly outlined three criteria for finalisation of the Basel III Framework[2]:

- Reducing the variability in capital requirements due to differences in internal capital adequacy models
- No significant increase of overall capital requirements across the banking sector
- Promoting a level playing field

[2] See the Communiqué of the G20 Finance Ministers and Central Bank Governors Meeting on 17-18 March 2017, available at http://www.g20.utoronto.ca/2017/170318-finance-en.pdf.

We find that the Final Basel III Framework, as laid out in the EBA main scenario, is challenged with respect to all three objectives, as outlined in the following.

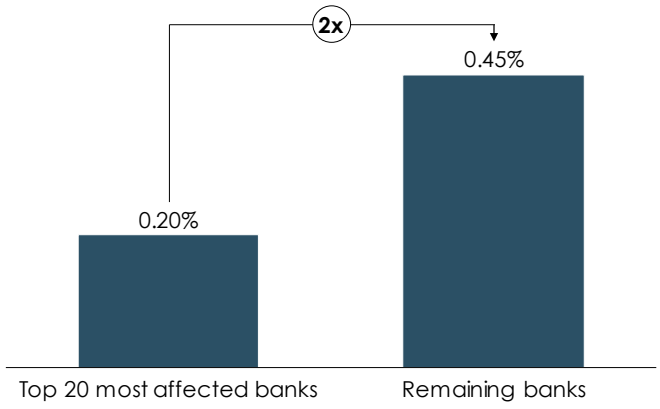
Alignment between internal models and underlying risks

The point of departure is the lack of evidence that internal risk models across the board are too optimistic about actual risks. Empirical research by EBA, BIS and IMF shows that the majority of the variation in internal models is driven by underlying risks – and the variability that does exist is not biased towards lower capital requirements. In fact, papers by EBA and BIS find that banks generally use conservative assumptions in their internal models.

Both the ECB and EBA have taken steps to further improve internal models, notably by having a common framework for measuring the probability of defaults and losses, streamlining the period over which loss probabilities are measured etc. The results of this work have started to be implemented in bank modelling. This work also underlines that risk probabilities for the same type of assets, notably mortgages and SME financing, will be different in different locations.

The implication is that broad-brush measures such as imposing the same minimum risk weights for assets across the globe may in fact not lead to a better alignment between underlying risks and capital requirements. This point is emphasised when looking at the 20 banks most affected by the package in the EBA's main scenario: The average credit losses for these banks are around half the size as the remaining banks, cf. Figure 1. We estimate that these twenty most affected banks will be required to increase capitalisation by around 50-60%.

Figure 1
Average credit losses from 2007-2017
Impairments in % of financial assets



Note: Impairments are averaged over the period 2007-2017 and expressed in percentage of financial assets, averaged over the same period. Banks with more than three missing observations over the period were excluded from the sample. If those banks were part of the 20 most affected banks, they were kept with the averages calculated over the years for which data was available (two of the 20 most affected banks had more than three missing values).
Source: SNL database and EBA transparency exercise.

No significant increase in capital requirements while promoting a level playing field

An additional increase of core equity of 24% must be considered a significant increase that is also very high in an international context. For example, in the Americas, the average increase in capital requirements is 1.5%, i.e. some 1/15 of the impact in the EU.

The major difference reflects the fact that US banks are much less susceptible to limitations in the risk sensitivity of capital requirements. There are several reasons for this, for example that most mortgages in US banks are sold to Government Sponsored Entities, while they remain on the balance sheet of European banks, significantly pulling down the average risk weights.

Thus, it is not clear that the harder impact in the EU is a result of a more initial misalignment between actual risks and assumed risks in banks' internal models. It is notable that losses on e.g. mortgages were orders of magnitude higher in the US during the crisis than for the EU banks.

The large difference between the EU and the US illustrates that when implementing the framework, it is important to take into consideration the structures of the banking sector as they can be very important in the overall impact.

Macroeconomic cost-benefit analysis

The international debate on reforming financial regulation in the aftermath of the financial crisis has systematically been based on the premise of decreasing benefits to increasing levels of capitalisation, while real-economy costs are increasing. A wide range of international studies, e.g. by IMF and BIS, suggest that regulatory-induced increases in capital ratios for advanced economies above 15% have little to no net benefit to society.

The basic arguments behind these estimates are straight forward:

- *Costs*: Higher capital requirements increase the required share of the more expensive equity funding for banks. This is passed on to bank customers in terms of higher interest rates, which eventually gives rise to a permanent decline in GDP.
- *Benefits*: Very few historical crises have led to banking losses that would bring banks close to insolvency if they started off with capital ratios above 15%. Moreover, there would be ample time to take mitigating measures – such as seeking new capital – before insolvency risks would materialise. In other words, there is very little risk that tax payers will have to bear the costs of bailing out insolvent banks on a large scale.

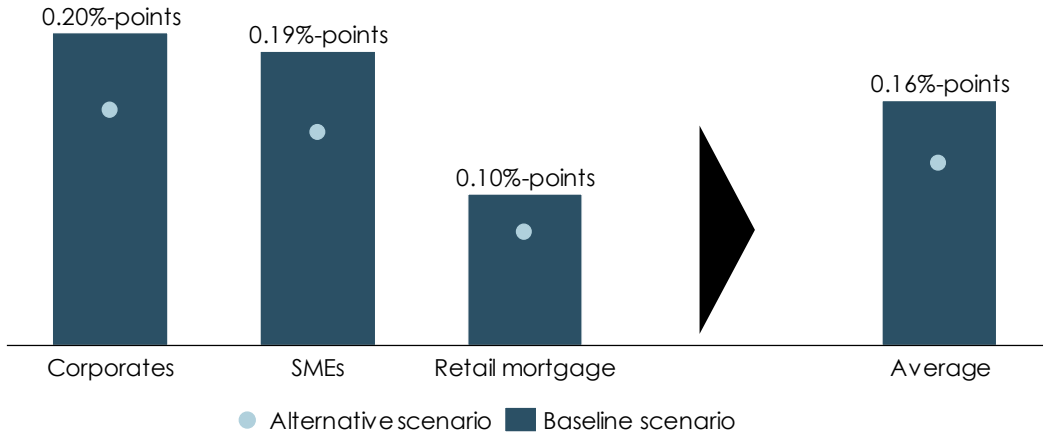
In the following, we flesh out our concrete estimate of the impact on the European economy of the Final Basel III Framework, as outlined in EBA's main scenario.

Macroeconomic costs

We estimate that higher capitalisation will increase the annual cost for European banking customers by around EUR 40-45 bn, in form of higher lending rates and fees.

When looking at lending rates for typical credit customers, we estimate an average increase between 0.12-0.16 percentage points, corresponding to a price increase of 5-7%, cf. Figure 2. On a portfolio level, the impact corresponds to price increases of around 11% for corporates, 7% for SMEs and 4% for mortgages. Note, these are estimations of permanent changes in the cost of borrowing, which will endure across business cycles, and are thus not comparable to the effects of ordinary interest rate hikes.

Figure 2
Impact on lending rates
Percentage points



Note: For the alternative scenario we assume a debt funding rate of 4% for all countries, which reduces the impact on additional costs due to increased capitalisation.
Source: Own calculations

We expect that the relatively large increase in the price for corporates could mean that they will increasingly fund themselves outside of the banking sector, e.g. on capital markets. In contrast, households and SMEs have few options outside the banking market, and consequently could be more affected by an increasing cost of borrowing.

To illustrate the impact of the Final Basel III Framework, we have constructed two cases regarding the impact on interest expenditures:

- For a typical new homeowner in Europe, the package could increase annual interest expenditures by around EUR 190. In the most affected countries, interest expenditures for a new homeowner family could increase by up to EUR 340 – through the lifetime of a typical mortgage, this amounts to some EUR 4,400.
- For a typical SME with a bank loan of around EUR 2.5 million, we find higher annual interest expenditures of around EUR 4,750, based on the average EU impact. In the most affected countries interest expenditures could increase up to around EUR 12,500 per year.

The higher interest rate will cause a decline in the credit demand by companies, reducing investments (fewer investments will be profitable). This leads to a decrease in productivity and eventually reduces GDP. Concretely, we expect the package will lead to a permanent decline in GDP of just above 0.5%, corresponding to EUR 90 bn (2018-level). For example, after a ten-year period, the accumulated GDP reduction would correspond to EUR 900 bn. The estimate is based on a macroeconomic model for the EU economy, of the same type as used by BIS, in preparation for Basel III.

We estimate that the decline in GDP will gradually appear the following ten years after implementation. In this transition period, investments will be subdued. Concretely, we estimate that

investments, every year, will be some EUR 70 bn lower, corresponding to a decline of around 1.7%. Accumulated over the ten-year period, the EU economy sees a reduction in investments of around EUR 700 bn.

Finally, we suggest that the adverse effect on the real economy could be stronger in the short to medium term; banks may prefer to partly solve their capital shortfall by cutting back on credit rather than raising new capital. One reason being that the capital shortfall would be so massive for the involved banks that they risk facing funding conditions that are unfavourable in a longer-term perspective. This could also negatively impact job creation as higher interest rates feed into lower economic activity. Based on other studies, we expect that the short-term GDP reduction could reach levels of 0.7%-1.75%.

Macroeconomic benefits

Since the financial crisis in 2008, the European banking sector has increased solvency to a point where further general increases in capitalisation provide little benefit in terms of reducing the risk of a crisis. Concretely, we estimate that the benefits from the Final Basel III framework correspond to a permanent increase in GDP of around 0.1%.

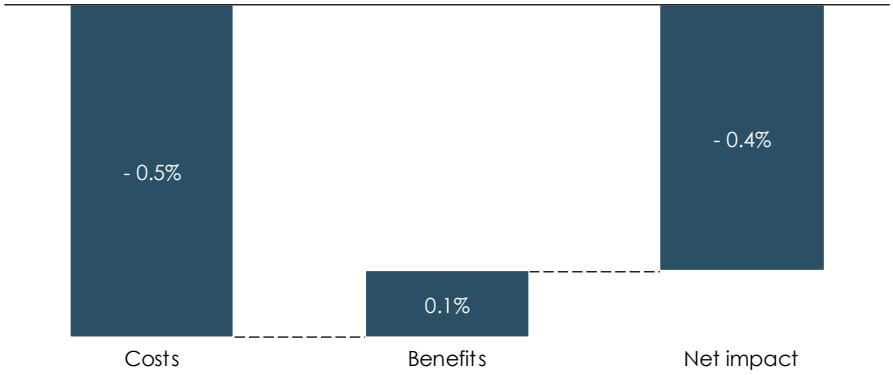
Our analysis does not rule out that the EU banking sector could benefit from targeted measures addressing specific identified issues – for example, for an identified group of vulnerable portfolios. However, this is not the case with the Final Basel III Framework, which provides a broad-brush increase in capital requirements for low-risk portfolios in particular.

Net economic benefits

Putting costs and benefits together, we find the Final Basel III Framework will provide net economic costs to society, corresponding to around 0.4% of GDP, cf. Figure 3.

This result is an average of the total EU result. Note, however, that the impact will be very different between countries and portfolios, e.g. with corporate lending rates impact reaching 0.5% in some regions. This suggests that the macroeconomic cost benefit trade-off could be significantly more unfavourable in some regions and for some portfolios than the average outlined above.

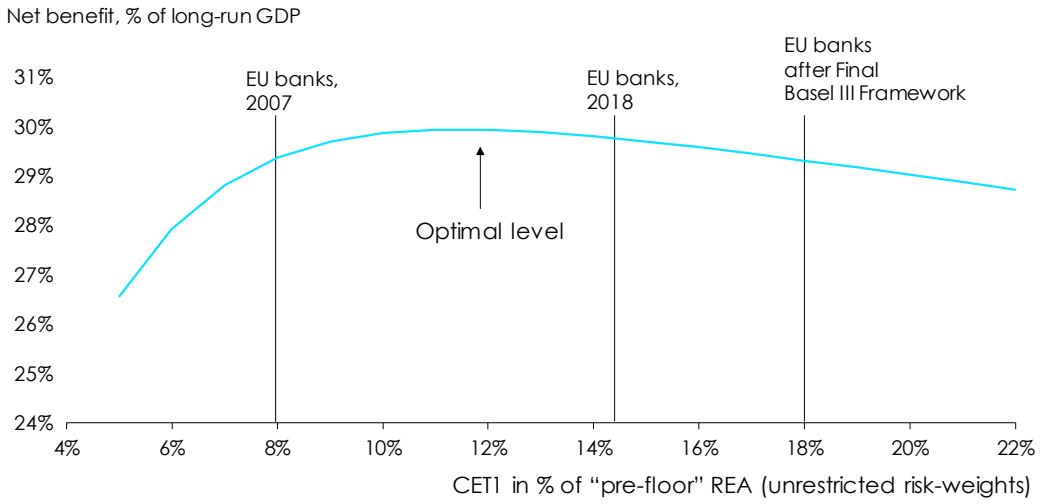
Figure 3
Real economy costs and benefits of the Final Basel III Framework
% of long-run GDP



Source: Own calculations

Overall, we find the current level of capital for the European banking sector of around 14.5% a bit above the optimal level, cf. Figure 4. This means that any further broad-brush increase in capitalisation will provide a net cost to society.

Figure 4
Optimal level of capitalisation



Note: Note that CET1 ratios are calculated using the original REA (before implementation of the final Basel III package).
Source: Own calculations

Policy conclusions: options for implementation

Our conclusion is that a 1-to-1 implementation of the Final Basel III Framework, as outlined in EBA's main scenario, is not consistent with the G20 mandate, nor will it provide net benefits to the EU economy. The fundamental problem is that it will widen – not narrow – the gap between the

risks implicitly proposed by the regulatory setting and the actual underlying risks – in particular for the banks most affected.

To mitigate this, we have identified four concrete implementational options that would make the framework more suited to European financial structures, bringing the impact more in line with other jurisdictions:

1. *Output floor* is perhaps the most crucial aspect of the implementation. Implemented as in EBA's main scenario, the output floor can alone – i.e. disregarding all other initiatives – lead to a substantial increase in capital requirements. Alternatively, the output floor can be implemented as a separate capital requirement, where only internationally agreed capital buffers are applied, the so-called backstop approach. This will greatly diminish the impact of the output floor and to a greater extent maintain the risk sensitivity of capital requirements.
2. *Unrated corporates* will be subject to relatively high capital requirements, often twice the capital requirements of a risk-based approach. An alternative treatment can be designed, which to a larger extent keeps the risk-based capital requirement for unrated corporates, reducing the impact by 2-3 percentage points.
3. *The EBA impact assessment provides several options* on how the impact on capital requirements can be limited, e.g. lower impact from operational risk and by keeping the SME supporting factor. Together, these could reduce the impact by 5-6 percentage points.
4. *A revision of EU-specific capital buffers* could also be considered when implementing the package. For example, if the systemic risk buffer (SRB) was excluded, it could reduce the impact by 1-2 percentage points.

Including the above options, the increase in capitalisation could be limited to around 10%-6%.[3] That is still above, but nevertheless closer to, the average global impact of around 5%.

With the above options included, we estimate that GDP would decline by around 0.2%, leading to a net societal cost of around 0.1% – somewhat lower than the standard implementation of the framework with a net societal cost of 0.4% of GDP.

In addition, we also suggest focussing on the work undertaken through EBA's IRB roadmap and the ECBs targeted review of internal models (TRIM) to streamline and verify the properties of internal risk models. Ultimately, financial institutions that have 1) solid, verifiable models identifying their forward 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.

Summing up, we propose working on two work streams in the coming years:

- Consider ways of implementation that to a larger extent take into consideration the structures of the EU financial markets, to minimise adverse effects on the economy.
- Ensure that the work supported by ECB and EBA to improve the overall well-functioning of internal models are fed back into the regulatory discussion on capital requirements at an international level.

[3] Note that the different options have cross effects, meaning that the sum of the marginal impact does not equal the total impact if all options are included.

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 Framework'. In a European context, the European Commission has asked the European Banking Authority (EBA) for an impact assessment of its implementation in the EU.

Chapter 1 sets out to explore how the Final Basel III Framework will impact the European banking sector. First, we describe the measures in the framework (section 1.1). We will then assess the impact on the European banking sector, using EBA's main scenario as a reference scenario (section 1.2). Finally, we will analyse the EBA's proposal against the criteria laid out in the G20 (section 1.3).

1.1 THE FINAL BASEL III FRAMEWORK

The key objective of the reform is to reduce excessive variability of internal capital adequacy models of banks.[4]

Banks with an advanced risk model framework estimate a part of their capital requirements using internal models. These models produce risk weights that determine the level of capital the bank is required to hold for different assets, cf. Box 1. The key concern for policy makers is the identified variability in the risk weights produced by the internal models (i.e. variability in capital requirements) that does not depend on variation in the underlying risks. Consequently, the G20 summit gave the mandate to the Basel Committee to finalise the post-crisis reforms of the financial regulatory system to reduce the variability of internal models.[5]

To address this, the Basel Committee has suggested to implement floors on the risk weights of the banks, thus providing a minimum capital requirement for the different exposures.[6] In this way, the variability of the risk weight estimation is reduced, as it gives a lower bound to capital requirements.

4 See BIS (2017)
5 BCBS (2015)

Box 1 Capital requirements for banks depend on risk weights

The required capitalisation of banks is not only determined by the total amount of exposures but also by the level of risk to these exposures. For example, a EUR 100,000 unsecured corporate loan entails a larger risk than a EUR 100,000 government bond exposure. Concretely, the required capital for an exposure depends on so-called risk weights. If a bank has a required capital ratio of 10% and an exposure has a risk weight of 50%, the required capital the bank should hold for that loan will be 10%*50%=5%.

For banks with an advanced risk model framework, the risk weights are estimated using internal models of the banks, based on certain risk parameters. For example, a company with a high debt compared to revenue is normally a relatively risky exposure and would typically be assigned a larger risk weight than exposures to less leveraged companies. Consequently, capital adequacy for banks is measured as a share of risk weighted assets (denoted REA), which essentially is the sum of exposures multiplied by their risk weights. In this way, there are fundamentally two ways a bank can reduce their capital requirements, either by reducing exposures in absolute levels or by decreasing the risk of the exposures to get lower risk weights.

Banks without an advanced risk model framework instead use the standardised risk weights. These weights are determined for buckets of assets, based on broad characteristics such as type of assets or ratings. For example, typical residential real estate exposures (under the whole loan approach) with a loan-to-value ratio between 60% and 80% have a risk weight of 30% (with the Final Basel III Framework).

The internal models of banks are subject to certain restrictions on how to model the risks. Nevertheless, empirical research has found significant variability in the internal models of banks.

This main concept of the package has been translated into numerous different measures, including:

- *Input floors and other restrictions* that set minimums for the parameter estimates going into the risk-weight functions and restricting the use of the more advanced approaches using own estimates of loss given default.
- *Output-floors* providing a minimum risk weight exposure amount (REA) for banks using internal models set at 72.5 % of the REA calculated using the standardised approaches, i.e. without the use of internal models (cf. Box 1).
- *A revised standardised approach for credit risk* with the aim of increasing the risk sensitivity of the standardised approach for credit risk. This includes a more granular risk weighting approach for residential real estate exposure (where risk weights now depend on the loan-to-value ratio).
- *Revisions of the market risk and credit valuation adjustment (CVA) risk framework*. These limit the use of internal models for market risk and entirely remove the possibility to model CVA risk based on internal models. Also, the standardised approaches for market and CVA risk have been revamped.
- *A new framework for operational risk* that replaces approaches based on internal models as well as the original three standardised approaches.

- *Other measures* include a leverage ratio requirement for global systemically important institutions (G-SIBs) and revisions to the calculation of counterparty credit risk exposures stemming from securities financing transactions (SFTs).[7]

1.2 IMPACT ON CAPITALISATION OF THE EUROPEAN BANKING SECTOR

On request of the European commission, the European Banking Authority (EBA) has conducted a comprehensive impact assessment of the Final Basel III Framework, based on detailed microdata from 189 European banks.

The main scenario in the EBA impact assessment corresponds to "*a scenario of a strict implementation of the Final Basel III Framework*".[8] This is mainly due to an output floor calculation applied to all buffers and not just the ones agreed on internationally, making the impact relatively high in the EU, as discussed in section 1.3. Other rather strict interpretations in the EBA main scenario include a removal of the preferential SME treatment and a new treatment of CVA risk.

Based on these premises, the EBA finds that the minimum required capital (MRC) of EU banks will on average increase by some 24%, cf. Figure 5. This includes large cross-country variance; in Sweden for example, MRC will increase by some 53%.[9]

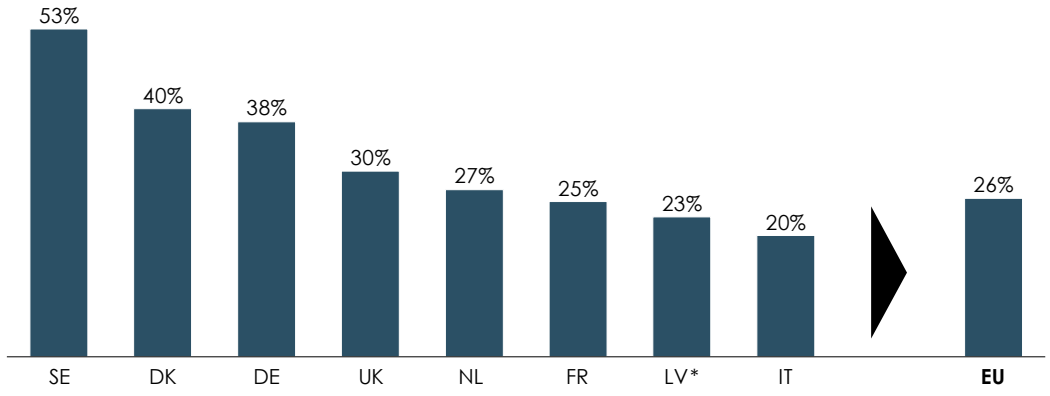
The EBA also provides other implementational scenarios that give rise to a smaller impact on capital requirements. In chapter 4, we discuss the different implementational options of the framework.

7 The revision of the leverage ratio framework requires banks identified as G-SIBs to hold a leverage ratio buffer equal to 50% of the bank's higher-loss absorbency requirement. The package also entails refinements to the leverage ratio exposure measure (the denominator of the leverage ratio). The changes to the calculation of counterparty credit risk exposures stemming from SFTs introduce minimum haircut floors for non-centrally cleared SFTs and imply a recalibration of the supervisory haircuts.

8 See p. 20.

9 Including the impact of the current mortgage floors in Sweden, we find a somewhat smaller impact using our model framework.

Figure 5
Increase in capital requirements (MRC)
% of original MRC



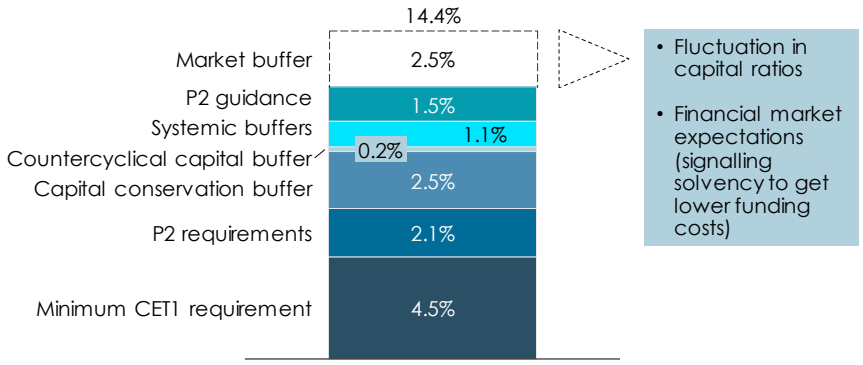
Note: * The impact in Latvia is based on the impact of the two European banks with the largest (according to total assets) subsidiaries in Latvia, Swedbank and SEB, the largest and third largest banks in the Latvian banking sector, respectively. The other banks are assumed to have no increase in capital requirements. The impact in the United Kingdom is based on our balance sheet model since no data are available in the EBA report for the UK. Without the UK, the average EU impact is 24%.
Source: EBA Impact assessment and own calculations for the United Kingdom and Latvia.

1.2.1 Required increase in capitalisation

To be compliant with the minimum required capital, the EBA estimates that EU banks are required to increase the core equity (CET1) by some of EUR 91 bn, if no deleveraging takes place. However, the actual increase in core equity due to the framework can be expected to be significantly larger, as banks cannot operate on the absolute minimum required capital; banks typically have buffers to the minimum capital requirements, cf. Figure 6. This is due to several reasons:

- Capital ratios fluctuate as part of the daily business; running on minimum levels would mean that the bank often would run into capital inadequacy and thus face supervisory restrictions on dividend payments, etc.
- The financial markets expect banks to run with buffers to requirements. Exactly meeting the required capital ratio could signal that the bank is in trouble, which would result in decreasing ratings and higher funding costs. Thus, it is profitable for banks to have capital buffers.
- Supervisors expect banks to hold capital above the official minimum requirements to be able to absorb potential losses in stressed scenarios (Pillar 2 guidance). In addition, supervisors might influence banks own buffers on top of the Pillar 2 guidance.

Figure 6
EU average components of the CET1 ratio
% of total REA

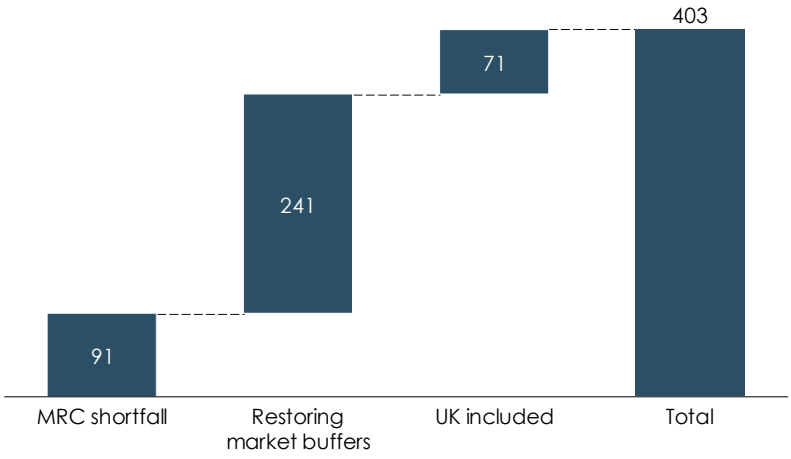


Note: The systemic buffers are composed of the systemic risk buffer (SRB), the buffer for globally systemically important institutions (G-SII) and the buffer for other systemically important institutions (O-SII). Usually only the maximum of the three buffers apply. Depending on which exposures are covered by the SRB buffer, the G-SII buffer or the O-SII buffer can, however, also apply in combination with the SRB.
Source: EBA transparency exercise, SNL database and European Systemic Risk Board

After the implementation of the Final Basel III Framework, banks would still need to run with a buffer to the minimum requirements. Assuming that European banks will keep the current average core equity (CET1) ratio of 14.4%, this implies an increase in core equity of 24% for EU27 (equivalent to the increase in minimum capital requirement). Including the UK, this means that the European banking sector would need to raise around EUR 400 bn. to sustain the current balance sheet, cf. Figure 7.[10] In terms of total capital (which can also consist of other types of equity than CET1, e.g. equity instruments), we expect the European banking sector would need to increase capitalisation by around EUR 520 bn.

[10] For this estimation we use total CET1 of the entire sample of banks in the EBA transparency exercise (excluding Norwegian banks) and multiply this number by the average MRC increase of 24.4% as given in the EBA impact study.

Figure 7
Estimated required increase in CET1 capital, without deleveraging
EUR bn



Note: The minimum required capital consists of 4.5% of common equity tier 1 (CET1), the combined buffer requirements (countercyclical and capital conservation buffer plus the systemic risk buffer, G-SII buffer and O-SII buffer, if applicable) and the Pillar 2 requirements.
Source: EBA transparency exercise and own calculations.

Note, that part of the current capital buffers could be a consequence of banks starting to build up capital now to meet the required increase from the Final Basel III Framework. Thus, banks could run with lower buffers than they currently do after implementation – to the extent this is the case, the required increase in capitalisation would be lower than stated above. Nonetheless, it seems safe to say that the amount of additional capital needed would be significantly higher than the EBA estimate.

The above estimate assumes that banks sustain their current balance sheet, i.e. no deleveraging (the so-called static balance sheet assumption). The other end of the scale is that banks do not increase capitalisation at all and adjust to the Final Basel III Framework by reducing assets (while keeping their current capital ratios). In that extreme case, we estimate a required decrease in total assets of around EUR 4,600 bn.[11] Looking at lending to private customers, it will lead to a reduction in credit of EUR 2,900 bn.[12]

As we will outline in the next two chapters, we expect the actual impact on capitalisation to be somewhere in the middle of the two cases; the higher capital requirements will increase the cost of lending, which will decrease credit demand, thus reducing assets and therefore the required increase in capitalisation.

[11] Assuming banks reduce assets uniformly across all asset types and using data from the SNL database for the sample of banks included in our analysis.

[12] European banks have around EUR 820 bn. allocated capital to their credit portfolio, supporting credit of some EUR 14,900 bn. That corresponds to a leverage ratio of around 18. Assuming an increase in capital requirement of 24%, this would reduce the leverage ratio to 15, meaning that capital of EUR 820 bn. can support credit worth EUR 11,900 bn – a reduction of around EUR 2,900 bn.

1.3 CONSISTENCY WITH THE G20 MANDATE

The G20 mandate behind the Final Basel III Framework laid out three criteria:

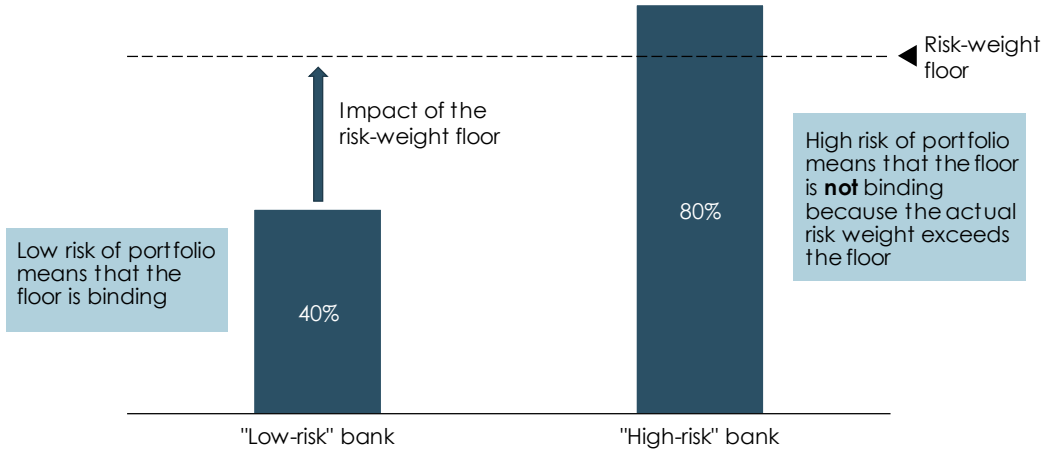
1. Reducing variability in capital requirements due to differences in internal capital adequacy models
2. No significant increase of overall capital requirements
3. Promoting a level playing field

In the following sections, we go through each of the three criteria.

1.3.1 Reducing capital requirements due to differences in internal capital adequacy models

As mentioned, the Final Basel III Framework puts an upper limit on the risk sensitivity of capital requirements. Consequently, we expect portfolios with low-risk to be the most affected by the package. Without the package, banks with "low-risk" are given low capital requirements as the data of their portfolios signals low risk, e.g. low historical loss rates, low leverage of customers, high income/earnings of customers compared to loan size, etc. The Final Basel III Framework limits the extent to which the low risk of the portfolios leads to lower capital requirements, cf. illustrative example in Figure 8.

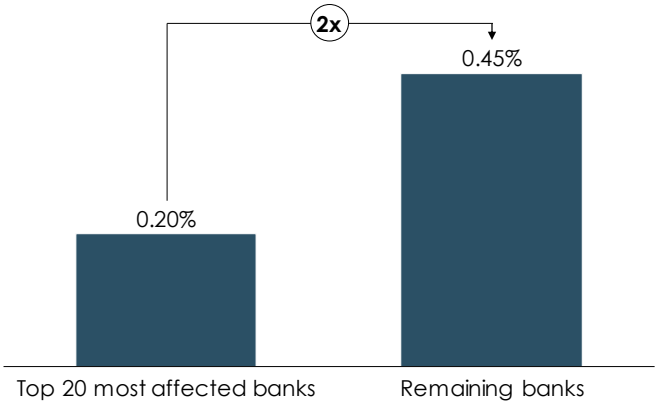
Figure 8
Illustrative example of the impact on risk sensitivity
Risk weight



Note: Example is purely illustrative and the average risk weights are hypothetical. A "low-risk" portfolio represents a bank with less risky portfolios.
Source: Copenhagen Economics

This point is emphasised when looking at the 20 most affected banks in terms of the relative increase in capital following the Final Basel III Framework: Average impairments are around half the size compared to the remaining banks, cf. Figure 9. We estimate that these twenty most affected will be required to increase capitalisation by around 50-60%.

Figure 9
Average credit losses from 2007-2017
Impairments in % of financial assets



Note: Impairments are averaged over the period 2007-2017 and expressed in percent of financial assets, averaged over the same period. Banks with more than three missing observations over the period were excluded from the sample.
Source: SNL database and EBA transparency exercise.

Risk weight floors do not lead to better alignment between risks and capital requirements

If a cap on the risk sensitivity (as in the Final Basel III Framework), should improve the link between capital requirements and underlying risks, it would be because low-risk portfolios (that are capped) should be systematically undervalued: we do not find empirical evidence that this is case, cf. Box 2.

There is some variability in internal models, although the majority of the variation in capital requirements is explained by fundamental factors (estimates suggest around 15%-20% of variability in capital ratios are due to model variability). Nevertheless, the variability is not biased towards lower capital requirements. In fact, a paper by the EBA finds that banks are somewhat conservative with assumptions in their internal models. This means that affecting low-risk portfolios in particular – which is the case with the approach taken in the EBA's main scenario – does not lead to a better alignment between underlying risks and capital requirements; low-risk portfolios would on average obtain too high capital requirements compared to what fundamentals would entail.

This also means that the work on improving internal models, as for example the TRIM exercise by ECB, would not lead to increasing capital requirements as the Final Basel III Framework does; for some banks, capital requirements will *increase* – but for others, they will *decrease*. This is backed up by a paper by IMF that finds: "*it is possible to harmonise risk weights without significant impact on bank capital*".[13]

[13] IMF (2017)

Box 2 Technical studies on variability of internal models

As mentioned, the background for the framework is an identified variability in predictions of internal models. For example, a paper by BIS from 2013 found that:

- For wholesale exposures, unwarranted variation can explain around 15-20% of variations in capital ratios. This means that the remaining 80-85% are explained by fundamentals.
- The variation due to model variability goes in both directions, i.e. not biased towards lower capital requirements.

A more recent study by the EBA, analysing mortgage, SME and corporate portfolios – the so-called high-default portfolios – largely confirms this:

- 82% of the variability can be explained by observable factors, such as default status, country of the counterparty and portfolio mix, etc. The remaining 18% is either due to variability in credit risk within each portfolio or because of variability of the internal models.
- Model variability is not biased towards lower capital requirements. In fact: "*estimated values for PDs and LGDs are, in general, higher than the observed default rates and loss rates, which suggests that banks are, on average, conservative*"
- Expressing capital ratios based on observed defaults rates (rather than PD estimates) would only have a minor impact, i.e. the internal model-based capital adequacy ratios seem in line with observed default rates.

A paper by BIS from 2016 also finds that model variation does not lead to capital ratios being biased:

- Estimates of PDs for retail and SME exposures are closely aligned with actual outcomes and tend to be higher than the actual long-run default rates for about two thirds of banks in the sample.
- Average LGD and EAD estimates are generally higher than the average actual loss rate and defaulted exposure outcomes.

Finally, a paper from IMF from 2017 finds "*that it is possible to harmonise risk weights without significant impact on bank capital*", "*is also in line with the ECB's most recent TRIM program*".

Source: BCBS (2013): Analysis of risk-weighted assets for credit risk in the banking book, *EBA (2017): Results from the 2016 High Default Portfolios (HDP) Exercise, BCBS (2016):* Analysis of risk-weighted assets for credit risk in the banking book and IMF (2017): Heterogeneity of Bank Risk Weights in the EU

1.3.2 No significant increase of overall capital requirements, while promoting a level playing field

The Basel Accord on the Final Basel III Framework sets out general regulatory standards, which then need to be adopted in different banking markets. The impact of the framework depends very much on the specific structures and current regulation in each region. For example, worldwide, BIS estimates an increase in capital requirements for large banks by around 5.3%, compared to the impact in EU of 24%.[14]

As such – on a global level – the Basel accord somewhat complies with the original mandate of the G20 declaration with no "*significantly increasing overall capital requirements*". However, it is also clear that the current structures and regulation of the European banking sector entail a relatively high impact, not in line with the G20 declaration.

Below we illustrate the importance of local structure of the banking market by comparing the impact in the EU and the US.

[14] The average impact of 5.3% for large banks is composed of a moderate increase in minimum required capital of around 1.5% in the Americas, a decrease of 2.7% in the rest of the world and an increase of 21.3% in Europe.

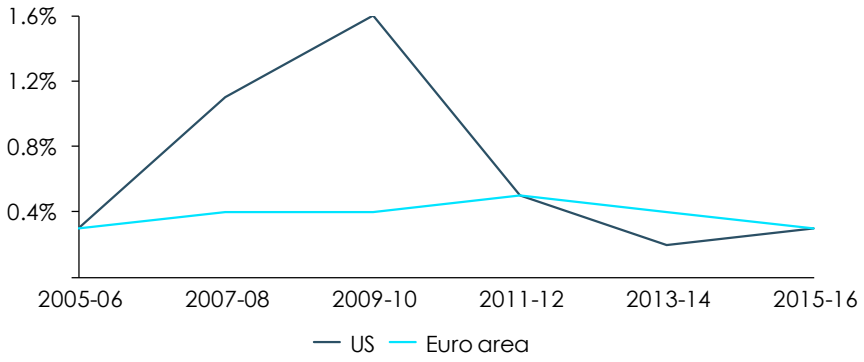
Differences in impact between EU and US

BIS expects an increase in capital requirements of around 1.5% in the Americas, i.e. some 1/15 of the impact in the EU.[15] The major difference reflects the fact that US banks are much less susceptible to limitations in the risk sensitivity of capital requirements (on a practical level, this means that internal models are much less used in US). There are several reasons for this:

- The majority of mortgages in US banks are sold to Government Sponsored Entities while they remain on the balance sheet of European banks until maturity, therefore significantly pulling down the average risk of EU banks. In particular since the mortgage portfolio is the largest asset class and has the lowest risk profile.
- In Europe there is dual recourse to the borrower and the property, which significantly reduces the losses on mortgages. This is not the case in the US.
- In the US, low-risk corporate credit is granted through capital markets to a much larger extent than in Europe, where the vast majority is granted by banks. This makes the impact on the corporate portfolio much higher in the EU than in the US.
- US banks have fewer capital buffers in their capital requirements, making them less sensitive to output floors.[16]

In general, it is not clear that the harder impact in the EU is a result of more initial misalignment between actual risks and assumed risks in banks' internal models. In fact, credit losses of financial institutions during the financial crisis (2007-2010) were considerably larger for US banks than for European banks, before returning to similar levels in 2016, cf. Figure 10.

Figure 10
Loan impairment expenses
% of average assets



Note: Based on a different source and type of calculation compared to figure 9.
Source: BIS (2018), p. 113

[15] See in BIS (2019) "*Basel III monitoring report*". 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 (Group 1 banks). No US banks are represented in the sample of Group 2 banks.

[16] US banks generally have lower capital requirements as a share of total REA, as less buffers are included in the US regulation, such as the systemic risk buffer and capital conservation buffer. This means that increases in REA impact US banks less.

Box 3 Main takeaways from Chapter 1

We find that the Final Basel III Framework, as laid out in the EBA main scenario, is challenged with respect to all three objectives of the G20 mandate:

- The framework will lead to a significant increase in minimum capital requirements of 24%. We expect this will lead to a need of additional capital for European banks of as high as EUR 300-400 bn. – a very significant increase.
- The framework will not lead to better alignment between underlying risks and capital requirements. The framework will primarily increase capital requirements for low-risk portfolios, despite evidence that the capital needs of these are based on conservative assumptions.
- The framework will worsen the global competitive playing field, as US banks will experience almost no increase in capital requirements. This is primarily due to bank funding being a more predominant type of funding in the EU for low-risk portfolios than a result of differences in the underlying risks.

CHAPTER 2

IMPACT ON BANK CUSTOMERS

In this chapter, we turn our analysis to the real economy, analysing how the customers of the European banking sector are likely to be affected.

First, we will analyse how the higher capital requirements increase the cost of banking and how this is passed on to customers (section 2.1). We will outline our estimates for the specific impact on lending rates for European banking customers (section 2.2). We will then provide examples on the impact on different customer groups (section 2.3) Finally, we briefly discuss how the higher lending rates could increasingly make customers seek funding outside the regulated banking system (section 2.3).

2.1 FINANCIAL REGULATION IMPACTS THE COSTS OF BANK PRODUCTS

Fundamentally, a bank has two sources of funding: equity and debt. As mentioned, there are many different initiatives in the Final Basel III Framework, nevertheless, most of the measures lead to the same end result: higher capital requirements. This entails that banks are required to increase the share of equity funding, and consequently, will have a lower share of debt funding.

The higher required share of equity will increase the cost of capital for banks, as equity funding is significantly more expensive than debt funding. The main reason being that equity is subordinated to debt in case of default – i.e. there are higher entailed risks from holding equity, giving rise to a higher required return. In addition, bank debt is used by households and businesses as a medium to store value; temporary surplus liquidity is usually stored in deposits, whereas more long-term savings can be stored as fixed-term deposits or bonds. This makes bank debt an attractive asset for investors, whereas bank equity does not have these properties.

Concretely, we assume a (after tax) cost of equity of 10%, based on several studies on the cost of equity for European banks.[17] In comparison, the average debt finance costs for European banks is currently around 1.2%.[18]

2.1.1 Higher costs are passed on to customers

The higher costs will be passed on to customers. Investors demand a certain return on their invested equity that corresponds to the risk they are running by investing in banks. Thus, the investors – i.e. the owners of the banks – cannot be expected to accept permanently lower earnings due to stronger financial regulation but will pass these costs on to customers. This is widely accepted in the related literature, e.g. BIS, IMF, ECB and Bank of England[19].

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17 Corresponding to a before-tax cost of equity of around 13%. BIS (2010) uses a cost of equity of around 15%.

18 The debt funding rate is calculated on a bank level using SNL data on bank interest expenditure and total financial liabilities, based on the sample of banks in our balance sheet model. ECB finds average funding cost for the banks under their supervision of 1.7%.

19 See, for instance, BIS (2010), Miles et al. (2011), The Riksbank (2011), IMF (2016a), ECB (2016) and Bank of England (2016b).

It should be noted that this is a long-term or structural consideration. In this study, we primarily consider long-term effects as The Final Basel III Framework is a permanent regulation, intended to be in effect for many years. In the short to medium term, the competitive dynamics on the banking market could affect how banks adjust to the changing costs, and typically imply a lower pass-through of costs.

2.1.2 Higher capital requirements could to some extent lower the cost of equity

In this study, we assume that increase in capital requirements will, to some extent, lead to a reduction in the costs of equity for European banks; the risk an investor is running from investing in a bank is reduced when capital requirements increase, as the risk of default decreases. This is the so-called Modigliani-Miller effect. In the appendix, we discuss Modigliani-Miller in banking in more detail.

Nevertheless, as we will show in chapter 3, the current capitalisation of the European banking sector has reached a level where there is little gain in terms of reducing the risk of a default from further increasing capitalisation. We therefore assume a modest decline in the equity cost rate of 0.15% for each percentage point increase in equity over total assets.

2.2 THE IMPACT ON BANKING CUSTOMERS

Banks allocate their costs of banking to customers through complex cost allocation models. Exactly how this takes place depends on several factors, including which types of customers primarily drive the increase in capital requirements.

In this study, we use our European banking balance sheet model, containing 107 of the largest banks, covering around ¾ of the banking market, cf. appendix for methodology. The model mimics the cost allocation procedures of European banks and can thus be used to simulate how costs of the framework will be allocated to different customer groups. It should be noted that country specific results are based on where banks are domiciled, irrespective of whether part of their business is conducted outside of the home country (through branches and subsidiaries).

Overall, we estimate that higher capitalisation will increase annual capital costs for European banks of around EUR 40-45 bn., which will be passed on to customers in terms of higher interest rates and fees.[20] This relates to both typical lending activities to private customers, as well as other activities that banks are involved in, e.g. financial market operations, equity holding and sovereign exposures, cf. table 1. The cost is equivalent to a price increase of around 5%. Or corresponding to some 0.3 percent of EU GDP.

[20] Assuming a return rate on equity of 13% and an EU average debt funding cost of 1.2%. We assume that the percentage point increase in funding costs will lead to an equivalent percentage point increase in interest rates.

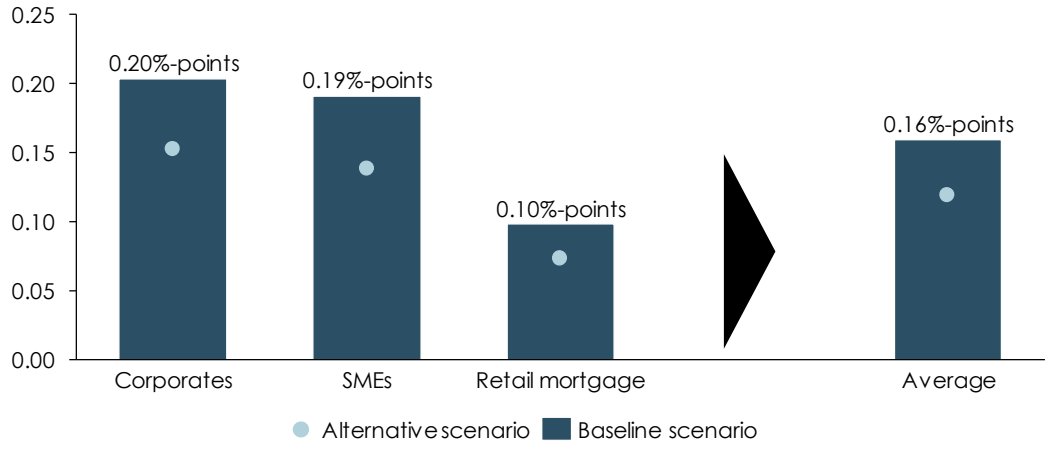
Table 1
Total increase in costs for EU banking customers (main estimate)
EUR bn.

CORPORATES	SME	RETAIL MORTGAGE	OTHER PORTFOLIOS AND SERVICES	**EU TOTAL**
15	6	5	17	**43**

Note: The numbers are based on our banking balance sheet model that covers ¾ of the European market. We assume that the rest of the banking sector follows the price increase of the banks in our model.
Source: Copenhagen Economics based on data from EBA transparency exercise and SNL.

Looking specifically at lending to retail mortgage, SME and corporates customers, we estimate that the total EU economy will incur additional interest expenditures of some EUR 26 bn. The impact on the three portfolios corresponds to a permanent increase in the effective lending rate of 0.16 percentage points, cf. Figure 11.[21] With an average EU interest rate of 2.3%, this corresponds to a price increase of 7%.

Figure 11
Impact on lending rates
Percentage point increase



Note: For the alternative scenario we assume a debt funding rate of 4% for all countries, which reduces the impact on additional costs due to increased capitalisation.
Source: Own calculations

[21] The term 'effective interest rates' is used here to indicate that this increase in the cost of credit could include increases in fees instead of the lending rate for the three portfolios considered.

The impact for different customers ranges from an increase for corporates of 0.20 percentage points (corresponding to a price increase of around 11%), 0.19 percentage points for SMEs (corresponding to a price increase of 7%) and 0.1 percentage points for retail mortgage (corresponding to a price increase of around 4%), cf. Figure 11.[22]

In estimating the impact, we also present an alternative scenario: In the main scenario, the debt funding costs[23] are equivalent to those currently incurred by European banks. In our alternative scenario, we assume debt funding of 4%, which is in line with what has been observed historically before the currently low interest rate environment.

Note, that the increase in borrowing costs outlined above are permanent and will endure across business cycles. Thus, the impact is not comparable to ordinary interest rate hikes but should rather be interpreted as a permanent wedge in capital allocation between lender and borrower.

We base our estimation on somewhat conservative assumptions, for example:

- We assume that the interest rate is only increasing as a result of an increase in cost of capital for that particular asset.[24] It could be the case that higher costs from other activities not related to private customers, e.g. interbank lending, or sovereign exposures, would be passed on to the three lending portfolios considered.
- We only consider increases in core equity (CET1), and do not include other equity instruments banks would need to increase to comply with the total capital requirements.
- Finally, we do not include increases in debt funding costs via the MREL/TLAC requirement.

Box 4 Impact in countries with many foreign banks: Latvia as a case

Banking markets with foreign banks can also be affected, even if domestic banks do not use internal models. We for example expect modest impact on Latvian banks, as they currently do not use internal models. However, Swedish banks are quite predominant in Latvia, and we therefore expect that Latvian banking customers will be significantly affected through higher interest rates of Swedish banks. Similar effects can be expected in other countries, where foreign banks using internal models are predominant.

[22] The calculation of the relative increase in interest rates is based on average SME lending rates and lending rates for large firms for European countries from the OECD Scoreboard on SME and entrepreneurship finance database as well as on average mortgage rates in the EU reported in the 2018 Review of Europe's Mortgage and Housing Markets prepared by the EMF. The average EU lending rate for SMEs is calculated as an average of the 19 EU countries for which data is available and amounts to approximately 2.7%. The average lending rate for large firms is around 1.8%. The EMF reports an average mortgage rate in the EU-28 of 2.4%.

[23] Covering deposit and junior as well as senior wholesale funding.

[24] Although, costs related to operational risks is distributed equally on all assets.

2.3 IMPACT ON DIFFERENT CUSTOMER GROUPS

On a company level, we expect that it will be the most solvent and low-risk companies that will experience the largest increase in interest rates, because the most solvent companies will have lower risk weights, being most susceptible to limitations of the risk sensitivity. In contrast, highly leveraged companies with large inherent risks can expect to see a much smaller impact. We expect interest rates for unrated corporates to be particularly affected, as the package will provide a large increase in cost-of-capital for this asset class.[25]

To illustrate the impact on different customer groups, and how this might differ between countries, we have constructed different cases, which will be outlined in the following.

Households

We estimate that the average increase in the mortgage rate in the EU will be around 0.10 percentage points, c.f. Box 5. For a for a typical new homeowner family, this corresponds to an increase in interest expenditures of EUR 190 (based on average price of a new home in UK). In some of the most affected countries, the impact on mortgage rates could be up to 0.17 percentage points. Here, we find that a new homeowner family will experience an increase in interest expenditures of EUR 340. Through the lifetime of a typical mortgage, this amounts to some EUR 4,400.

Box 5 Higher interest expenditures for typical new homeowner families

We use the average price of a new home in the UK as a benchmark price as data is readily available. This implies an average price for a house of around EUR 260,000[1)].

In the EU, we estimate an increase in the mortgage rate of around 0.10 percentage points. With an average loan-to-value (LTV) ratio in the EU of around 76%[2)], this implies that a typical new homeowner family will have their annual interest expenditures increased by around EUR 190.

In the most affected countries, we estimate increases in the average mortgage rate of up to 0.17 percentage points. Using again the average price for housing in the UK of EUR 260,000, this amounts to an increase in interest expenditures of around EUR 340 per year. With a typical maturity of a mortgage loan of 25 years, this implies that the purchase of a new house is approximately EUR 4,400 more expensive.

Source: 1) HM Land Registry data 2) EMF(2018) – Review of Europe's Mortgage and Housing Markets

SME

We have also assessed how the framework will impact borrowing costs for SMEs:

- The EU average increase in lending rates for SMEs is around 0.19 percentage points. For an SME, with a bank loan of EUR 2.5 million, this will lead to an increase in annual interest expenditures of EUR 4,750.

[25] Exposure in this asset class is assigned a risk weight of 100% with standard risk weights in the output floor calculation (or at best 65% in jurisdictions where the ratings approach is not allowed and if the corporate is classified as "investment grade"). As opposed to this, current internal models often suggest much lower risk weights due to the low probability of default of financially sound unrated corporates. This implies that the cost of credit increases to a larger extent for such corporates, as the floor on the risk weights limits the extent to which such unrated corporates can benefit from their low risk profile.

- In some of the most affected countries, we estimate an average increase in the SME lending rate of around 0.50 percentage points. For a typical SME, with a bank loan of EUR 2.5 million, this will lead to an increase in annual interest expenditures of EUR 12,500.

Box 6 Impact on two types of SMEs

Based on the European Commission's definitions, we construct two cases of an SME:

- A micro company with less than 10 employees, a turnover of at most EUR 2 million and a balance sheet of at most EUR 2 million. We assume that bank debt corresponds to 25% of total assets, which means that an increase in the lending rate of 0.19-0.50 percentage points will lead to an increase in annual interest expenditure of around EUR 950-2,500.
- A small company with less than 50 employees, EUR 10 million turnover and a balance sheet of EUR 10 million. With bank debt corresponding to 25% of total assets, this implies that an increase in the lending rate of 0.19-0.50 percentage points will increase annual interest expenditure of around EUR 4,750-12,500.

Source: Copenhagen Economics, European Commission

Corporate

Finally, we have constructed a case of a typical corporate customer:

- The EU average increase in lending rates for corporates is around 0.20 percentage points. For a typical corporate customer, with a bank loan of EUR 250 million, this will lead to an increase in annual interest expenditures of around EUR ½ million.
- In some of the most affected countries, we estimate that the average impact on corporate lending rates is around 0.40 percentage points. Based on this impact, typical corporate customers could experience an increase in annual interest expenditures of up to EUR 1 million.

Box 7 Impact on a corporate

We construct a case of a corporate with a total balance of EUR 600 million, with bank debt of around 40% of total assets. The company has around 2,500 employees and a turnover of EUR 500 million. With the average EU increase in interest rates for corporates of 0.20 percentage points this leads to an increase in the annual interest costs of around EUR 0.5 million. An increase of 0.40 percentage points as in the most affected countries implies around EUR 1 million of additional interest expenses per year.

Source: Copenhagen Economics, annual reports data

2.4 MOVE OF CREDIT TRANSMISSION TO LESS REGULATED SECTORS

The Final Basel III Framework could provide a stronger incentive to bypass the traditional banking system, resulting in more credit flowing from less-regulated institutions, often referred to as shadow banking.[26] This could include (but is not limited to): credit hedge funds, limited purpose finance companies and the rapidly growing FinTech industry.

Shadow banking appears to have been growing in the light of the previous tightening of the financial regulation. According to the European Systemic Risk Board's "Shadow banking monitor", shadow banking, broadly measured, expanded by around 75% in the eurozone between 2010 and 2017.[27]

The migration of activities to shadow banking could entail the build-up of new systemic risks as 1) a smaller part of the credit flow would be under supervision, and 2) the credit flow and interdependencies in the financial sector would be less transparent to market participants and supervisors.

Box 8 Main takeaways from Chapter 2

- We find that the framework will lead to a total increase in banking costs for European banking customers of around EUR 40-45 bn. This will be recuperated through higher fees and lending rates.
- We expect interest rates for SMEs to increase by 0.19 percentage points, for corporates by 0.20 and for household mortgages by 0.10.
- At a customer level, this means that for example a typical new homeowner will have higher annual interest expenditures of EUR 190. In the most affected countries, annual interest expenditures are around EUR 340 higher annually. A typical SME with a bank debt of EUR 2.5 million will have higher interest rate expenditures of EUR 4,750 per year and up to EUR 12,500 in the most affected countries.

[26] See Plantin (2014): Shadow Banking and Bank Capital Regulation.

[27] https://www.esrb.europa.eu/pub/pdf/reports/esrb.report180910_shadow_banking.en.pdf

CHAPTER 3

NET ECONOMIC IMPACT ON SOCIETY

In the previous chapter, we have analysed how the Final Basel III Framework could impact the banking sector and estimated the resulting impact on banking customers. In this chapter, we widen the scope and present a general societal cost-benefit analysis of the framework.

Optimal capitalisation in banking is a topic that has been extensively researched over the past years, especially in the preparation for the regulatory overhaul of the financial sector needed in light of the global financial crisis. The cost-benefit analysis in this chapter is based on the framework established in this research – in particular BIS (2010), also called the LEI study[28], which provided the analytical foundation for the original Basel III Framework.

In this chapter, we will first analyse the real-economy costs of the Final Basel III Framework (section 3.1). We will then analyse the benefits (section 3.2), which we will bring together in a coherent societal cost-benefit analysis (section 3.3).

3.1 REAL-ECONOMY COSTS

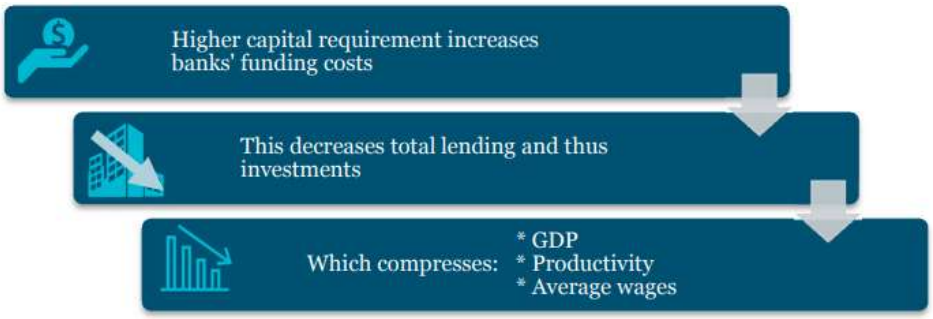
To estimate the costs, we implement the increase in capital requirements resulting from the EBAs preferred implementation (estimated in chapter 1) in a structural macroeconomic model of the European economy (a so-called DSGE model). The model has been calibrated to the most recent average EU macroeconomic and financial data, allowing us to estimate the impact on investments and GDP.[29]

The causality of the real-economy impact goes as follows; higher capital requirements increase the funding costs of Europeans banks (as equity is a more expensive source of funding than debt). The higher capital costs are passed on to customers through higher interest rates, which reduces credit demand. This curbs investment activity, causing a decline in overall productivity that eventually contracts GDP.

[28] Named after the working group in BIS, called Long-Term Economic Impact.

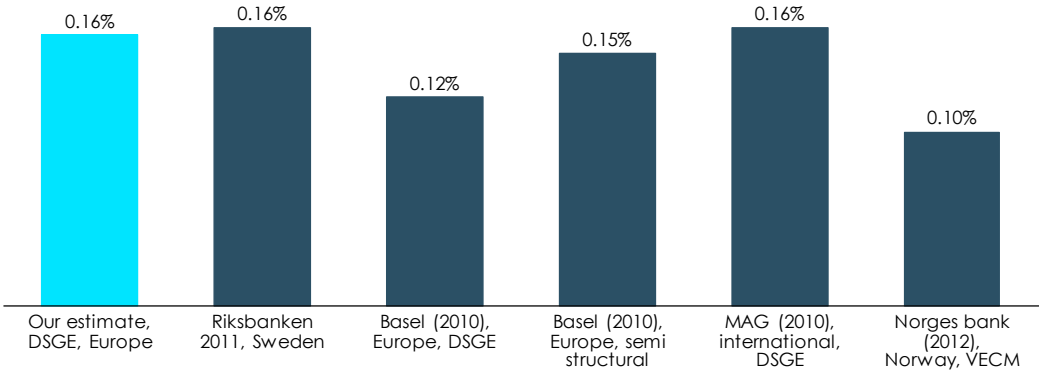
[29] The model was originally developed by Meh Moran (2010)

Figure 12
How the Final Basel III Framework impacts the real-economy



Concretely, we estimate that structural GDP declines some 0.16% for every percentage point increase in the CET1 ratio. The result is in line with previous research on the topic, cf. Figure 13. This is unsurprising as we use the same general model framework to estimate the impact, cf. appendix.

Figure 13
Decline in GDP of higher capital requirements
Decline in long-run GDP from a one percentage point increase in CET1 ratio



Source: Own calculation based on referenced papers

3.1.1 Impact on investments

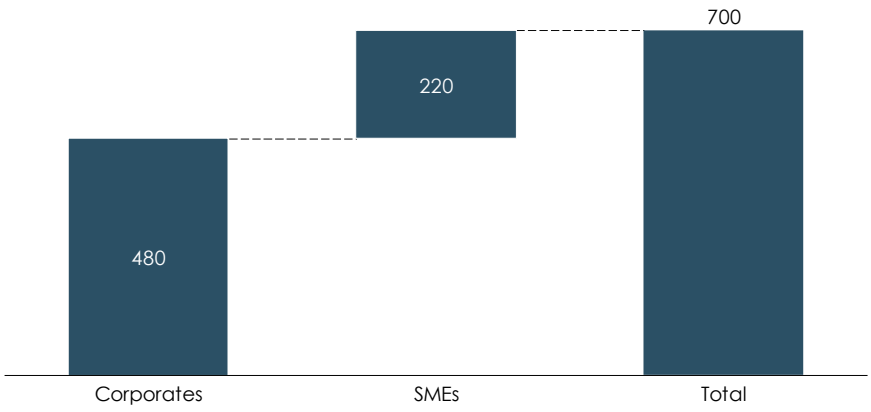
Assuming capital requirements will increase by some 24% as described in chapter 1, we estimate that the total EU GDP will permanently decline by just above 0.5% from implementation of the Final Basel III Framework, corresponding to around EUR 90 bn (2018-level). In other words, the total EU GDP will, every year, be some 0.5% lower than it otherwise would have been.

We estimate that the decline in GDP will gradually appear the following ten years after initial implementation. In this transition period, the higher interest rates will give rise to subdued investments (which eventually will entail the lower structural GDP). Concretely, we estimate that, every year,

investments will be some EUR 70 bn lower, corresponding to a decline of around 1.8%. Accumulated over the ten-year period, the EU economy sees a reduction in investments of around EUR 700 bn.[30]

Of the total accumulated reduction in investments of EUR 700 bn[31], SMEs account for some EUR 220 bn. and corporates account for the remaining EUR 480 bn., cf. Figure 14.

Figure 14
Accumulated impact on investments
EUR bn



Note: Based on the current distribution of investments between SME and corporates.
Source: Own calculations

3.1.2 Uncertainty of estimates

It should be noted that these types of calculations are entailed with significant uncertainty due to several factors. One uncertainty factor often discussed in the relevant literature is how the real-world capital requirements feed into the simplified model framework.

Another debated question is whether a higher level of equity will reduce the required return on equity (and the riskiest parts of debt funding). In other words, if banks are more well-capitalised then the expected loss by investing in the bank should fall and hence also the required rate of return (the so-called Modigliani-Miller effect). However, it is by no means obvious that banks that are already well-capitalised, as is the case for the banks with the largest capital shortfalls, will in reality be able to get lower funding costs in the different funding classes. In this respect, we also note that some large international studies of the real-economy impact of capital requirements, e.g. BIS (2010)[32] did not include the Modigliani-Miller effect. We discuss this in more detail in appendix B.

[30] Corresponding to a decline in the capital stock of around 1.5%. The equivalent to this is a reduction in total lending to businesses of around 3.5%. Combining this with the estimated interest rate increases gives rise to a numerical price elasticity of between 0.4-0.8 depending on assumptions of future interest rate structure.

[31] Based on the current share of investments.

[32] BIS (2010): *An assessment of the long-term economic impact of stronger capital and liquidity requirements.*

In our estimation, we have built some of these uncertainty elements into our calculation, reducing our GDP impact by some 20%.

How do banks accommodate the increase in capital requirements?

How banks accommodate the increase in capital requirements is also not clear-cut. Recall from chapter 1 that the reduction in total credit as a result of the Final Basel III Framework would be:

- EUR 2,900 bn.: if banks do not increase capitalisation at all
- Zero: if banks fully increase capital corresponding to the increase in capital requirements

In our model, we do expect a reduction in total assets, following a decline in demand as a result of the higher interest rates. The deleveraging is hereby not an active choice by the banks, but a result of lower credit demand. As such, the estimates in our model framework lies somewhere between the two extremes.

Short-term impact could be higher

In the short to medium term, it could be that banks prefer partly to solve their capital shortfall by directly cutting back on credit rather than just passing on the higher cost of capital. One reason for this being that the capital shortfall would be so massive for the involved banks that they risk facing unfavourable funding conditions in a longer-term perspective.

Such a cut-back in credit would entail stronger short to medium-term effects on the real economy, including a decline in employment, as it would subdue economy-wide demand. There is some evidence for this being a likely scenario:

- The Macroeconomic Assessment Group estimates that the negative short to medium-term effects are, at their greatest, around 50% greater than the permanent effects (derived as an average of several models). In terms of the Final Basel III Framework, this would correspond to a GDP decline of 0.75%.
- The Riksbank (2014) finds that the negative effects reach their maximum after eight years (with a phase-in period of four years). In terms of the Final Basel III Framework, their estimate corresponds to a GDP decline of 0.7%-1.75%.

3.2 REAL-ECONOMY BENEFITS

Having established the costs, we now turn our attention to the benefits. First, we establish a theoretical basis for why banks need to be regulated. We then estimate the benefits of the Final Basel III Framework using a model framework developed in BIS (2010).

3.2.1 Why are banks regulated?

Banks have an important role in the economy. They act as financial intermediaries, allocating credit so it yields the highest return for investors and society. A well-functioning bank sector is therefore crucial to ensuring a sufficient flow of investments and for economic growth in general. On the other hand, bank failures can result in a credit crunch with severe consequences for the overall economic activity, as amply illustrated by the financial crisis. In addition, this could lead to a taxpayer-financed bailout in order to restore credit transmission.

As any other company, banks have a self-interest in being sufficiently capitalised to avoid default. Nevertheless, there are several so-called economic imperfections on the banking market entailing that market-determined capital and liquidity buffers may be too low from a socio-economic point of

view: When deciding on the level of capitalisation, owners of the bank only consider their private costs in the case of bank failure and not the total cost imposed on society. Because of banks' crucial role in society, the societal costs of bank failure are likely to be higher than the private costs to bank owners. Consequently, banks may have capital levels that are below the optimal level for society, which creates a scope for the regulation of banks, cf. also Box 9.

Box 9 Moral hazard in banking

Moral hazard arguments also call for regulation that ensures a minimum level of capital. There is generally imperfect (or asymmetric) information on the capital markets, implying that market participants cannot perfectly monitor the riskiness of bank portfolios. When there are low equity levels (i.e. low capitalisation), equity holders have little "skin in the game" and may consequently try to influence management to increase the risks of the bank's portfolio in order to increase the upside of their equity. Higher capital requirements can reduce this moral hazard issue. It will increase the potential loss for equity owners in the event of a bank failure. As a result, they will be less likely to try to increase the risk of the portfolio. This factor is compounded by government insurance of depositors, as their required return will not increase as the probability of default increases. This gives banks a further incentive to increase their leverage.

Source: See Meh and Moran (2010) or Myers and Majluf (1984)

3.2.2 Declining benefits of bank regulation

As outlined above, there are clear benefits of certain minimum levels for capital ratios. The benefits are nevertheless declining – and beyond a certain point, the positive effects are very small: With higher capital levels, it will take an increasingly strong economic setback to disrupt financial stability, and beyond a certain point, the risk of a banking crisis – as a result of too low capital ratios – becomes so small that the benefits are negligible.

Concretely, the BIS (2010) finds that the additional benefit for advanced economies of increasing capital ratios[33] above 15%, in terms of reducing the risk of a crisis, is small. Similarly, the IMF estimates that 85% of all banking crises in OECD countries since 1970 could have been avoided with total capital ratios of 15%. They find that: "*The marginal benefit of additional capital declines rapidly after that*" as further capital increases only have marginal effects on preventing crises.[34] It should be mentioned that the estimates are subject to uncertainty. The assumptions behind the estimation are laid out in appendix B.

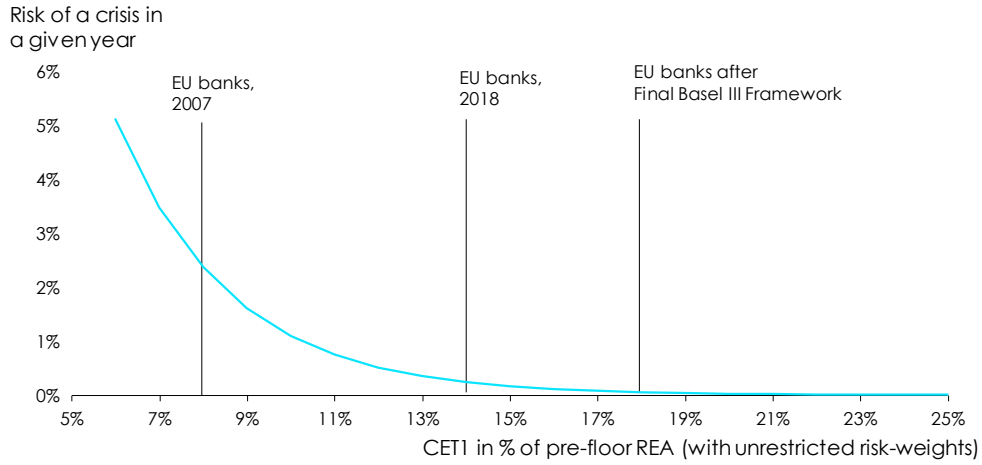
3.2.3 Currently limited marginal benefits of increasing capitalisation

Since the financial crisis, the European banking sector has moved from a situation where there were still clear benefits of higher capitalisation to a situation today, where the effect of further increasing the capital requirements are quite small, *cf.* Figure 15. This means that the gross benefits of the increasing capitalisation in general are limited.

33 Measured as CET1 / Total REA

34 See IMF (2016): Benefits and Costs of Bank Capital p. 15.

Figure 15
Estimated risk of a crisis as a result of too low capitalisation



Note: "EU banks with The Final Basel III Framework" is measured in % of original REA. The graph is an extrapolation of the estimates from BIS (2010), assuming an exponential form. The original estimates are reported in Tangible Core Equity divided by Risk Weighted Assets (RWA), which are converted to a CET1 ratio with a conversion factor of CET1=0.92•TCE.
Source: BIS (2010), page 15 and own calculations

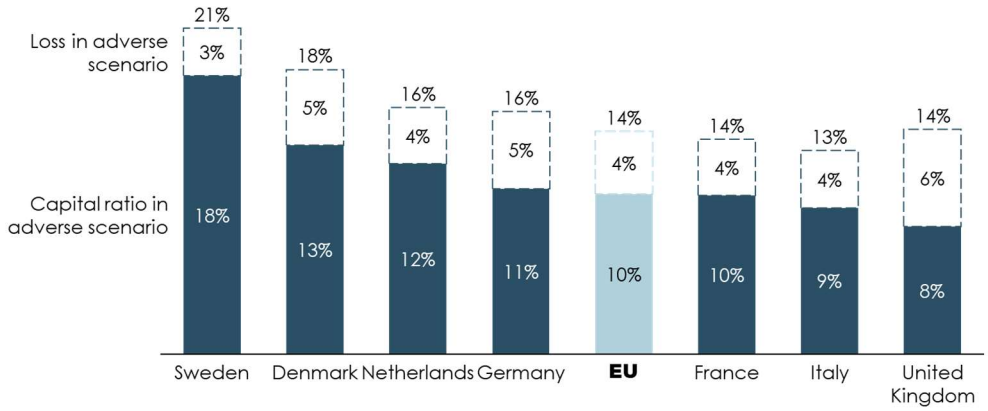
Note, that in the Figure 15 we are presenting the result as a share of REA with the original risk weights, i.e. "pre-floor" REA[35], because the original studies referenced are analysing the topic using a REA that is risk-based, i.e. not floored by measures in the Final Basel III Framework. In other words, from an economic perspective, it does not matter whether the capitalisation is increased by increasing the risk weights or by increasing the capital ratio – the economic impact is the same.

The reduction in the risk of a crisis, as displayed in Figure 15, can be transformed to a benefit in percentage of GDP, based on assumptions on the GDP costs of a crisis, cf. appendix. Using the model framework from BIS (2010), we estimate that the gross benefit of the Final Basel III Framework corresponds to a permanent increase of 0.1% of GDP. In other words, the reduced risk of a crisis from the Final Basel III Framework corresponds to GDP being higher by 0.1% every year.

The low gross benefit of further capitalisation is confirmed by the European stress test by the EBA, showing that most banks would have solid capitalisation after a severe economic recession, avoiding a government sponsored bail-out, cf. Figure 16. For example, the EBA estimates that the average EU banking sector would still have a capital ratio of around 10%, after a severe economic recession.

[35] As defined in the EBA impact assessment p. 176

Figure 16
Actual and estimated capital ratios before and after severe economic recessions: results from EBA stress test
CET1 ratio in % of risk exposure amount



Source: EBA EU-wide stress testing 2018

The above analysis is based on the aggregate capitalisation of the EU banking sector. However, our analysis suggests that the most impacted banks have above-average levels of capitalisation already. For example, the most affected banks have credit losses half that of the other banks and have, on average, a higher capitalisation. Thus, a large increase in required capital of already robustly capitalised banks will limit the benefits. This suggests that the gross benefits will likely be smaller than the estimate above.

The reduced risk sensitivity of capital requirements is also likely to impact the risk appetite for banks. Using internally based risk weights, there is a clear incentive to reduce the risk within each asset class; if the risk of an asset increases, the average risk weight of that particular asset will also increase, and the bank is required to hold more (costly) capital. However, if there is a floor on the risk weight and it is binding, increased risk-taking will not lead to higher capital requirements. In this way, risk-taking will become "cheaper" for banks with currently low-risk portfolios.

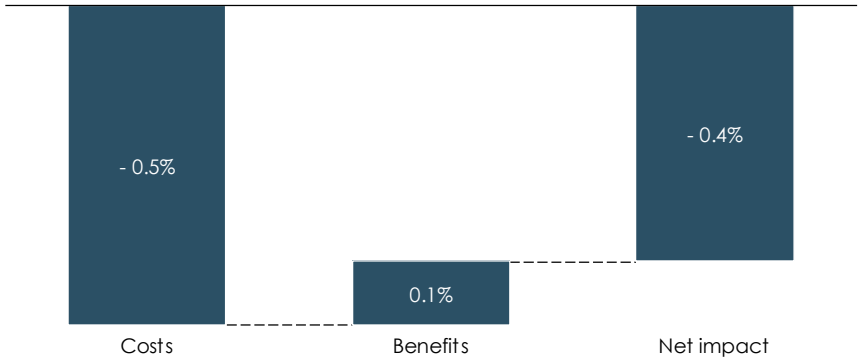
This is not included in the estimate, but an increase in risk appetite could – viewed in isolation – limit the gross benefits for financial stability.

3.3 NET SOCIETAL IMPACT

As described, there are increasing costs and declining benefits of higher capital requirements. The task for policy makers is to balance these costs and benefits to provide a net benefit for society.

Considering the Final Basel III Framework, we find that the costs clearly outweigh the benefits. As described, we estimate the benefits to be equivalent to 0.1% of GDP, compared to the estimated GDP reduction of 0.5% of GDP. This leaves a net cost of 0.4% of GDP, cf. Figure 17.

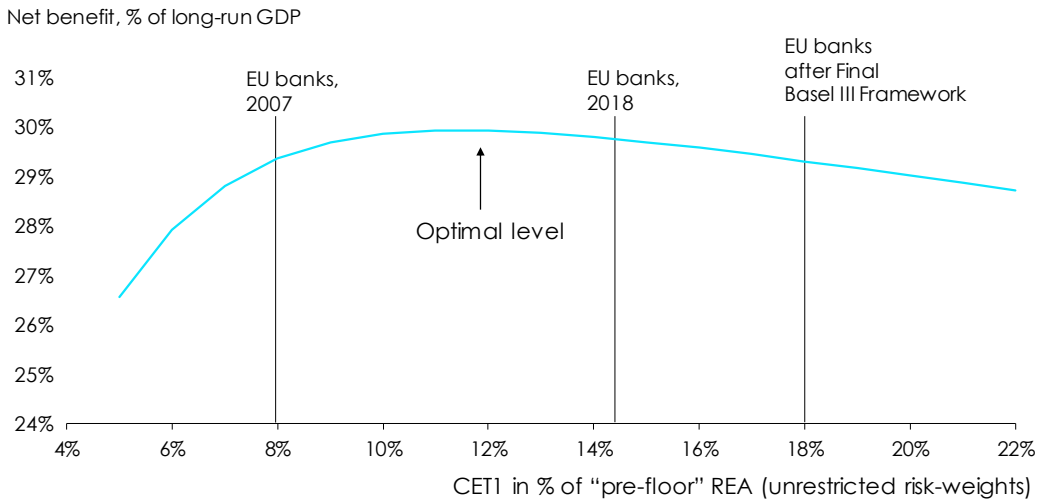
Figure 17
Total gross costs and benefits of a strict implementation of The Final Basel III Framework
% of long-run GDP



Source: Own estimations

In general, we find that the average EU capitalisation of around 14% is just above the optimal level of capitalisation of 12-13%, cf. Figure 18. Thus, an additional increase in capitalisation will – on average – not bring net benefits to society.

Figure 18
Net real-economy benefits for different levels of capitalisation



Source: Own calculations based on BIS (2010)

3.3.1 Macroeconomic assessment in the EBA report

The EBA impact assessment briefly provides a "*highly preliminary*" assessment on the macroeconomic impact of the Final Basel III Framework. While we acknowledge the preliminary nature of the work, it still raises some questions:

First, EBA presents a new approach to estimate an economic cost-benefit analysis called Growth At Risk (GRA). They find that "*based on preliminary and still tentative results, the finalisation of the Basel package should ensure net benefits for the economy as a whole*". However, it is not clear to us which effects are included in the analysis the conclusion is based upon: Looking at the figure included it looks like no permanent costs from the package is included. Is this based on an assumption that shareholders permanently reduce their required return on equity as a result of the new legislation? This would go against the assumptions behind the work leading up to Basel III, i.e. the BIS (2010) and the Macroeconomic Assessment Group (MAG) report.

Second, the EBA uses another approach based on the more traditional MAG/ BIS (2010) approach. The EBA primarily describes how the benefits are calculated, without any numerical results. The conclusion is that: "*tentative results suggest that the enhanced resilience of the banking sector is likely to reduce the number of systemic banking crises and the size of the ensuing negative real economic impact, thus yielding a net benefit*." However, it is not clear to us, whether this conclusion is based only on an assessment of the benefits of the Final Basel III Framework or an analysis also including macroeconomic costs, resulting in a net benefit estimate.

Box 10 Main takeaways from Chapter 3

- The higher interest rates will lead to a decline in private investments of around 70 bn per year, ten years after the implementation. The lower level of investments will contract GDP permanently by around 0.5%, corresponding to around EUR 90 bn.
- The benefit in terms of a lower risk of a new financial crisis are limited; the post-crisis reforms increase capitalisation of the European banking sector to a level where there are limited marginal benefits of further increases. Concretely, we assess that the benefit corresponds to around 0.1% of GDP.
- This means the framework, as laid out in the EBA's main scenario, gives rise to a net reduction in welfare of 0.4% of GDP.
- In general, the capitalisation of the European banking sector is on aggregate a bit above the optimal level.

CHAPTER 4

DIFFERENT OPTIONS OF IMPLEMENTATION

The previous chapter concluded that the Final Basel III Framework does not bring net benefits to society if implemented in the form laid out in the EBA's main scenario. In addition, it was documented in chapter 1 that the framework will lead to a significant increase in capital requirements in the EU, in contrast to other jurisdictions, most notably the US. It is thus not in line with the original G20 declaration stating that the framework should be without "*further significantly increasing overall capital requirements across the banking sector, while promoting a level playing field*".

This raises the questions of how the Final Basel III Framework can be implemented in a way more in line with real-economy considerations and at the same time respect the mandate of the G20 declaration. These questions will be explored in this chapter.

First, we will provide some options of alternative ways the framework can be implemented and what these options would entail for the net benefit of the framework (section 4.1). We will then discuss the implications for the real-economy net benefits (section 4.2).

4.1 MAIN PRIORITIES IN THE IMPLEMENTATION OF THE FINAL BASEL III FRAMEWORK

In this section, we consider options on how the Basel III Framework can be implemented – taking structures of the European financial system into consideration. This means, on one hand, avoiding the broad-brush increase in capital requirements in EBA's main scenario, while keeping EU's commitment to follow global standards in banking regulation. The aim is to bring the impact of the European implementation more in line with the impact in other jurisdictions and limit the negative societal impact.

Output floors

A high impact of the output floor is one of the main reasons, why the Final Basel III Framework affects the European banking sector much stronger than other jurisdictions. Thus, an appropriate implementation of the output floors is a key task in achieving an increase in capital requirements more in line with the global average.

An approach to make the impact more in line with other jurisdictions has in fact been put forward, the so-called "back-stop" approach or "parallel stacks" approach[36]. The approach would entail that EU banks are subject to three different capital requirements:

1. *Leverage ratio:* Equity should be above 3% of total assets.
2. *Pre-floor REA:* Based on risk weights unrestricted by the output floor, with all capital buffers included – similar to what is binding for most banks today.
3. *Floored REA:* The floored REA are used to determine internationally agreed capital buffers only, i.e. the buffer for global systemically important banks (G-SIBs), the countercyclical buffer and the capital conservation buffer. Buffers that are set at the EU level such as Pillar 2 and the systemic risk buffer would be excluded.

[36] See EBA impact assessment p. 175.

We see this implementation as being more in line with the G20 mandate and real-economy considerations: First, it will ensure a more level playing field towards the US, as the output floor REA would apply to the same capital buffers. It will also mitigate the impact on capital requirement. When implemented on top of the other measures, we find the impact to be around 0-2% increase in capital requirements, i.e. no significantly increase in capital requirements.

Unrated corporates

Corporates that do not have a rating are significantly impacted, for banks where the output floor is binding. Concretely, an unrated corporate gets assigned a risk weight of 100%. This is substantially above what an internal model typically predicts. And since the majority of corporates in the EU do not use external ratings,[37] this makes exposure to such corporates relatively costly.

There are some exceptions to the requirement of the 100% risk weight. In jurisdictions where external ratings are not recognised – and if the company is listed on an exchange – banks can assign a 65% risk weight to so-called investment grade corporates[38], which is more in line with predictions of internal models. However, in its current form, these exceptions are rare and have little impact on the risk weights, among other things because a relatively small share of companies are listed on exchanges compared to, e.g., the US.[39]

One option to adjust the framework to fit the European financial system better would be to remove the requirement that the company should be listed on an exchange as well as to allow the application of the investment grade classification for all unrated corporates (and not only for corporates in jurisdictions where external ratings are not recognised). This would ensure a level playing field across jurisdictions irrespective of whether external ratings are permitted or not and irrespective of the funding structure of companies. This could be achieved by, for instance, relying on a certain size, turnover, etc.

We estimate that allowing a 65% risk weight to be assigned to investment grade exposures in all jurisdictions would amount to a reduction in the increase in capital requirements of up to 4 percentage points, depending on the chosen threshold.[40]

EBA options to avoid broad-based increase in capital requirements

The EBA impact assessment also provides options on how the impact on capital requirements could be mitigated compared to their main scenario[41]:

- **Maintaining the SME supporting factor:** The Final Basel III Framework introduces a preferential risk weight for corporate SME exposures. Currently, there is also a SME supporting factor that applies to all SME exposures. In the EBA's main scenario, the SME

37 The EBA impact assessment, for example, finds that around 80% of corporate exposure was unrated in a sample of 58 banks (p. 75).

38 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 impact assessment, p. 74).

39 Financing of businesses in the EU is largely dominated by bank funding and, thus, listing securities on an exchange is not very predominant. See *European Commission (2017) – Improving European Corporate Bond Markets*, pp. 11-12, for instance.

40 For this estimation we assume a share of investment grade corporate exposures of around 30% (see EBA impact assessment, p. 75).

41 In addition, EBA expects the final revisions to the trading book, published in January 2019, will reduce the total impact by around 0.5 percentage points.

supporting factor is removed due to the new preferential risk weights. Keeping the SME supporting factor would reduce the total impact on capital requirements by 1.5 percentage points.[42]

- **Excluding the historical loss component:** 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. Excluding this historical loss component from the capital calculation would reduce the total impact by around 1 percentage point.
- **Keeping the Credit Valuation Adjustments (CVA) exemptions:** The package could also impact the cost of risk management for corporates. Currently corporates use derivatives to hedge financial risks. With the Final Basel III framework, the current EU-specific arrangement to limit these costs – the so-called CVA charge exemption - is removed.[43] Keeping the CVA exemptions would reduce total impact by 2.5 percentage points.

Reduction of EU specific capital buffers

The implementation of the Final Basel III Framework could also be an occasion to consider a recalibration of the capital buffers introduced specifically to the European banking market. These requirements include the buffer for other systemically important institutions (O-SII), the systemic risk buffer (SRB), the countercyclical capital buffer and the Pillar 2 requirements to be implemented by the national authorities. Furthermore, national capital guidance (that de facto works as additional capital buffer) could be recalibrated.

Concretely, we estimate that a removal of the systemic risk buffer (SRB) would reduce the impact by 1-2 percentage points.

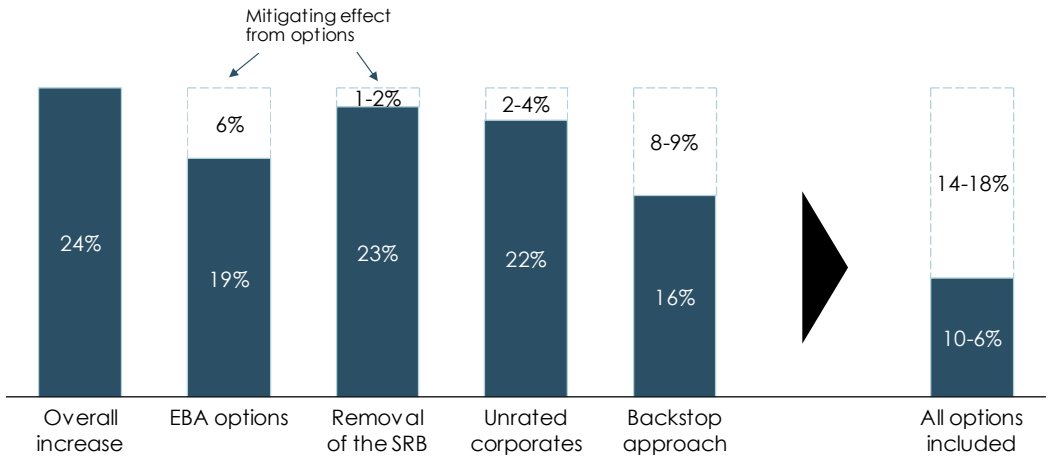
4.1.1 Total impact on capital requirements

Following the above options, we assess that the impact of the Final Basel III Framework could be limited to an increase in capital requirements in the magnitude of 6%-10%, cf. Figure 19.

[42] See EBA impact assessment, p.24. The EBA assessment most likely underestimates the impact as it is based on a less comprehensive applicability of the SME supporting factor compared to the final regulation (see p. 77 of the EBA impact assessment).

[43] See also Allen & Overy (2014) – *Capital Requirements Directive IV Framework, Credit Valuation Adjustment*

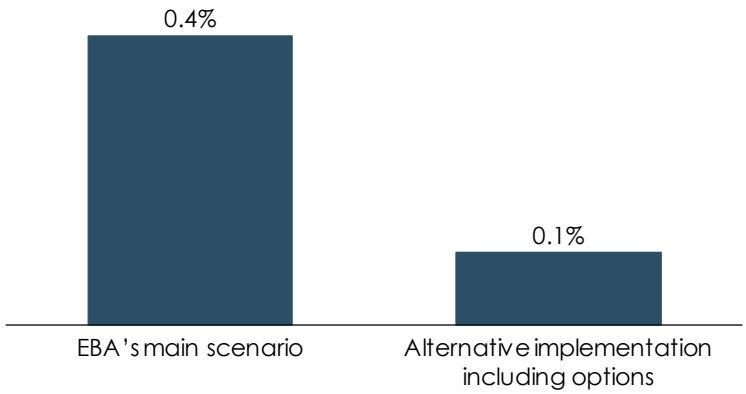
Figure 19
Increase in capital requirements with different options of implementation
Increase in CET1 requirement



Note: The EBA options include the following: "Maintaining the SME supporting factor", "Excluding the historical loss component", "Keeping the CVA exemptions" and "Including the 2019 revisions to the FRTB". Calculations include the UK.
Source: Own calculations

This implementation would mitigate the negative real-economy impact of the framework. Concretely, we estimate that GDP would decline in the area 0.15%-0.2% of GDP. We estimate benefits corresponding to 0.05% of GDP, giving rise to a net benefit loss of around 0.1%, i.e. 0.3 percentage points lower net costs than from EBA's main scenario.

Figure 20
Net societal costs from the Final Basel III Framework, with and without options
Percent of GDP



Source: Copenhagen Economics

Box 11 Main takeaways from Chapter 4

- To mitigate the broad-brush impact of the Final Basel III Framework, we outline a range of options, that could limit the capital increase to around 6%-10%.
- This would bring the net societal costs of the framework to around 0.1% – a significant reduction from 0.4% as in the EBA's main scenario.
- In addition, we recommend continuing the work with optimising internal models to increase model predictions and thus reduce unwarranted variability.

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Ongena Popov and Udell (2013): When the cat's away the mice will play: Does regulation at home affect bank risk-taking abroad?

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OECD (2013): Financing SMEs and Entrepreneurs 2013: An OECD Scoreboard

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The Riksbank (2011): Appropriate capital ratio in major Swedish banks

The Riksbank (2013a): Financial Stability Report 2013:1.

The Riksbank (2013b): Financial Stability Report 2013:2

The Riksbank (2014a): Penningpolitisk Rapport

The Riksbank (2014b): Financial Stability Report 2014:1

The Riksbank (2014c): Lower neutral interest rate in Sweden?

The Riksbank (2015a): Financial Stability Report 2015:2

The Riksbank (2015b): Supply of housing in Sweden

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Schmitz, Sigmund, and Valderrama (2016): Bank Solvency and Funding Cost: New Data and New Results

Shafer (2018): The foreign capital flow and domestic drivers of the US financial crisis and its spread globally

Woodford (2011): Inflation Targeting and Financial Stability

Wyman (2016): Real-economy cost of regulation in the Swedish banking system

Uluc and Wieladek (2015): Capital requirements, risk shifting and the mortgage market

ZEB (2018): European Banking Study

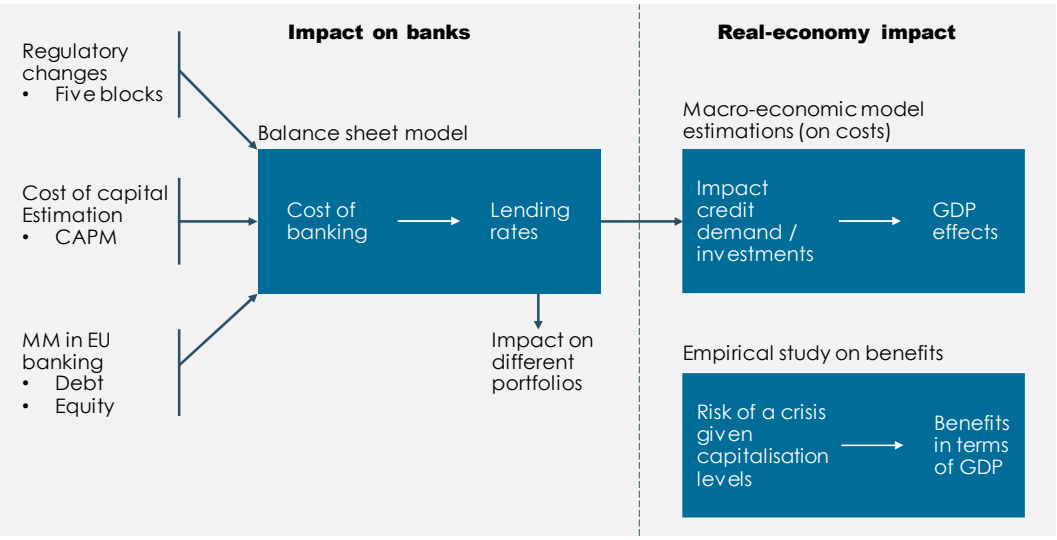
APPENDIX A

THE BANKING BALANCE SHEET MODEL

The appendix describes both the balance sheet model we use to estimate the impact of The Final Basel III Framework on different interest rate portfolios 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 of 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 130 banks across 25 European countries. The data includes information on original exposures, exposure values (exposure at default in BIS terminology) and risk exposure amounts for credit risk split across different asset classes. This data forms the basis for the calculations within the balance sheet model. The data are from the end of the year 2017.
- **The S&P Global Market database (SNL database):** The SNL database contains granular information from banks' financial statements, such as total assets, interest expenditure, profits, impairments, and so on. We primarily use this data in the estimation of the interest rates. The data are for the year 2017.

- **EBA impact assessment:** The EBA impact assessment provides a detailed analysis of the expected impact of the Final Basel III Framework. We closely follow the results obtained in the EBA report in that we calibrate the country average impact obtained in our model to the numbers estimated by EBA.

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) as well as the results from the EBA Basel III impact study to infer changes in the standardised risk weights.[44]

Our sample initially consists of the 130 banks available from the EBA 2018 transparency exercise. After matching these with the banks for which data is available in the SNL database, 115 banks remain in the sample. From this sample we further exclude seven banks which are public or do not have a traditional commercial businesses model.[45] These banks have CET1 capital ratios above 50% and could distort the average results.

This leaves us with a sample of 107 banks in total, covering 22 European countries. The EU countries which are not represented in our sample are: Bulgaria, Croatia, Czech Republic, Latvia, Lithuania and Slovakia.

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.
- **Corporate**: Exposure to corporates excluding corporate SMEs.

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

45 The excluded banks are: the Belgium branch of The Bank of New York Mellon, DEPFA bank Plc (Ireland), Municipality Finance (Kuntarahoitus Oyj, Finland), Nederlandsche Waterschapsbank (Netherlands), Banco de Crédito Social Coperativo (Spain), Volksbanken Verbund (Austria) and Kommuninvest (Sweden).

- **Public sector:** exposures to central banks, central government and other public sector entities.
- **Bank:** Exposures to financial institutions is contained within.

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 REA.

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 risk exposure amount for each bank (giving the current portfolio risk weight) and are then adjusted according to the increase in exposure class standardised REA found in the EBA impact study.

The impact of the revision of the IRB approach is based on the portfolio impact in the EBA study and 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.

Increase in REA due to CVA, market risk and operational risk is approximated by using the EU average impact provided in the EBA study. 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.

Step 3: Implementing the output floor

The output floor is implemented as the last requirement and it limits the impact of internal models for the determination of banks' risk exposure amount by restricting the capital requirements to be at least 72.5% of the capital requirements calculated under the standardised approaches. The output floor is applied on an aggregate level.

For the output floor estimation, we assume the following risk weights for the IRB portfolio:

- **Retail mortgage exposures: 30%:** Corresponding to an average LTV ratio of 60%-80% as suggested in a study by the EMF.[46]
- **Corporate exposures: 92%**: This risk weight is calculated as the weighted average of 80% unrated corporate exposure (not considering potential investment grade classification, such exposure is assigned a risk weight of 100%) and 20% rated corporates with an average rating between A- and BBB- (approximated from EBA report, p. 75). It is very similar to the EU average risk weight under CR-SA of 91%.
- **SME exposures**: **75%:** Weighted average of preferential risk weight of 85% for SME corporates, a risk weight of 75% for retail SME exposures and a risk weight for exposure to SMEs that are secured by real estate of around 45%.

[46] See: https://hypo.org/app/uploads/sites/3/2017/09/HYPOSTAT-2017.pdf, p. 26

- **Central banks and central government exposures**: **8%**: Inferred from the EU average SA risk weight. No impact from the final Basel III package.
- **Financial institutions (banks) exposures**: **24%**: This is the EU average risk weight for IRB exposure of 20% adjusted for the average expected increase in EBA impact assessment. Note that short-term interbank exposures get a 20% weight in the final Basel III pacakge.
- **Other retail**: **75%**: EU average SA risk weight
- **Securitisation**: **58%**: EU average SA risk weight. No impact from the final Basel III package.
- **Equity**: **314%:** We assume that current EU average IRB risk weight will be equal to the new standardised risk weight.
- **Covered bonds** (only under SA portfolio): **11%**: Average EU SA risk weights. No impact from the final Basel III package.
- **Other exposures** (only under SA portfolio): **81%.** No impact from the final Basel III package.

In addition, we also assume that all non-credit risk REA is equal to the value under the standardised approaches. This does not have any direct effect on the estimation of the impact on the cost of additional capital requirements for the mortgage, SME and corporate exposure classes, but it affects the portfolios indirectly in the calibration and when determining whether the output floor will be binding.

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.

Swedish banks already face a risk-weight floor of 25% on their mortgage exposure. In the calculations we assume that this floor will be replaced by the new output floor (if binding). This limits the impact of the output floor on the Swedish mortgage portfolio considerably.

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. In particular, we calibrate the increase in REA to the increase in MRC in the respective country.[47]

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

The impact on the portfolio interest rates is generated by the change in the bank funding structure after Final Basel III Framework implementation. Banks will now need to finance a larger share of their credit portfolio with equity which is more expensive than debt. We assume that banks hold the same CET1 ratio as before the implementation of the Final Basel III Framework. This means that banks are not able to use any buffer they might hold on top of the capital requirements to compensate for increased capital requirements.

Basically, impact on funding costs for a portfolio is calculated as:

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47 It should be noted that the average of the country averages is not exactly 24.4%, because the impact is not shown for all countries. Moreover, the impact on the MRC is not exactly equal to the impact on REA because the MRC uses CET, not REA, as weights.

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

We assume that the percentage point increase in funding costs will lead to an equivalent percentage point increase in interest rates. In the calculations, we assume a required return on equity of 13% (10% after tax). This estimate is aligned with a recent study conducted by the EBF, covering the 50 largest banks in Europe. In comparison, the assumed cost of equity in BIS (2010) is 14.8%.

The debt funding cost rate is estimated for each bank using data on bank interest expenses and liabilities from SNL.

In our estimation, we also account for so-called "Modigliani-Miller" 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 interest rates from an increase in capital is thus mitigated by MM-effects. For a discussion on MM-effects, see Appendix B or CE (2016): "*Cumulative impact on financial regulation in Sweden*".

Finally, we distribute the impact from operational risks according to share of total REA.

APPENDIX B

ESTIMATION OF THE MACROECONOMIC EFFECTS OF THE FINAL BASEL III FRAMEWORK

MACROECONOMIC COSTS

To estimate the macroeconomic costs, i.e. 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 reduces investments and hereby compresses 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 is calibrated to fit the EU economy

The parameters of the financial sector are calibrated to capture the following aspects:

1. A CET1 ratio of 14%, which is the current average capitalisation of the banks in our balance sheet model.
2. Equity/total financial assets of 46% for non-financial firms. *Source: Eurostat*
3. Expected return of bank equity of 13%.
   Source: Estimation based on beta-coefficients made by the EBF.
4. 2.5% of the employment are working in the financial sector.
   Source: Eurostat
5. Annual inflation = 2%. *Source: ECB's inflation target*

Following parameters are based on the estimation of ECB's DSGE-model, NAWM II:

- Habit formation (=0.62)
- Quarterly depreciation of physical capital (=2.5%)
- Income share of capital (= 36%)

- Calvo price parameter (=0.82)
- Calvo wage parameter (=0.78)
- Annual risk-free long-run interest rate (=2%).

The rest of the parameters follow the calibration of Meh and Moran (2010).

How our macroeconomic model works

In the model, there is a moral hazard issue between the households, which 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, *cf. the Box b1 below*.

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

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**
   By 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 model. 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 including 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 strong influence on the overall results.

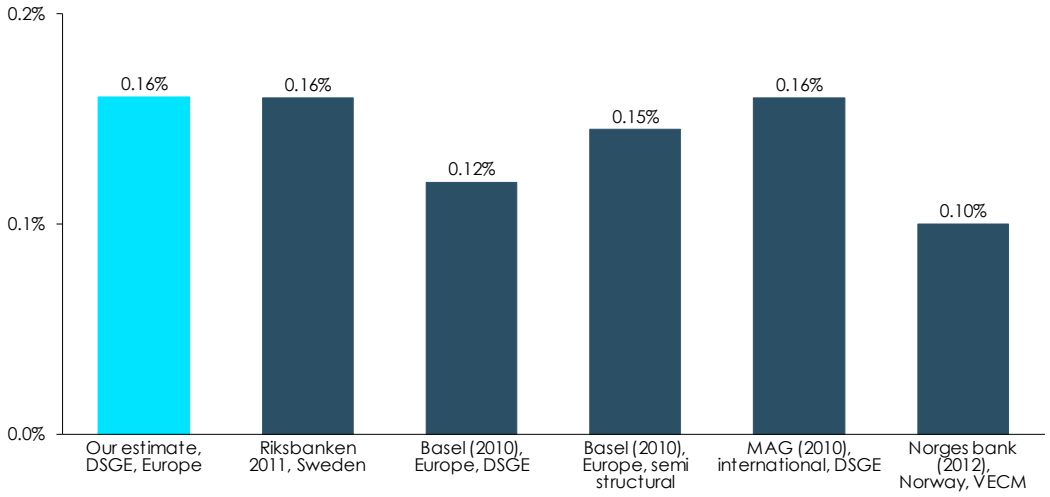
A main conclusion from the literature is that higher capitalisation has a distinct, non-linear impact on overall funding costs; above a certain threshold, investors will not consider a bank less risky if it increases the level of equity so overall funding costs will rise.[48]

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 21% downward, giving rise to an estimate of a 0.16% decline in GDP for an increase in CET1 ratio requirement of 1 percentage point.

Figure B.1
Our estimate compared to those of other institutions
Decline in long-run GDP due to 1 %-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 on 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”

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

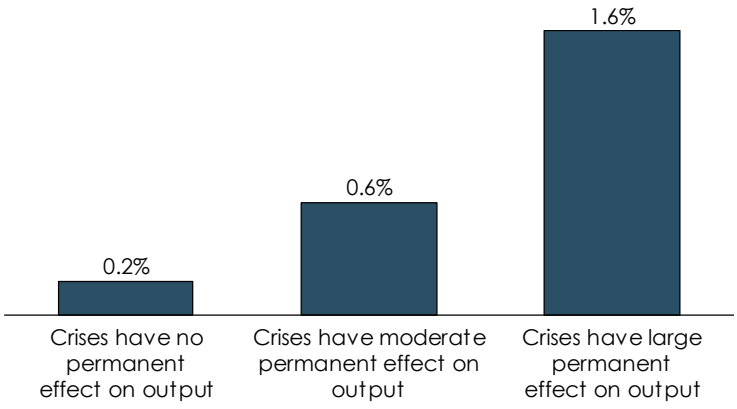
1) Cost of a crisis

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. 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.[49]

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

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

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, reduces 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).