

# Cumulative impact of financial regulation in Sweden

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## Preface

The BIS and the EU Commission are about to complete a regulatory package, dubbed “Basel IV”, which is a reform of the banking sector regulation initiated in the wake of the financial crisis. The package contains a new element called “capital floors” that will substantially increase the capital requirements of Swedish banks. This package comes on top of the already extensive measures put in place in Sweden over the last eight years. In addition, new macro-prudential measures are being considered to reduce the risk to financial stability in the future.

It is against this background that the Swedish Bankers’ Association has asked us to analyse the costs and benefits of further tightening financial regulation in Sweden.

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## Executive summary

The central issue addressed in this study is the extent to which new regulatory measures targeting the banking sector in Sweden deliver net benefits to society. As accepted in central IMF and BIS papers,<sup>1</sup> marginal returns to society from bank regulation are falling while marginal costs are increasing. The issue for Sweden, as well as for other EU countries, is whether the tipping point has already been reached. We think it has, as discussed below.

### The declining benefits

We see limited benefits from measures that further increase the solidity of the Swedish banking sector. In particular, we see only a small risk of adverse economic conditions leading to future bailouts financed by taxpayers and/or to the stop of credit flows in the midst of a future recession.

Key facts supporting this conclusion:

- The large Swedish banks have some of the highest capital adequacy ratios among their global peers. In 2015, the average capital (CET1) ratio of the largest Swedish banks was 19%, which is higher than that of the German, Dutch and French banks.
- Stress tests from the European Banking Authority show that expected losses in adverse economic conditions are smaller than for the peer group in other EU countries. The Swedish banks' average net loss<sup>2</sup> during stress was 2.4%, compared to the German banks' net loss of 5.4%.
- Financial markets price in the solidity of the Swedish banking sector: they obtain higher credit ratings than prior to the crisis despite tougher assessment methods. Within EU, only the highly capitalised Dutch banks match the performance of the Swedish banks. The cost of insuring against default is also among the lowest in EU.
- Based on reviews of historical banking crises in a wide range of countries, both the BIS and IMF suggest that there are few if any benefits to be gained from raising the capital adequacy levels of banks above 15%-20%, levels that have already been reached or exceeded by the Swedish banking sector.
- In fact, the Swedish government has earned a net profit of 0.4% of GDP on the interventions to support the banking sector since 2008. This should be seen in the context of Swedish banks going into the economic crisis with lower capital cushions than they have today: in 2007, the average CET1 ratio of Swedish banks was 8% compared with an average of 19% today.
- As a consequence, we also assess the risks of moral hazard in the banking sector to be low. Losses from taking excessive risks will be borne by investors, not taxpayers. This creates incentives for lending decisions to be based on a sound commercial basis.

### The increasing costs

Currently, there is a policy discussion about putting in place additional measures to further solidify Swedish banks as well as banks globally. We think in particular of capital floors and

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<sup>1</sup> See Basel (2010) and IMF (2016).

<sup>2</sup> Measured as a decline in CET1 ratio.



TLAC/MREL on top of the recently adopted LCR, NSFR, LR, mortgage risk floors, systemic risk buffer, capital conservation buffer, countercyclical capital buffer and pillar II requirements.

We suggest that such proposals may lead to substantial costs for the Swedish economy. Key facts supporting this conclusion are as follows:

- Overall funding costs will rise if Swedish banks are forced to hold more equity capital in particular and/or more liquid assets. With already very high credit ratings, funding rates for debt finance will go down only marginally. This will be more than offset by increasing costs from the higher share of equity, not least because equity financing is more expensive for example due to distortions in the tax system.
- This will reduce productivity and growth, as discussed below.
- Compliance costs will also rise. The various instruments in practice impact very much the same variables, namely the composition of assets and liabilities, including the share of equity financing. In essence, there are too many instruments chasing the same goal – namely, making the Swedish banks safer. That means we are adding potentially redundant instruments with no new benefits while making life more complicated for banks and supervisors, inter alia leading to higher administrative costs.
- Credit flows to firms and households will increasingly be provided to the less regulated part of the financial sector. This is already happening and undermines the very purpose of regulation namely financial stability.

### **Calculations of the increasing costs**

The increasing funding costs of banks due to the new regulation will be passed on to customers through higher lending rates. This in turn will reduce investment activity, resulting in lower productivity, which will eventually depress Swedish GDP and productivity.

To illustrate the increasing costs of regulation, we have carried out a number of simulations of the macroeconomic effects of already implemented legislation as well as possible new measures. Our definitions of the new measures are based on discussions currently taking place, particularly at the G-20, BIS and EU Commission level.

We estimate that the initiatives already adopted have reduced GDP permanently by 1.6%, corresponding to roughly SEK 65 bn. Half of the effect is due to the standard implementation of Basel III – primarily higher capital requirements. The other half of the decline in GDP is due to an over-implementation of Basel III in Sweden, with for example minimum risk-weights on mortgages, high SIFI-buffers, etc.

With respect to the new regulatory package currently being discussed at EU and BIS level, we estimate that it will result in a permanent reduction in Swedish GDP of 1%. This corresponds to roughly SEK 45 bn.

If we add up the estimated effects of both potential new and already implemented measures, the total gross GDP loss for Sweden amounts to 2.6% (with an upper bound estimate of 3.6%), while business investment will decline by roughly 1.5%. Our estimates are in line with earlier estimates from the Riksbank and BIS, among others.

### **Banking regulation excessively taken over role from standard macroeconomic policy**

In Sweden, as in other countries with very expansionary monetary policies, there is a focus on the need to address the increasing risks of financial instability. These are perceived to arise in particular from high debt-to-income rates for households, possibly linked to what may be an approaching bubble in housing and financial asset prices.

There is a clear risk that banking regulation is being overly charged with a task that could be addressed by more standard economic policy management. This may be linked with the fact that the economic crisis has been perceived internationally very much as a crisis originating in a financial system with incentives prone to create problems.

Somewhat forgotten has been the fact that all OECD countries that experienced severe economic setbacks – Ireland, Spain, Portugal, Denmark and the Baltic countries as well as the US – had prior to the crisis experienced classical and easily observable problems of overheating. These problems arose from deficiencies in fiscal policies and other structural problems leading to low savings rates, loss of competitiveness and rising external deficits as much as from failing bank regulation.

Consequently, the focus on macro-prudential policies rather than more classical fiscal and monetary policy management may be unproductive. In a Swedish context, possible measures put forward to reduce such risks include limitations on loans to individual households as well as new requirements for banks with regard to capital adequacy and liquidity reserves.

The problem with these measures is twofold:

- They do not directly target the underlying drivers of consumer demand for credit.
- Measures directed only at Swedish banks may be undermined by increased cross-border supply.

Our recommendation would be to use policy instruments that more directly target the emerging risks. We suggest looking at three areas:

- *The highly expansionary monetary policy* Sweden has with negative policy rates and a QE programme in the context of relatively low-level of slack in the labour market and underlying inflation very close to target rates and rising. This is a policy that arguably focuses too much on short-term inflation management versus longer-term financial stability.
- *Lowering the tax value of deduction of interest payments* linked to household debt and the tax treatment of owner-occupied accommodation.
- *Reducing barriers to expanding the supply of housing*, particularly in urban areas, thus easing the upward pressure on housing prices.

### **Overall conclusions**

The Swedish banking sector is very robust, within both a historical and an international context.

Benefits from additional layers of regulation are next to zero while costs are rising, hurting growth and long-term productivity in particular. Swedish banks are also competing internationally and will suffer from measures that give them higher costs.

We suggest that direct and targeted measures would be more effective and less counterproductive than the kind of policy packages discussed above.

Furthermore, we suggest that international negotiations on banking regulation going forward, certainly at the EU level, should take into account the robustness of the banking sector in the different member states. In particular, these negotiations need to have a more careful assessment of measures that do not take into account actual differences in the quality of seemingly equal asset types.

## Chapter 1

# Declining benefits and increasing costs of financial regulation

In this chapter, we set up our analytical framework, describing how the benefits of financial regulation are declining and the costs are increasing. In particular, we demonstrate that in a Swedish context, the benefits of further tightening regulation are very small while the costs are substantial.

First, in *section 1.1*, we show that there is a strong argument for regulating the financial sector, not least to reduce the risk of taxpayer-financed bailouts. However, in *section 1.2*, we describe how the benefits of regulation decline sharply once banks have reached a certain threshold of capital. In *section 1.3*, we describe how the costs of regulation are increasing, as the overall funding costs of banks increase subsequent to higher capital requirements. Concretely, we estimate a sizeable increase in funding costs for the Swedish banking sector. Finally, in *section 1.4*, we describe how the recently implemented regulation has increased complexity, subsequently increasing compliance costs and the risks of overlapping instruments targeting the same objectives.

## 1.1 Banks are important and should be regulated

There is scope for financial regulation, as the market-determined robustness of banks may be too low from a socio-economic perspective. Concretely, financial regulation should:

- Ensure a sufficient economy-wide flow of credit at all times, even during adverse economic conditions.
- Reduce the risk of taxpayer-financed bailouts.
- Prevent banks from taking excessive risks as a result of implicit and explicit government insurance and imperfect information on the capital markets.

### A well-functioning banking sector is important

Banks have an important role in the economy. They act as financial intermediaries, allocating credit so that it yields the highest return for investors and for society as a whole. A well-functioning banking sector is therefore crucial to ensure a sufficient flow of investment and for economic growth in general.

On the other hand, bank failures can result in a credit crunch, which has severe consequences for overall economic activity, as amply illustrated by the recent financial crisis in some hard-hit countries. If banks are insufficiently capitalised, a banking crisis could also lead to a taxpayer-financed bailout in order to restore credit transmission.

### Market-determined capital ratios may be too low

Market-determined capital and liquidity buffers may be too low from a socio-economic point of view. When deciding on the robustness of their bank, creditors and equity holders

only consider their private cost in the case of bank failure and do not consider the total cost imposed on society. Consequently, banks may have capital levels that are below the optimal level for society, which creates scope for the regulation of banks.<sup>3</sup>

Moral hazard arguments also call for regulation that ensures a minimum level of capital. There is in general 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.<sup>4</sup> 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.

## 1.2 Declining benefits

The benefits of stronger financial regulation are nevertheless declining – and beyond a certain point, the positive effects are very small.

*As stated above, there is a strong case for regulation to ensure minimum level of capital to avoid that even a moderate economic setback could cause a bank or, especially, group of banks to fail, with a resulting credit crunch as well as the high risk of a taxpayer-funded bailout.*

*However, 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 due to too low capital ratios becomes so small that the benefits are negligible. In addition, the risk of a major economic setback even occurring is reduced, as banks will not be forced to hold back on lending, which otherwise would reinforce the downturn.*

With its current very high capitalisation, the Swedish banking sector falls into the latter category, with very low benefits of higher capital requirements. Concretely, the Basel Committee finds that the additional benefit of increasing CET1 ratios above 15% is very small in terms of reducing the risk of a crisis (a CET1 ratio is a measure of core capital, excluding capital instruments, measured as a percentage of Risk Exposure Amount (REA)).<sup>5</sup> It should be mentioned, that the estimates are subject to uncertainty, as described in *Box 1.1*. However, the Swedish banking sector is well beyond the estimated threshold. The benefits of increasing capital further are virtually zero - *cf. Figure 1.1*.

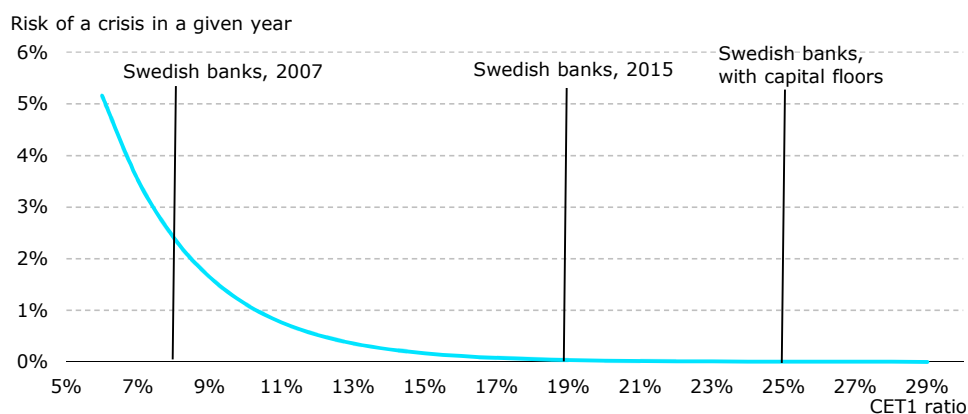
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<sup>3</sup> See Llewellyn (1999): The Economic Rationale for Financial Regulation, p. 13.

<sup>4</sup> See Meh and Moran (2010) or Myers and Majluf (1984).

<sup>5</sup> See Basel (2010) (also called the LEI report).

**Figure 1.1 Higher capital requirements barely reduce the risk of a crisis in Sweden**



Note: 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  $CET1=0.92 \cdot TCE$ , which we find is appropriate for Swedish banks. The estimates include the effects of implementing NFRS. The figure for Swedish banks in 2015 is a weighted average of the four largest banks. The graph is an extrapolation of the estimates from Basel (2010), assuming an exponential form.

Source: Basel (2010), page 15.

Similarly, IMF estimates that 85% of all banking crises in OECD countries since 1970 could be 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.<sup>6</sup> By comparison, the capitalisation of the Swedish banking sector was 24% in 2015 (measured as total capital relative to REA).

### Declining gain from reduction in moral hazard

As described in the previous section, low capital levels can entail moral hazard issues in the banking sector. However, with CET1 ratios of 19% in the Swedish banking sector, the incentive to monitor loans and avoid risky assets is strong, as equity owners have substantial “skin in the game”. The potential gain from higher capital requirements in form of a reduction in moral hazard is thus very limited as well.

<sup>6</sup> See IMF (2016): Benefits and Costs of Bank Capital p. 15.

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### **Box 1.1 Estimating the benefit of higher capital requirements**

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The result from Basel (2010), depicted in Figure 1.1, is based on estimations of 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. The estimations are based on six different statistical models, which overall reduce the risk of outlier results. In relation to the uncertainty of the results, two aspects should nevertheless be mentioned:

- 1) 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).
- 2) The estimations are based on data from many countries and there might be country-specific aspects, which could change the result when looking specifically at Sweden. For example, most of the financial exposure in Sweden is placed at four large, highly interconnected banks. If just one of the four were to collapse, it might very well cause a general banking crisis.

To incorporate the country-specific aspects, the Riksbank (2011) estimated the relationship between capital ratios and the risk of a crisis using Swedish data. The downside of such an estimation is that it is based on very few crisis observations. Consequently, we believe that the estimations by Basel (2010) are more suitable for assessing the optimal capital ratio. Nevertheless, when CET1 ratios are around 19%, The Riksbank's result is in line with the estimations by Basel (2010): an additional percentage point increase in the capital ratio decreases the risk of a crisis by 0.02 percentage point, compared to a 0.01 percentage point decrease in Basel (2010).

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Source: Basel (2010), the Riksbank (2011)

#### **Benefits of reducing the risk 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 - *cf. Box 1.2*. In our estimations documented in chapter 3, we have assumed that financial crises have moderate permanent effects on output, meaning 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.<sup>7</sup>

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<sup>7</sup> See OECD (2012): Innovation in the crisis and beyond.

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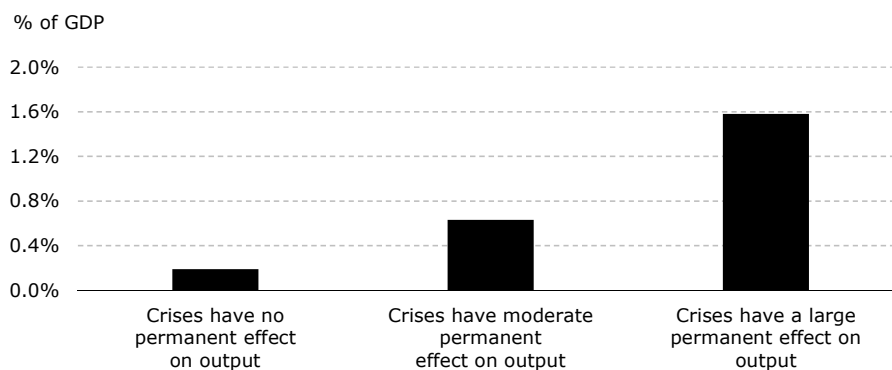
### Box 1.2 Benefits of reducing the risk of a financial crisis

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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 have only 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). However, empirical studies have suggested that financial crises could have permanent or at least very long-term effects on output, meaning that after a crisis, GDP will continue to grow at a pre-crisis rate *but* on a lower level.

Concretely, 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 below*:

#### Benefit of reducing the risk of a financial crisis by one percentage point



Source: Basel (2010), p. 10-11

### 1.3 Increasing costs

The costs of financial regulation are increasing, as higher capital requirements increase the overall funding costs of banks. As we demonstrate in this section, this is particularly the case for the well-capitalised Scandinavian banks, as the reduction in systemic risk that results from increasing the capital requirements is very small. The higher funding costs have sizeable real-economy effects hurting growth and investment. This will be the topic of the next chapter.

#### Higher capital requirements increase the overall funding costs of banks

Fundamentally, a bank has two sources of finance – 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.

When tested empirically, this simplistic view does not hold. Below we list four of the most important reasons:

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 guaranties:** By the deposit guarantee, the risk to private depositors (up to 100,000 euros in Sweden) is guaranteed, i.e. the required return on this part of the debt will not react to the funding structure.
3. **Implicit guaranties:** When banks are too big to fail, the government<sup>8</sup> implicitly takes on a part of the default risk, especially for “unsecured” debt and equity holders. However, we think this plays a minor role in Sweden now precisely because banks are so well capitalised, with high credit ratings, etc., as discussed in chapter 2.
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.<sup>9</sup>

Thus, when capital requirements increase, the required return on debt and equity might to some extent decline, but overall funding costs will increase. The extent to which funding costs increase depends on the capitalisation of the bank to begin with:

*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 (as demonstrated in the last section) and the required return will not decline very much. Equity finance will nevertheless still be more expensive than debt finance due to the reasons mentioned above and the overall funding cost will increase.<sup>10</sup>

With capitalisations levels of close to 20%, the Swedish banking sector falls in the latter category and, as described below, we find a sizeable increase in overall funding costs if the capital requirements are increased further in Sweden.

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<sup>8</sup> Or the resolution framework – see: ” <https://www.riksgalden.se/en/aboutsndo/Financial-stability/Managing-banking-crises-resolution/>.

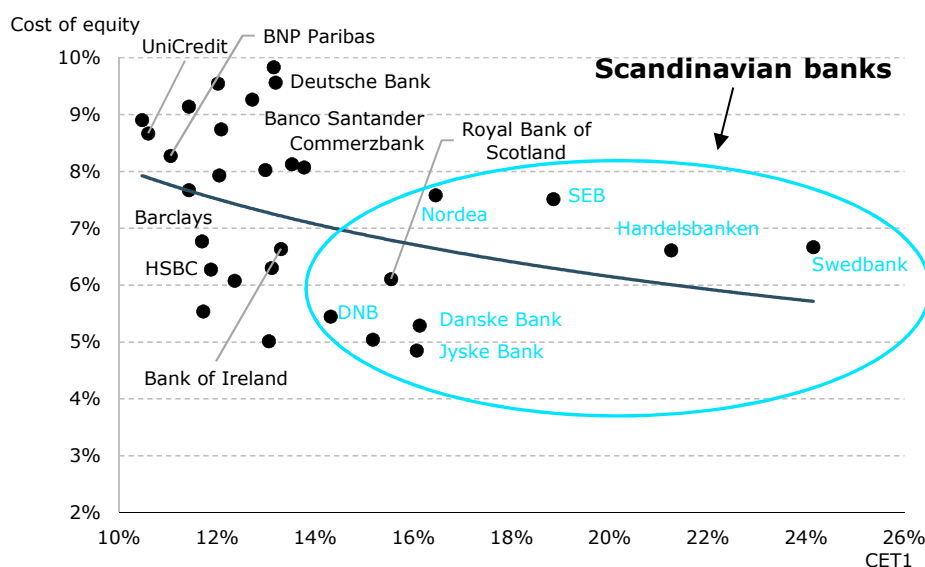
<sup>9</sup> See DeAngelo and Stulz (2013): Why High Leverage Is Optimal for Banks

<sup>10</sup> For example, IMF (2016): Bank Solvency and Funding Cost finds that “the relationship between funding cost and solvency appears to be non-linear, with higher sensitivity of funding cost at lower levels of solvency”.

### Higher capital requirements will increase the funding costs of banks in Sweden

Looking at current market data for Scandinavian banks, we do not see any evidence that the required return will decline when capital requirements increase - *cf. Figure 1.2*. The seven Scandinavian banks included have the same estimated cost of equity in the range of five to eight per cent despite considerable differences in CET1. Thus we find no correlation between the required return on debt and equity and the capitalisation. Consequently, we estimate that a one percentage point increase in capital requirements will increase the funding costs of Swedish banks by some 0.1 percentage point (see model appendix for a description of our estimation).

**Figure 1.2 No correlation between capitalisation and funding costs for Scandinavian banks**



Note: In our estimation, we find no correlation between the capitalisation and the cost of both equity and debt for Scandinavian banks. The estimation has been carried out using data from 2015 and as a panel data estimation including data from 2012 and 2015.

Source: The Danish Central Bank

It should be noted that there is currently major uncertainty about the future banking regulation, which might influence our estimation results. Therefore, it cannot be ruled out that, when there is more clarity on the future banking regulation, there may be a small reduction in the required return from increasing capitalisation.

Looking at a broader spectrum of countries, including the less-capitalised southern European banks, we do find that higher capitalisation leads to a lower required return. This highlights that the increase in funding costs is especially high for banks with capital levels above a certain threshold, and according to our estimation, the Swedish banking sector has crossed that threshold.

The results from the academic literature are likewise quite mixed and dependent on the estimation period and sample of banks.<sup>11</sup> However, most find some reduction in required return when capital requirements increase but still with an increase in the overall funding costs.<sup>12</sup>

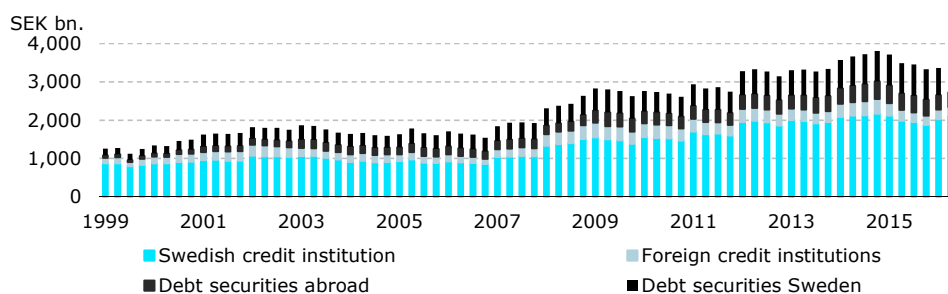
### Higher costs will be passed on to smaller firms and households

The extent to which the higher costs of regulation will be passed on to different customer segments varies. A relatively large part of the costs may be passed on to households and small-to-medium-sized firms, while large and international corporations may be less affected.

Large international corporations have many alternative ways of getting funding. They have access to funding through domestic banking markets, through large banks in other countries and through debt security markets (corporate bonds). Furthermore, in order to keep the larger international firms as customers, domestic banks may to a lesser extent increase their lending rates when capital requirements increase.<sup>13</sup>

On the other hand, households and small-to-medium-sized firms have limited options apart from domestic banks. The SME share of business loans was 92% in 2009 and may have increased since given the increased amount of lending through debt securities - *cf. figure 1.3*.<sup>14</sup> As a result, banks may make households and small-to-medium-sized firms bear most of the burden of the increased costs.

**Figure 1.3 Outstanding debt financing of Swedish non-financial corporations**



Note: Data nominal prices  
Source: SCB

<sup>11</sup> IMF (2016): Bank Solvency and Funding Cost finds that during periods of stress, the funding cost is more sensitive to solvency than in normal times. The results from the literature range from almost no reduction in the required return when the capitalisation increases, to a strong reduction (See for example Schmitz et al. (2016)).

<sup>12</sup> BoE (2015) finds that funding costs increase by about 50% over the long run as compared to a situation with no reduction in the required return. Basel (2010) finds an effect of 65%.

<sup>13</sup> Banks' cost path-through rate to a given customer segment typically depends on the extent to which customers' demand for banking services changes when prices change. A strong reaction – as in the case of large international corporations – means a low cost path-through. See also Copenhagen Economics (2016): Wage tax on a rapidly changing Swedish financial sector. Here it has also been found that a potential wage tax on Swedish banks will have a larger cost path-through for households and large small-to-medium-sized firms.

<sup>14</sup> See OECD (2013): Financing SMEs and Entrepreneurs 2013: An OECD Scoreboard, p. 200.

#### 1.4 Increased complexity and overlapping regulation

Financial regulation has become increasingly more complex over the last decade, from the core and total capital requirements in Basel II to the CET1, Tier1, Tier2 and LR requirements in Basel III. Add to this the upcoming MREL and TLAC requirements for the amount of “bail-in” eligible liabilities that banks are required to hold. Furthermore, the shift towards the IRB method when determining risk weights has severely increased complexity, as supervisors put a lot of restrictions on estimation methods, including several statistical conservative buffers that hamper transparency.

The Basel III regulation has also introduced two new liquidity requirements: the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR), respectively requiring banks to hold sufficient short- and long-term liquidity. The measures affect the whole composition of banks’ assets and liabilities, further adding to the complexity. Finally, the Swedish FSA has introduced multiple country-specific measures, such as the 25% Pillar II mortgage floor, the 2.5-year maturity floor for corporates, revised approaches for corporate PD estimation and the IRB treatment of sovereign exposures.

The wide range of regulatory measures are to some extent overlapping. For example, increasing capital requirements also increase the resilience of liquidity, as a liquidity crisis to some extent can be attributed to uncertainty over the solvency of part of the financial system – *cf. Box 1.3*.

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#### Box 1.3 Overlapping regulation

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Capital and liquidity requirements are fundamentally intertwined. Well-capitalised financial institutions are less likely to be affected by adverse shocks to liquidity. A so-called liquidity crisis, best exemplified by the financial crisis, can partially be attributed to uncertainty over the solvency of financial institutions. As banks have become increasingly dependent on interbank funding, instability and bankruptcies can create uncertainty that essentially shuts down the market for short-term funding as was seen during the financial crisis. However, when banks are better capitalised, the probability of such events decreases exponentially and the benefits of regulations such as the LCR requirement decrease as a result. It should also be noted that capital requirements and LCR requirements are directly linked. Increasing CET1 capital, for instance, automatically increases the LCR as such capital has a zero outflow rate in the 30-day stress scenario.

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Source: Copenhagen Economics

The overlap of regulatory measures is often not well understood, and quantitative impact studies often analyse each measure in isolation. This could potentially imply that some regulatory measures are essentially not binding and therefore do not add to financial stability while still significantly limiting banks’ business model.

As demonstrated, there are numerous instruments chasing the same goal of a more stable Swedish banking sector. All these measures interact in complex ways and in several dimensions, making the financial regulation of the Swedish banking sector immensely complicated – *cf. Box 1.4*.

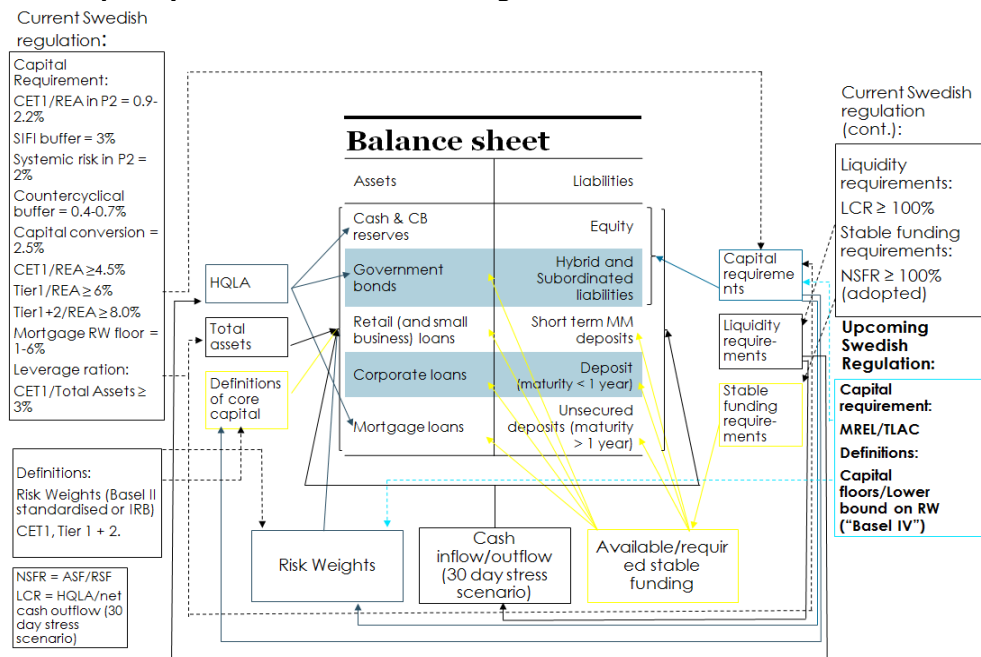
### Box 1.4 Numerous instruments chasing the same goal

The complexity of the current financial regulation is immense, with several overlapping instruments chasing the same goal, as illustrated in the figure below.

For example, increasing capital requirements force banks to hold more equity or decrease the amount of risky assets held. The LCR requirement will essentially have a similar effect: banks will hold more equity to limit cash outflow in times of stress or they will hold more high-quality liquid assets, which are generally less risky. In addition, the NSFR requirement also gives banks an incentive to hold more equity, as this is considered to be the most stable form of funding, or to decrease the amount of risky assets held in order to decrease the required stable funding.

These interactions imply that the effects of individual measures are highly dependent on the pre-existing value of other measures. For example, if capital requirements are set at a sufficiently high level, it is less likely that the LCR and NSFR requirements will have any effect on the systemic risk of the banking sector.

#### The complexity of the current financial regulation is immense



Note: The figure only focuses on capital and liquidity requirements, i.e. neglecting new restructuring, corporate governance and product market measures (e.g. MiFID II, EMIR, FTT and Solvency II). The figure is illustrative and not exhaustive.

Source: Copenhagen Economics

#### *This immense complexity increases compliance costs*

The multitude of new regulatory measures increases compliance costs for the banking sector. More people must be hired and more resources spent in order to comply with the new regulation. Increasing compliance costs may be problematic for large banks, but they could be detrimental for small banks. Lessons from the Dodd-Frank Act in the US suggest that

regulatory compliance costs increased by 50%-200% for small community banks.<sup>15</sup> If small banks can no longer meet the complex challenges of new regulation, the financial sector will end up being more concentrated and less innovative.

In addition, stronger financial regulation could provide a stronger incentive to bypass the traditional banking system, resulting in more credit flowing from less-regulated institutions (referred to as shadow banking).<sup>16</sup> This could include (but is not limited to): asset-backed commercial paper, credit hedge funds, limited purpose finance companies and the rapidly growing FinTech industry.

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.

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<sup>15</sup> See Marshall and Greene (2015): The State and Fate of Community Banking.

<sup>16</sup> See Plantin (2014): Shadow Banking and Bank Capital Regulation.

## Chapter 2

# The Swedish financial sector is robust

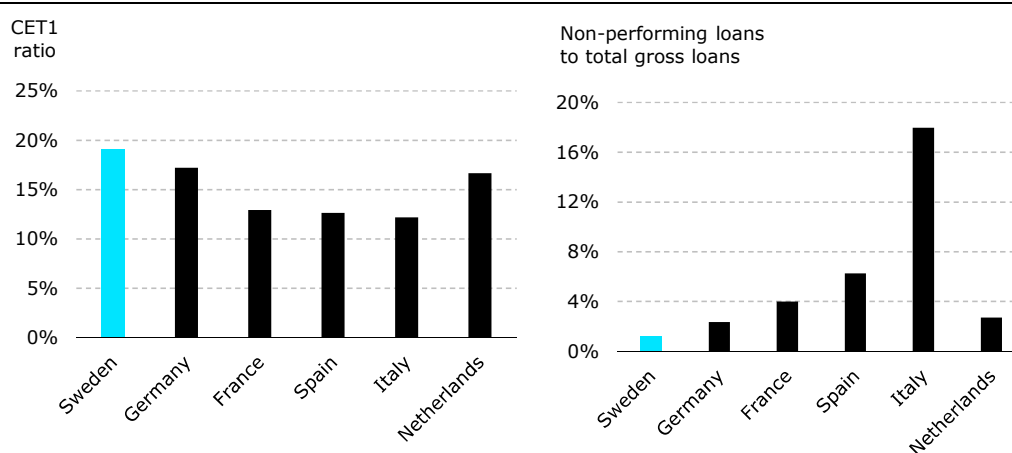
In this chapter, we document the current robustness of the Swedish banking sector and describe the implications for the sector of the discussed capital floors.

In *section 2.1*, we document that the Swedish banking sector is one of the most robust in Europe. In *section 2.2*, we give a brief recap of the history of the financial sector in Sweden. We document the sound restructuring of the sector following the crisis in the early 1990s, and describe how Basel III is over-implemented in Sweden, leading to the current very high capitalisation. Finally, in *section 2.3*, we analyse the consequences for the sector of implementing capital floors on top of the already immense regulation.

### 2.1 The Swedish banking system is very robust

Sweden currently has one of the most robust banking sectors in Europe. In 2015, the four largest Swedish banks had an average CET1 ratio of 19%. This (together with Finland) is the highest ratio among the countries participating in the 2016 stress test by the European Banking Authority (EBA) - *cf. Figure 2.1*. At the same time, the credit risk of Swedish banks is very low. In 2015, only 1.2% of the sector's loan portfolio was labelled as non-performing, compared to for example around 4% of the French banking sector's portfolio - *cf. Figure 2.1*.

**Figure 2.1 Swedish banks have high capitalisation and low credit risk**



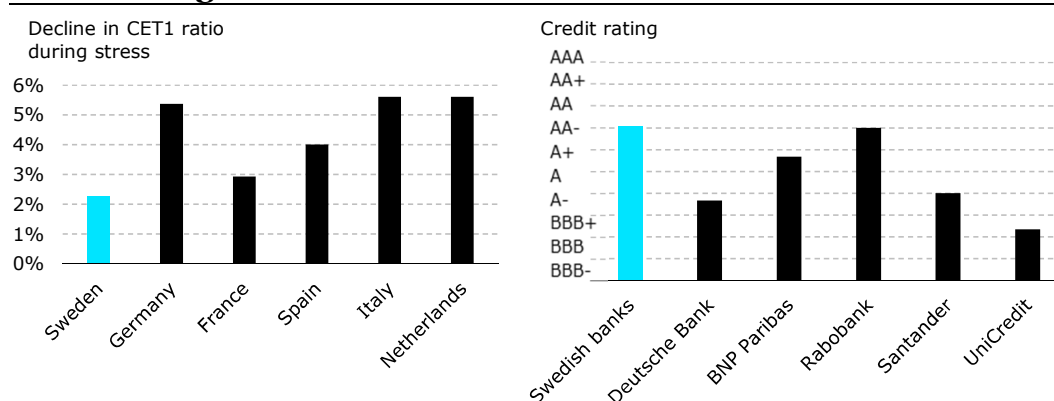
Note: The figures for the Swedish banking sector are calculated as a weighted average. The figures for the other countries are calculated as simple averages for the banks in the country. Data is from end 2015.

Source: EBA 2016 stress test and The World Bank Group

### The Swedish banking sector shows strong resilience in stress tests

In forward-looking stress tests, the Swedish banking sector likewise appears robust. In the 2016 EBA stress test, the average reduction in the CET1 ratio of Swedish banks is around 2.3%, which is one of the lowest of the participating countries - cf. figure 2.2.

**Figure 2.2 Swedish banks have low impact in stress tests and high credit ratings**



Note: The figure to the left shows the development in the CET1 ratio from 2015 to 2018 in the adverse scenario in the 2016 EBA stress test. The country ratios are simple averages for the banks participating in the stress test. The figure to the right shows ratings from 2016. Credit ratings from Swedish banks are based on an average of ratings for SEB, Handelsbanken, Nordea and Swedbank. The country rankings indicate averages of available rankings.

Source: Moody's, Standard & Poor's and Fitch, and the EBA 2016 stress test

In the stress test, the solvency of the banks are tested in an adverse macroeconomic scenario.<sup>17</sup> Here, GDP in EU declines by 1.8% over three years, whereas residential property prices in EU contract by 10.7%. The scenario results in an average decline in the CET1 ratio of EU banks from 13.2% in 2015 to 9.4% at the end of the stress test – a decline of 3.8 percentage points.

In comparison, the average CET1 ratio of the Swedish banks only declines by 2.3 percentage points, even though the Swedish scenario is much tougher. Swedish GDP declines around 7% over the three years and residential property prices contract around 35%.

Accordingly, by the end of the stress test the average CET1 ratio of the Swedish banks is 4.7 percentage points higher than the EU-wide average CET1 ratio for 2015. Thus, according to the EBA stress test, after an adverse macroeconomic setback, the Swedish banking sector will still have significantly stronger capitalisation than the current EU banking sector.

<sup>17</sup> The stress test is conducted by the European Banking Authority (EBA) and covers 51 banks from 15 EU countries. In Sweden, the four largest banks participate: Nordea, Handelsbanken, Swedbank and SEB. See <https://www.eba.europa.eu/-/eba-publishes-2016-eu-wide-stress-test-results>.

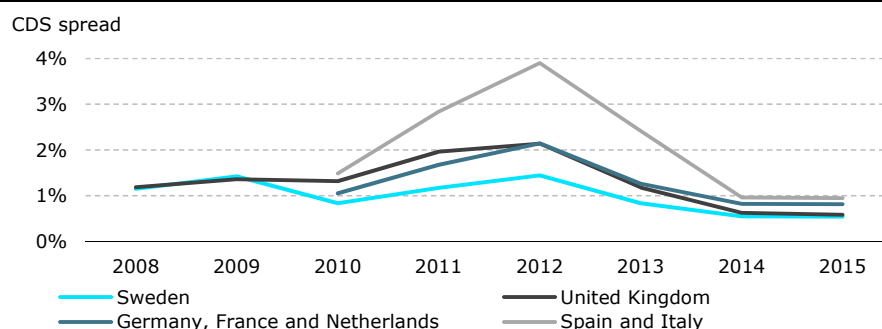


### The financial markets and ratings agencies assess low risk of default

The strong results in stress tests and the extensive capitalisation are reflected in high credit ratings. In 2015, the four largest Swedish banks had an average credit rating of AA-, corresponding to: “The obligor's capacity to meet its financial commitment on the obligation is very strong”.<sup>18</sup> This puts them among the top-rated in Europe - cf. Figure 2.2.

Finally, the extensive robustness of the Swedish banks is backed up by the financial markets. Since the financial crisis, Swedish banks have had some of the lowest CDS spreads in Europe - cf. Figure 2.3. CDS is a type of insurance against default of a debt issuer. The CDS spread is the price of the insurance. A low CDS spread means that the insurance is cheap, which implies that the market evaluates the risk of default of the debt issuer to be low. In 2015, the average CDS spread of the four largest Swedish banks was around 0.5%, one of the lowest in Europe.

**Figure 2.3 Market participants assess low risk of default for Swedish banks**



Note: The figure shows yearly averages for a five-year CDS premium for banks in basis points. It gives an average for comparable major banks domiciled in each respective country. CDS premiums indicate bank costs for unsecured borrowing on the bond market.

Source: Moody's, Standard & Poor's and Fitch

## 2.2 History of financial regulation in Sweden

In the early 1990s, the Swedish economy experienced a severe financial crisis. Accumulated loan losses were at 20% of the loan stock over the period 1990-1996. At the peak of the crisis (in the final quarter of 1992), losses were of 7.5% of lending, which amounted to about twice the operating profits at the time.

In the aftermath of the crisis, a number of fundamental changes were made to the financial sector, which significantly improved financial stability in Sweden:

- Banks increased their capital buffer from less than 1% to 2%-3%<sup>19</sup>.
- Shadow banking was minimised, as the Swedish FSA forced banks to take over so-called “finance companies”.

<sup>18</sup> The wording depends on the rating agency. This phrase is from S&P – see “[https://www.standardandpoors.com/en\\_AU/web/guest/article/-/view/sourceId/504352](https://www.standardandpoors.com/en_AU/web/guest/article/-/view/sourceId/504352)”.

<sup>19</sup> See Englund (2015): The Swedish 1990s banking crisis: A revisit in the light of recent experience, p. 40.

- Swedish regulators started to apply forward-looking accounting principles and required banks to make reservations for expected credit losses before they were actually realised.
- Regulators put in place a so-called “good-bank bad-bank” separation (a model later adopted in many other countries during the financial crisis of 2009). This ensured that there was no fire sale of badly performing assets, and that the winding-up process of banks was done smoothly, minimising losses for the taxpayer.
- Regulators followed their stated principle of rescuing banks but not their owners. Out of the SEK 66 bn in government payments to banks, only SEK 3 bn went to bank owners.<sup>20</sup> This limited the potential moral hazard problem of implicit government guarantees going forward.

The sound restructuring of the financial sector in the 1990s helped to increase the robustness of the Swedish banking sector, and when the financial system was shocked in 2008, the sector was – at least in comparison to banking sectors in many other countries – relatively robust. During the crisis, no banks were failing and only a minority of banks were in need of government support.<sup>21</sup> In fact, the government eventually earned a net profit on the interventions, amounting to 0.4% of GDP.<sup>22</sup> The Swedish economy also recovered swiftly from the crisis; in 2009, real GDP contracted by 5% but then grew by 6.1% in the following year.<sup>23</sup>

### **Basel III was over-implemented in Sweden**

Even though the Swedish banking sector largely was able to cope with the worst financial crisis since the Great Depression, the measures in Basel III were over-implemented along several dimensions:

- Measures have been implemented early, with short phased-in periods compared to their European peers.
- Capital requirements were raised significantly above the minimum in the EU implementation of Basel III (called CDR IV/CRR).
- On top, additional measures were introduced, which enhance the effects of the Basel III – for example, minimum risk floors on Swedish mortgages.

In total, this means that the Swedish banking sector currently has capital levels that are more than 50% higher than most of its EU peers. This over-implementation does little to reduce the risk of a new crisis and, as we will demonstrate in the next chapter, entails significant real-economy costs.

It is in this context that the current discussion of capital floors should be seen.

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<sup>20</sup> See Englund (2015): The Swedish 1990s banking crisis: A revisit in the light of recent experience, p. 34.

<sup>21</sup> See Laeven and Valencia (2012): Resolution of Banking Crises: The Good, the Bad, and the Ugly, p. 18.

<sup>22</sup> See Daniel Barr och Hannah Pierrou: Vad blev notan för statens bankstöd under finanskrisen 2008–09?

<sup>23</sup> See IMF (2015): Out of recession.

### 2.3 “Basel IV” will increase Swedish capital requirements

Capital floors will greatly increase the capital requirements of the Swedish banking sector. Assuming capital floors of 75% of the standardised risk weights (which is the midpoint of the indicated interval by Basel), we estimate that the CET1 capital requirements of Swedish banks will increase by 39% (see model appendix for a description of the estimation). This corresponds to an increase in the average CET1 ratio requirement from 17% to 23%.<sup>24</sup>

The relatively large increase in the capital requirements of Swedish banks is due to two factors. *First*, the relatively low risk weights of Swedish banks due to a favourable business climate, a stable economy and low historical default rates. *Second*, the use of IRB methods to determine risk weights is relatively widespread among Swedish banks.

#### Background to the new regulatory package

Officially, the new regulatory package is not a new Basel accord; it is about completing Basel III. The exact outline of the package has yet to be decided, but it will indeed revise many of the elements of Basel III.<sup>25</sup> However, a key element in the package is new compared to Basel III: the introduction of floors on the risk weights used in the calculation of REA, also known as “capital floors” – *cf. Box 2.1*.

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#### Box 2.1 Risk Exposure Amount and capital floors

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Capital requirements of banks are defined as a percentage of Risk Exposure Amount (REA). The biggest component of REA is credit risk, which is the sum of a bank’s assets where each asset is weighted according to the risk. For large IRB banks, these risk weights are based on the banks’ internal models, subject to certain constraints. For example, a normal unsecured retail loan might have a risk weight of 100%, whereas a corporate loan might have a risk weight of 35%. Smaller banks (which are not IRB-approved) use a standardised approach where each asset class has a standardised risk weight. For example, some corporate loans always have a risk weight of 100% according to the standardised approach.

In Basel IV it is proposed that IRB banks using internal models should have a floor on the risk weights so that they cannot go below a certain percentage of the standardised risk weights. For example, if the floor is 75% of the standard risk weight, the risk weight of a corporate loan cannot be lower than  $75\% \cdot 100\% = 75\%$ . The exact risk weight floor has yet to be decided, but Basel has indicated that it will lie somewhere between 60% and 90%.<sup>26</sup>

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Source: Copenhagen Economics and EBA 2015 transparency exercise

Following the implementation of Basel II, the Basel committee has observed a variance in the banks’ regulatory capital requirements based on the banks’ own internal estimations. The Basel committee wants to align the risk weights across banks so that two assets with the same underlying risk have the same risk weight.<sup>27</sup> From both a competition as well as a

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<sup>24</sup> With unchanged risk weight.

<sup>25</sup> See EY: The likely path for Basel capital requirements (2016), p. 1.

<sup>26</sup> See Basel (2016): Reducing variation in credit risk-weighted assets, p. 2.

<sup>27</sup> See Basel (2014): Reducing excessive variability in banks’ regulatory capital ratios, p. 2.

financial stability perspective, it is indeed desirable that the capital requirements of banks accurately reflect the risk of the banks' portfolios.

### **Capital floors have counter-intuitive effects**

However, we do not see capital floors as being the right solution. Several aspects of the initiative are counter-intuitive and counter-productive:

*First*, it is primarily banks with low risk weights, and therefore low underlying risk, that will be required to increase their capital.<sup>28</sup> For example, Swedish banks will be required to increase their capital further, even though they are already among the most robustly capitalised in Europe. As demonstrated in the previous chapter, this will do little to reduce the risk of a financial crisis. On the other hand, banks in southern Europe will not be required to significantly increase their capitalisation, even though they are much less robustly capitalised and generally have a higher risk of insolvency, as seen from the EBA stress test. The increase in the capital requirements of Swedish banks may be unintended, as the Basel committee has stated that they have an "aim to not significantly increase overall capital requirements".<sup>29</sup>

*Second*, the capital floors could further increase the complexity of financial regulation, as they would remove the link between the underlying risk of an asset and its risk weight. *If* it were the aim to increase the capital requirements of Swedish banks, it would be more transparent if the capital ratio requirement were increased directly instead of putting floors on the risk weights.

*Third*, the capital floors might lead to excessive risk-taking. Using internal 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".

*Finally*, as we will demonstrate in the next chapter, capital floors would have severe implications for Swedish investments, economic growth and productivity.

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<sup>28</sup> To see why, consider a bank with a high risk portfolio. The bank's internal model will produce relatively high risk weights that will be close to the standard risk weights. Hereby, a floor on the internal risk weights as a percentage of standard weights will have little effect. Conversely, a bank with a low risk portfolio will have risk weights far below the standard risk weights and will be greatly affected by the capital floors.

<sup>29</sup> See Basel (2016): "Reducing variation in credit risk-weighted assets".

## Chapter 3

# Real-economy cost of new regulation

In this chapter, we present the cumulative real-economy cost of financial regulation. This includes both the regulation implemented after the financial crisis up until now and the new regulation currently discussed at EU and BIS level.

Concretely, we have calculated the real-economy costs of following four regulatory measures:

1. Basel III: the standard effect of implementing Basel III, without the over-implementation in Sweden.
2. The Swedish over-implementation of Basel III, including minimum risk weights on mortgages, etc.
3. The suggested capital floors currently discussed at EU and BIS level.
4. On top of the capital floors, the effect of MREL/TLAC, which are requirements on the amount of “bail-in” eligible liabilities banks should hold.

In *section 3.1*, we present the cumulative real-economy costs of the above regulatory initiatives. We show that the regulation has significant impact on Swedish GDP, productivity and investments. We also explain the dynamics behind the results. In *section 3.2*, we use the estimate of benefits that was developed in *chapter 1* together with our GDP estimate in order to assess the “net benefit” of the new regulation. In addition, we argue that the optimal capitalisation of the Swedish banking sector, from a socio-economic perspective, is around the requirements in Basel III, without the Swedish over-implementation.

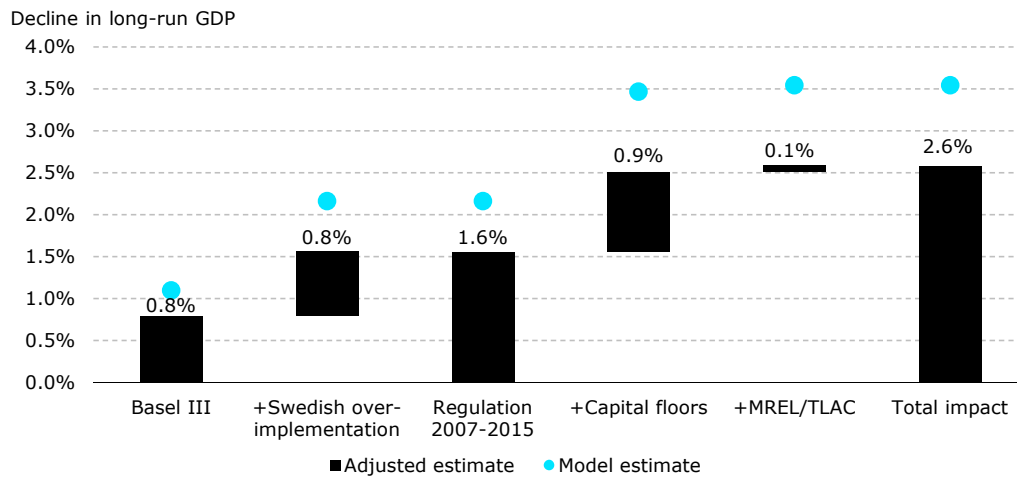
### 3.1 Costs of regulation

We estimate that the capital floors will cause a permanent reduction in Swedish GDP of 0.9%. MREL and TLAC will compress GDP by a further 0.1%, making the total cost of the new regulation around 1% of GDP – *cf. Figure 3.1*. This corresponds to roughly SEK 45 bn.

Higher capital requirements increase the funding costs of banks, which are passed on to customers through higher lending rates. This curbs investment activity, causing a decline in overall productivity that eventually contracts wages and GDP – *cf. Figure 3.2*.

The effects are estimated in a structural macroeconomic model (a so-called DSGE-model) adapted for the Swedish economy. According to the model, higher capital requirements also cause the lending margin to increase, in addition to the above-described effects of higher funding costs. We have adjusted the GDP effects downward, corresponding to a constant lending margin. Alternatively, the adjusted estimates can be seen to take into account that the required return on debt and equity could decrease when capital requirements increase, as described in *section 1.3* (see model appendix for a detailed description of our model framework).

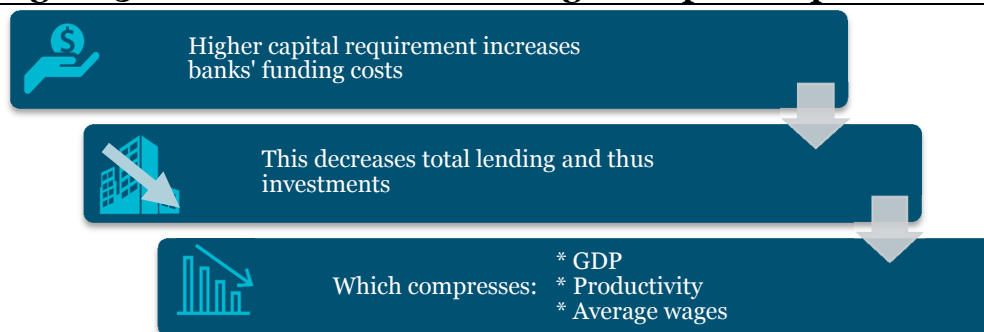
**Figure 3.1 Cumulative costs of financial regulation**



Source: Copenhagen Economics

In *Figure 3.1*, we also present a “model estimate”, which is an unadjusted estimate from the macroeconomic model. Here, when capital requirements increase, the lending margin increases and there is no reduction in the required return on debt and equity. It could be argued that the lending margin would indeed increase due to for example higher compliance costs and that there would be no reduction in the required return as Swedish banks are already very robustly capitalised. According to our model estimate, GDP declines by 1.4% as a consequence of capital floors and MREL/TLAC.

**Figure 3.2 Permanent effects of higher capital requirements**



Source: Copenhagen Economics

We estimate that the adjustment period will be of around ten years. In this period, the higher capital requirements and subsequent higher lending rates give rise to subdued investments. Concretely, we estimate that the Swedish economy will miss out on net investment of some SEK 35 bn per year over the next ten years.

### Cost of regulation adopted from 2007 to 2015

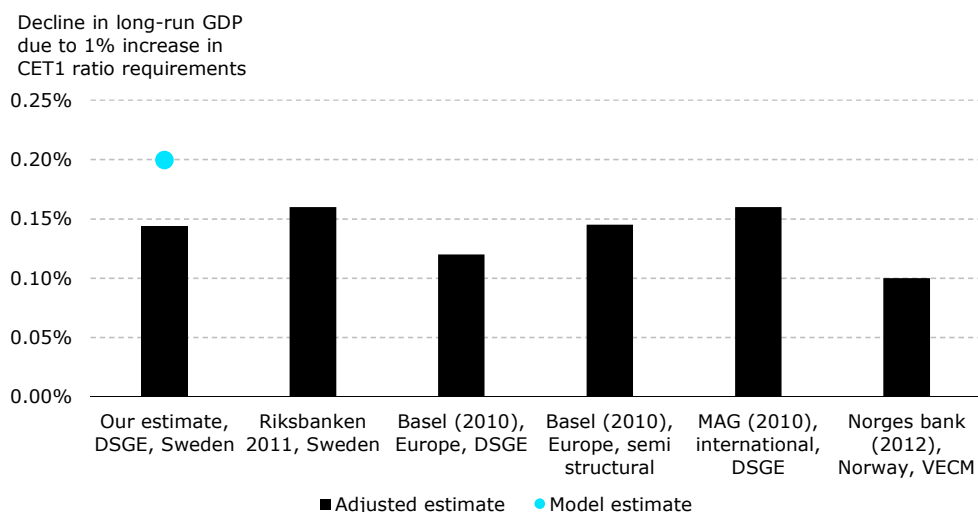
We estimate the total cumulative impact of regulatory measures already adopted together with possible new regulatory measures to be a decline in GDP of 2.6%.

The regulation already adopted has reduced GDP permanently by an estimated 1.6%, corresponding to SEK 65 bn. Around half of the decline in GDP is due to the over-implementation of Basel III in Sweden (described in *section 2.2*), corresponding to almost SEK 30 bn.

The effects are primarily due to higher capital requirements. Of the total Basel III effect, we estimate that stronger liquidity requirements (LCR and NSFR) have contracted GDP by just over 0.1%.

Our estimated marginal effects are generally in line with the estimations of other institutions – *cf. Figure 3.3*. Looking across five different empirical studies, a one percentage point increase in the CET1 ratio leads to a long-run fall in GDP of between 0.10% and 0.16%. The 2011 study by Riksbanken provides an estimate very close to our two estimates, which is not surprising as we use the same modelling framework.

**Figure 3.3 Our estimate is in line with that of other institutions**



Note: The effect of the Riksbank (2011) is denoted as high-cost, which is presented as their main estimate. The estimate is of an increase in the CET1 ratio, which is what was intended with the model according to Meh and Moran (2010). In addition, they present a low-cost estimate, which is based on capital divided by total assets that is around half as big.

Source: Copenhagen Economics

### The effects are greater in the short-to-medium term

The effects presented above are permanent, i.e. once the economy has fully adjusted to the higher capital requirements. The negative effects on GDP in the short-to-medium term

might be greater, as higher capital requirements can work as a shock to the economy. Especially since the market to some extent expects banks to be immediately compliant with new regulatory initiatives, regardless of the phase-in period.<sup>30</sup>

Concretely, Basel's 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).<sup>31</sup>

The Riksbank (2014) finds that the negative effects reach their maximum after eight years (with a phase-in period of four years). They estimate that at this point GDP has declined by 0.2%-0.5% due to an increase in the capital requirement of 1% (depending on whether the monetary policy is reacting). This corresponds to a decline in GDP by 1.5%-3.5% as a reaction to capital floors and MREL/TLAC.<sup>32</sup>

The short-run dynamics depend on the solvency of the banking sector prior to capital requirements being implemented. If there is uncertainty related to the banking sector, it will be difficult to obtain new equity funding at favourable rates. The banking sector can find itself forced to be compliant with new capital requirements by scaling down on the asset side rather than issuing new capital. This can imply a sharp halt in the availability of new loans, with greater consequences for investment and economic growth than the above-described short-term effects.

On the other hand, if the fundamentals of the banking sector are healthy, it will be possible to issue capital on more normal terms, and the decline on the asset side will not deviate as much from the long-run effects. In addition, if the banking sector has solid net profits, it will be possible to comply with higher capital requirements by retaining earnings. In this sense, the "overshooting" of the negative GDP effects will be more moderate. Given the very healthy state of the Swedish banking sector, we suggest that this is the most likely outcome.

### **3.2 Costs of new regulation outweigh benefits**

As described in *section 1.2*, the benefits of increasing the capital requirements would be very small given the current robust capitalisation of Swedish banks. As a result, the costs of the capital floors and MREL/TLAC clearly outweigh the benefits – *cf. Figure 3.4*. Concretely, we estimate that implementation of the new regulation would imply a net cost corresponding to approximately 0.9% of GDP (as the benefits in terms of lower risk of a crisis correspond to around 0.1% of GDP and the costs are estimated to be 1% of GDP).

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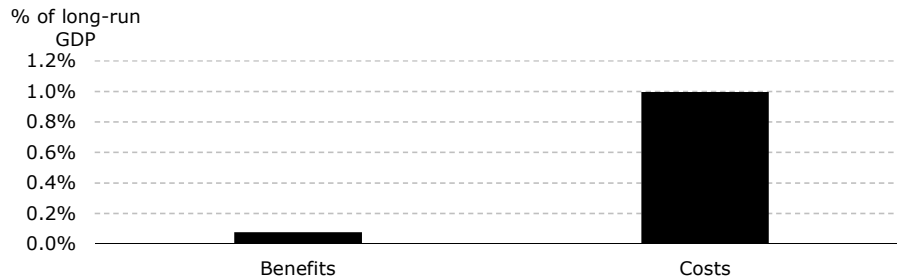
<sup>30</sup> The estimates of the short-term effects are more uncertain than the long-run estimates. In general, short-run dynamics are subject to a large number of rigidities and imperfections, which complicates the estimation and thus increases the uncertainty. See IMF (2016), p. 27.

<sup>31</sup> See Macroeconomic Assessment Group (2010), p. 3.

<sup>32</sup> See The Riksbank (2014).



**Figure 3.4 Costs of capital floors clearly outweigh benefits**

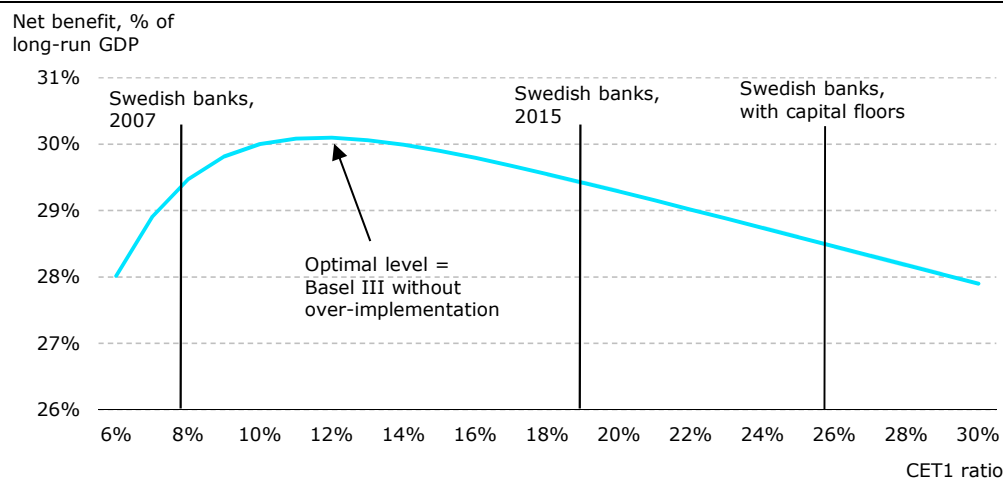


Note: The figure shows the effects of implementing capital floors and MREL/TLAC. When calculating the benefits, we assumed that a financial crisis has moderate permanent effects as described in section 1.3. The calculations are based on the adjusted estimate.

Source: Copenhagen Economics and Basel (2010).

The above estimations can be used to assess the optimal capital ratio requirement for the Swedish banking sector. According to our estimation, costs start to exceed benefits when the CET1 requirement is around 12%-13% of REA – cf. Figure 3.5.

**Figure 3.5 Optimal capitalisation is around the standard implementation of Basel III**



Note: The figure shows the net benefit of CET1 ratio requirements. The costs are estimated in our macroeconomic model described in this chapter. The benefits are based on the estimations in the Basel (2010) report described in chapter 1. In respect of "Swedish banks, with capital floors", the increase in capital requirements is translated into higher CET1 ratio requirements, based on current risk weights. The exact level of the net benefit in the figure should be interpreted with caution, as it is technically calculated relative to a highly hypothetical situation where the banks' CET1 ratio is zero. The calculations are based on the adjusted estimates.

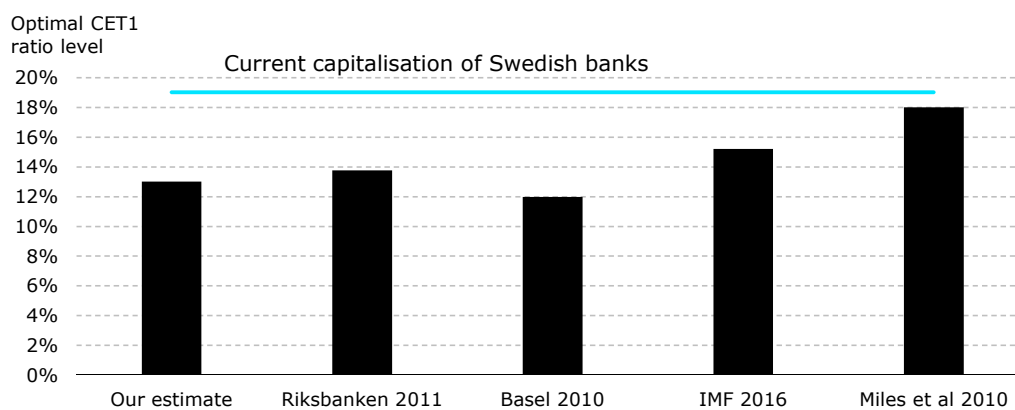
Source: Copenhagen Economics and Basel (2010).

Our analysis thus indicates that the optimal CET1 ratio for Swedish banks would be around 11%-14%. If we assume that the banks prefer a capital buffer of 2% of REA (which is the

case today), this corresponds broadly to the standard capital requirements in Basel III – without the Swedish over-implementation.

In general, it is difficult to find any empirical evidence, which supports the idea that net benefits will increase by further increasing Swedish capital requirements – *cf. figure 3.6*.

**Figure 3.6 Swedish CET1 ratios are above all recommended levels**



Note: When the optimal level is presented as the total capital level, it is converted as a capital ratio  $\cdot 0.8 =$  the CET1 ratio corresponding to the current average difference between the capital ratio and the CET1 ratio of the four largest Swedish banks.

Source: Copenhagen Economics, the Riksbank (2011), Basel (2010), IMF (2016) and Miles et al. (2011)

## Chapter 4

# Preventing the next crisis: more bank regulation versus macro and structural policies

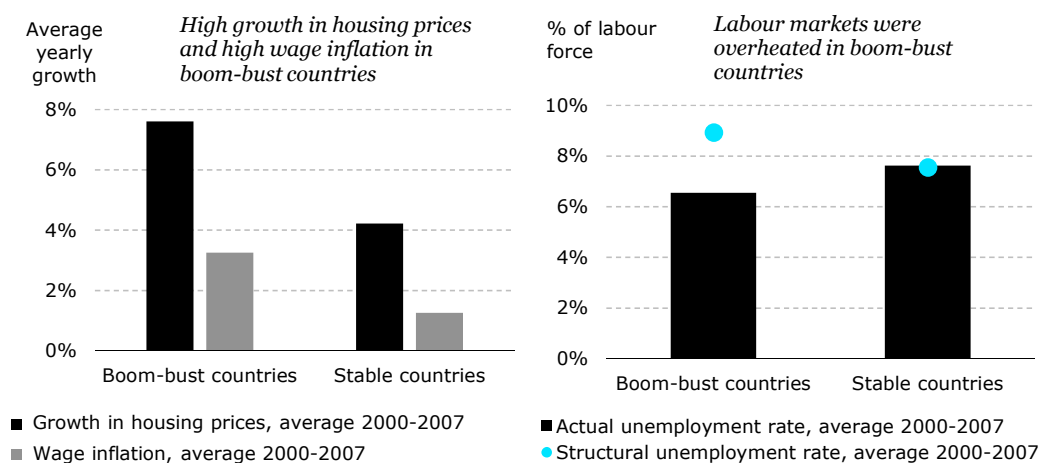
In Sweden as in other countries with very expansionary monetary policies, there is an increasing focus on the need to address the issue of the recurrence of financial instability. Such instability is perceived as arising in particular from high debt-to-income rates for households, linked to perceived bubbles in the prices of houses and other financial assets. As a consequence, measures to reduce such imbalances have been put on the table under the heading of macro-prudential policies.

We question somewhat whether this is the first best approach for Sweden. *In section 4.1*, we emphasise the extent to which the cause of the severe economic crisis that began in 2008 was really linked to flawed banking regulation policies as opposed to more underlying policy failures in the countries that were affected the most. We also point out some weaknesses associated with the measures currently being discussed in Sweden. *In section 4.2*, we outline some more direct and targeted policies to reduce new sources of instability.

### **4.1 The economic crisis was caused by weak macroeconomic policies**

The financial crisis was triggered by financial turmoil following the collapse of Lehmann Brothers, but in many OECD countries the global *economic* setback was as much a result of classic macroeconomic overheating prior to the crisis – *cf. Figure 4.1*. Indeed, the countries that experienced the largest loss of economic output from 2008 to 2011 were clearly also the countries that in the period running up to 2008 were the most overheated. This was reflected in rapid increases in housing prices and the loss of external competitiveness through high wage inflation, as well as in unemployment rates well below structural levels. Clear examples of such boom countries are the US and, in Europe, the Baltic countries, Denmark, Spain and Ireland. Countries with more stable economic development prior to the crisis, including Sweden, also faced setbacks but these were much smaller.

**Figure 4.1 Economic development prior to the crisis, 2000-2007**



Note: The boom-bust countries are Ireland, Spain and the US, and the stable countries include Sweden, Germany and Canada.

Source: OECD Economic Outlook No. 99 – June 2016

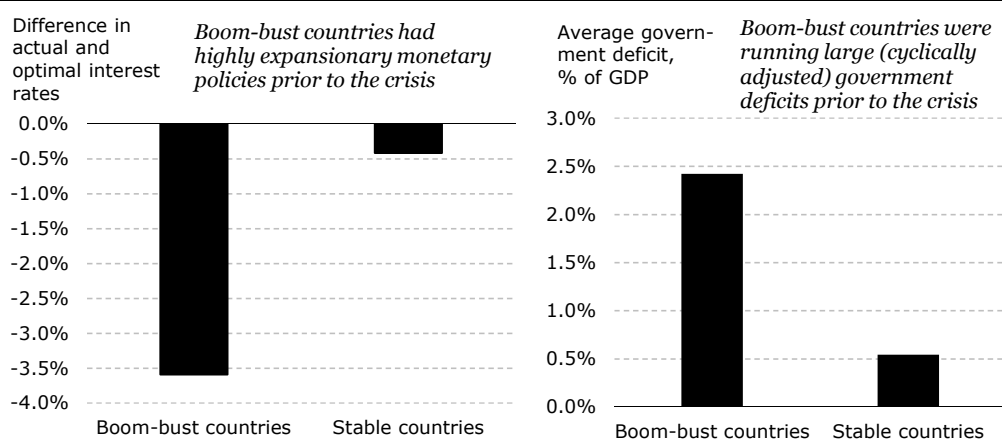
It is also clear that misaligned macroeconomic policies played an important role in the overheating of the countries mentioned – cf. Figure 4.2. In EU, countries such as Ireland and Spain had monetary and fiscal policies that were highly expansionary despite strong growth and relatively high inflation. In US, a deliberate loosening in credit standards for the two large government-sponsored credit institutions played a large role in stimulating housing markets. A very important factor as these two institutions in 2007 owned or guaranteed 40% of the single-family mortgage market.<sup>33</sup>

Moreover, the recovery from the financial crisis in the different countries was linked to the quality of macroeconomic and financial market policies after the crisis. It is notable, for example, how a deliberate policy of forcing banks to recapitalise after the crisis, together with a winding-up of non-performing banks, was successful in such diverse countries as the US, Denmark and Sweden. It helped these economies to get back on track, with unemployment returning to normal levels, and the governments in all three countries had large net gains from their investments into the financial sector.<sup>34</sup>

<sup>33</sup> See Federal Reserve Bank of New York (2015): The Rescue of Fannie Mae and Freddie Mac, p. 6.

<sup>34</sup> The Swedish government profited by SEK 12.4 bn from the government guaranty programme – cf. Harr and Pierrou (2015): Vad blev notan för statens bankstöd under finanskrisen 2008–09? The US government profited by USD 15.3 bn from the TARP programme – cf. <http://money.cnn.com/2014/12/19/news/companies/government-bailouts-end/>, and the Danish government profited by approximately DKK 18 bn from bank relief packages – cf. Erhvervs- og Vækstministeriet (2016): Økonomisk status på bankpakkerne – Marts 2016.

**Figure 4.2 Monetary and fiscal policies prior to the crisis, 2000-2007**



Note: The boom-bust countries are Ireland, Spain and the US. The stable countries include Sweden, Germany and Canada. The first panel depicts the difference between actual interest rates and the optimal interest rate estimated by a Taylor rule using ECB data – cf. Heebøll (2014). For the boom-bust countries the average monetary stress was driven solely by Spain and Ireland. In the second panel, average government deficits are cyclically adjusted for the period 2000-2007. Among the stable countries, Sweden and Canada actually had a government surplus in the period 2000-2007.

Source: Heebøll (2014) and OECD Economic Outlook No. 99 – June 2016

### New macro-prudential tools and their weaknesses

In a Swedish context, a number of reports have suggested increased risks of financial instability. These risks are perceived as arising in particular from high debt-to-income rates for households, possibly linked to what may be an approaching bubble in housing prices.<sup>35</sup>

As result, a number of measures have been put forward to reduce such risks, including both limitations on loans to individual households as well as new requirements for banks with regard to capital adequacy and liquidity reserves. Specifically, there has been discussion about introducing a debt-to-income limit as well as sound minimum levels for the standard values that banks use in their discretionary income calculations.<sup>36</sup> In addition, the Riksbank has proposed: 1) a leverage ratio requirement of five per cent, 2) an increase in the countercyclical capital buffer to the maximum level of 2.5%,<sup>37</sup> 3) an extension of the LCR requirement to cover Swedish kronor, and finally 4) having banks report their NFSR and LCR more frequently.<sup>38</sup>

The problem with these measures is twofold:

*First*, they do not directly target the underlying drivers of consumer demand for credit, as discussed below.

<sup>35</sup> See the Riksbank's Financial Stability 2016:1.

<sup>36</sup> See the Riksbank (2015): Financial Stability Report 2015:2 and the Riksbank (2014): Financial Stability Report 2014:1.

<sup>37</sup> See the Riksbank (2014): Financial Stability Report 2014:2 and the Riksbank (2014): Financial Stability Report 2014:1.

<sup>38</sup> See the Riksbank (2014): Financial Stability Report 2014:1, the Riksbank (2013): Financial Stability Report 2013:2, and the Riksbank (2013): Financial Stability Report 2013:1.

*Second*, these measures directed specifically at Swedish banks may be undermined by increased cross-border supply. The tighter regulation gives foreign banks a competitive advantage, and firms with a presence in multiple countries or wealthy individuals could shift their bank exposure to foreign banks, which could undermine the effect of the regulatory measures. Furthermore, evidence suggests that banks increase their exposure abroad when faced with restrictions at home.<sup>39</sup> The Swedish banks could also potentially experience a bank capital outflow, as tighter regulation pushes bank capital into less regulated regions.<sup>40</sup>

## **4.2 Targeted economic policy tools that would improve financial stability in Sweden**

Below we present three economic policy tools that would curb the risk of a financial bubble in Sweden much more effectively than increasing financial regulation. In addition, the suggested policy tools have no cost in terms of decline in long-run GDP.

### **1) Monetary policy inflation projections and financial stability concerns suggest a quicker return to neutral policy rates**

The current inflation and output projection from the Riksbank suggests that a process of monetary tightening could be speeded up. Swedish inflation is expected to end up at 1% in 2016, increasing to 1.4% in 2017 and 2.2% in 2018.<sup>41</sup> The output gap has already been closed and further improvements are expected in the coming year - see *Figure 4.3*. Given the stated inflation target of 2%, there seems to be little support for keeping repo rate at the historically low level of -0.5%. Nevertheless, the latest forecast suggests that the rate will remain negative all the way to the fourth quarter of 2018.

Using a standard Taylor rule, we find that the current repo rate should be increased by 1.3 percentage points. In the calculation, we conservatively assume a natural nominal interest rate of 2.5% and take into account considerations for a smooth transition to higher interest levels.<sup>42</sup>

In general, there is an increasing tendency to attach more weight to financial stability when conducting monetary policy.<sup>43</sup> For example, the BIS sees a role for monetary policy to “lean against” strong growth in asset prices: “Financial stability is too large a task for prudential (...) frameworks alone. Monetary policy strategies also need to (...) lean against the build-up of financial imbalances even if near-term inflation remains low and stable.”<sup>44</sup> The central

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<sup>39</sup> Ongena et al. (2013): “When the cat’s away the mice will play’: Does regulation at home affect bank risk-taking abroad?” and BoE (2016): Cross-border regulatory spillovers: How much? How important? What sectors? Lessons from the United Kingdom.

<sup>40</sup> Houston et al. (2012): Regulatory arbitrage and international bank flows p. 1845-1895.

<sup>41</sup> The Riksbank (2016): Monetary Policy Report, October 2016, p. 37.

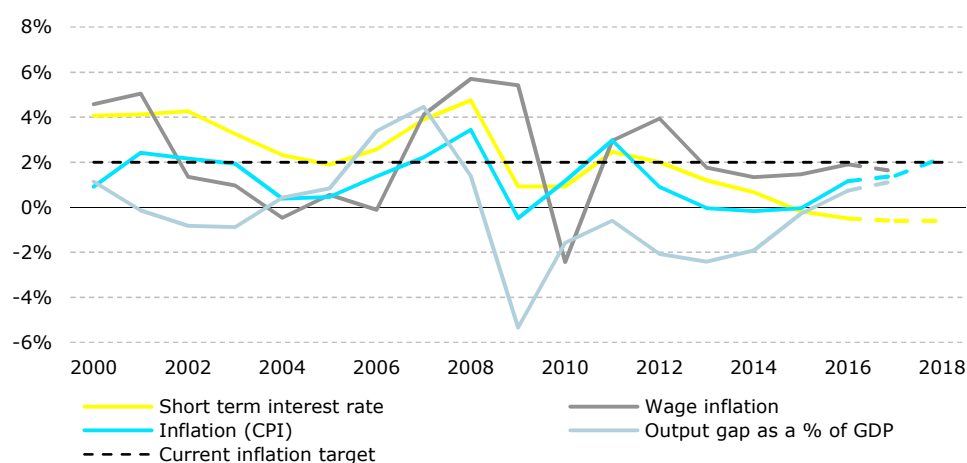
<sup>42</sup> See the Riksbank (2014): “Lower neutral interest rate in Sweden?”, p. 6.

<sup>43</sup> See Agénor et al. (2012): “Macroeconomic Stability, Financial Stability, and Monetary Policy Rules” for a review. For example, Woodford (2011) demonstrates that it is possible in an inflation-targeting framework to take account of financial stability concerns alongside traditional stabilisation objectives.

<sup>44</sup> Speech by Jaime Caruana, General Manager of BIS: <http://www.bis.org/speeches/sp110707.htm>.

bank of Norway has also kept its policy rate higher than what inflation targeting suggests in order to mitigate high growth in housing prices and income-to-debt ratio.<sup>45</sup>

**Figure 4.3 The short-term interest rate and macroeconomic performance**



Note: Forecasts for inflation and the short-term interest rate are taken from the Riksbank (2016) and forecasts for wage inflation and output gap are from the OECD Economic Outlook.

Source: OECD Economic Outlook No. 99 – June 2016 and the Riksbank (2016) Monetary Policy Report, October 2016 p. 37.

## 2) Tax reforms to encourage higher savings rates and reduce debt financing for housing purchases

There are substantial risks associated with the soaring housing prices and increasing indebtedness of Swedish households, and measures are needed to tackle the underlying cause. One such measure could be a phase-out, or at least a reduction, in the tax relief on interest expenditures. The current very low interest rates, together with the sizeable tax relief of 30% (21% above SEK 100,000), give some extremely low after-tax mortgage rates, igniting the currently high housing price growth.

Phasing out the tax relief would increase the effective costs of housing purchases, which would dampen housing price growth. This would also decrease the currently high debt-to-income ratio for existing home owners, as it would give an incentive to increase mortgage repayments.<sup>46</sup> IMF estimates that phasing out the tax relief would dampen the growth in housing prices by 4% over eight years. In addition to improving macroeconomic stability, phasing out the tax relief would increase tax revenue for the Swedish government by an estimated 0.5% of GDP.<sup>47</sup>

<sup>45</sup> See speech by Governor Øystein Olsen: <http://www.norges-bank.no/en/Published/Speeches/2015/2015-04-27-Olsen-LSE/>.

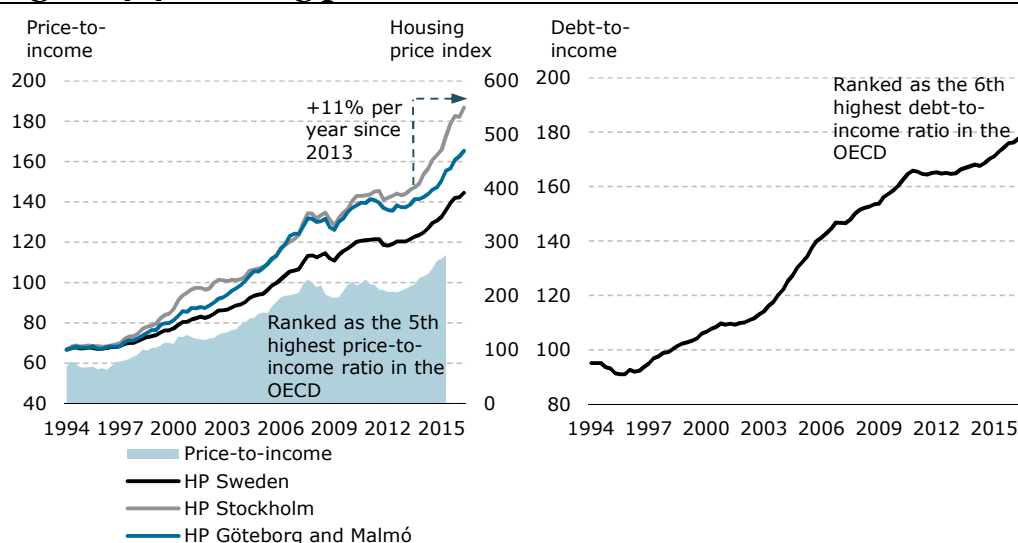
<sup>46</sup> See The Riksbank's Financial Stability report 2015:2.

<sup>47</sup> See IMF 2015: Sweden Article IV consultation report.

### 3) Expanding the supply of housing, particularly in urban areas

Swedish housing prices and mortgage debts have been increasing quite rapidly in recent years, driven particularly by the high price inflation in urban areas – cf. Figure 4.4. In fact, the annual growth in prices in Stockholm has been at 11% since 2013. Furthermore, when we look at price and debt indicators, Sweden has the fifth highest price-to-income ratio and the sixth highest debt-to-income ratio of all OECD countries.

**Figure 4.4 Housing prices and debt in Sweden**



Note: For the housing price index: 1994=100. HP indicate housing price index.

Source: SCB and OECD

This may be the result of several interlinked factors:

*First*, interest rates have been very low at a time when unemployment is low and wages are increasing quite rapidly. Prices typically react strongly to low interest rates<sup>48</sup>.

*Second*, economic growth is significantly stronger in Stockholm and other large cities than in most decentralised areas, leading to net migration into these cities. For example, the annual population growth of the Stockholm (region) went from an average of about 0.5% in the early 2000s to a bit over 1.7% from 2006 onwards. A similar picture can be seen in several other large cities. Copenhagen, for example, experienced a similar jump in population growth beginning around 2005. This growth has a strong effect on prices in the larger cities.

*Third*, these urban areas are characterised by a limited supply of land, which limits the supply of dwellings as well as the supply-side reaction in the housing market (the construction industry) over the short and medium term. For this reason, when the population

<sup>48</sup> See Heebøll (2014) and Anundsen and Heebøll (2016).



and housing prices start to increase rapidly, as they have been doing in Stockholm, the supply side will not adjust very much over the medium and short term.<sup>49</sup>

In combination, these three factors provide a very strong boost to housing prices, and low interest rates have reduced the cost of servicing a given loan. As most of the growth and most of the income going forward will be in urban areas with a limited land supply, the low interest rates and migration to urban areas like Stockholm will tend to result far more in higher housing prices than in the expansion of housing stock. The consequences could possibly also include both price speculation and a so-called financial accelerator, where the higher prices are pledged as collateral for higher lending.<sup>50</sup>

Hence, not only is a curtailing of demand through less expansive monetary policies and tax reform warranted, but so is a focus on increasing supply. Indeed, from a historical perspective it is paradoxical that over the past two decades while housing prices have been booming there has been a low level of residential housing construction in Sweden. In Sweden, the municipalities are responsible for planning how land is subdivided for housing. The system is time-consuming and complex, favouring larger companies with local knowledge. This hampers competition in the construction sector, swelling construction prices and limiting the supply of housing.<sup>51</sup>

One measure to stabilise housing prices could be the reform of land acquisition and planning procedures. The process could be made easier, more standardised and less time-consuming. This would increase housing construction and in turn dampen the growth in housing prices. To further incentivise housing construction, the government could put an extra tax on undeveloped land to ensure that projects are undertaken in a timely manner.<sup>52</sup>

In addition, rent controls could be abolished, which would increase the incentive to build new rental homes. Rental controls create a supply shortage with long waiting lists, which could force new entrants on the housing market to buy instead of renting, increasing housing prices even further.

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<sup>49</sup> Note that we are speaking in relative terms. Therefore, even though we see a large absolute amount of new construction in Stockholm and other larger cities, this amount is often rather small when we see it relative to the existing housing stock and population growth in the cities.

<sup>50</sup> Anundsen and Heebøll (2015) document these effects for 245 regional US metropolitan housing markets.

<sup>51</sup> See the Riksbank 2015: Supply of housing in Sweden.

<sup>52</sup> See IMF 2015: Sweden Article IV consultation report p. 20.

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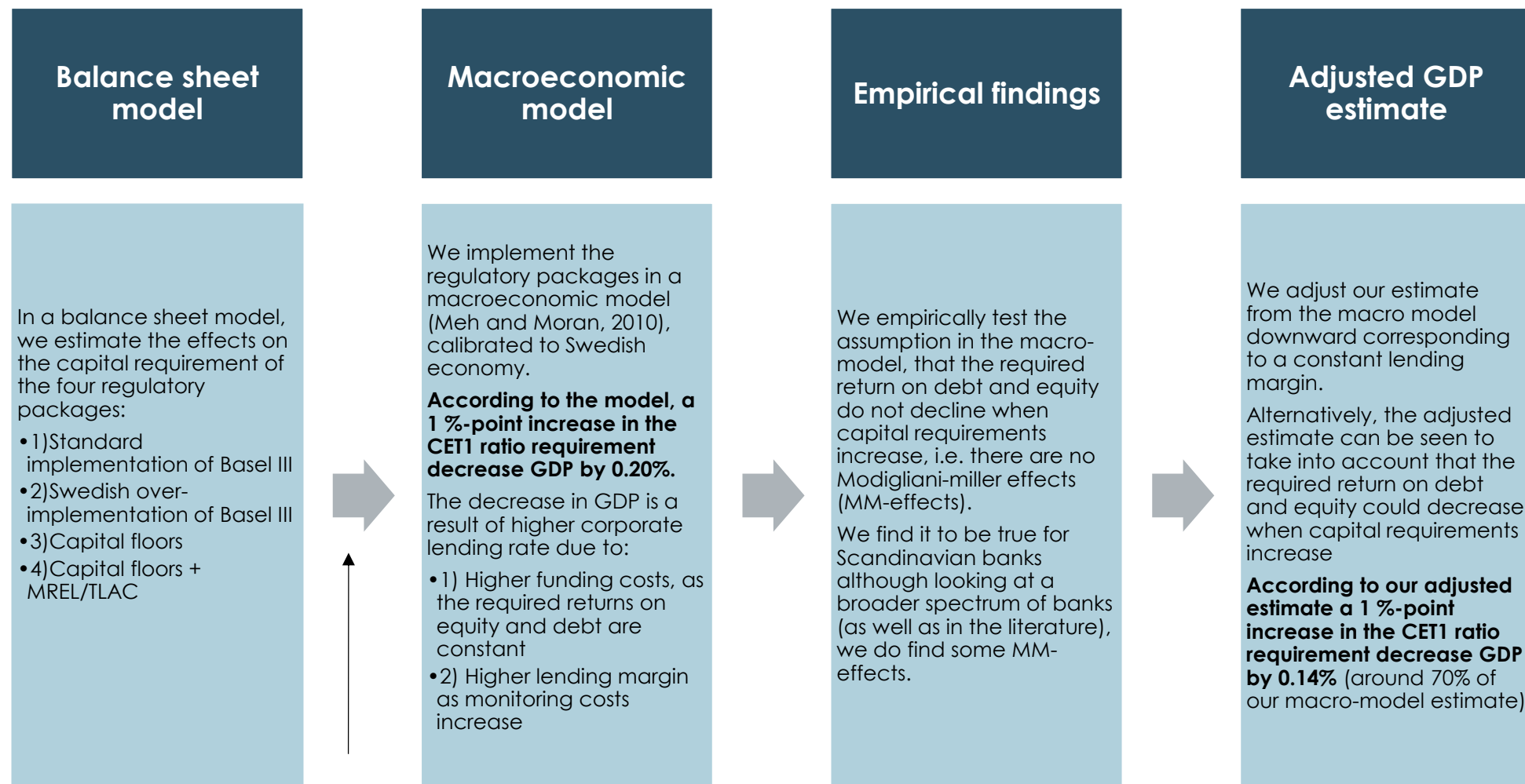
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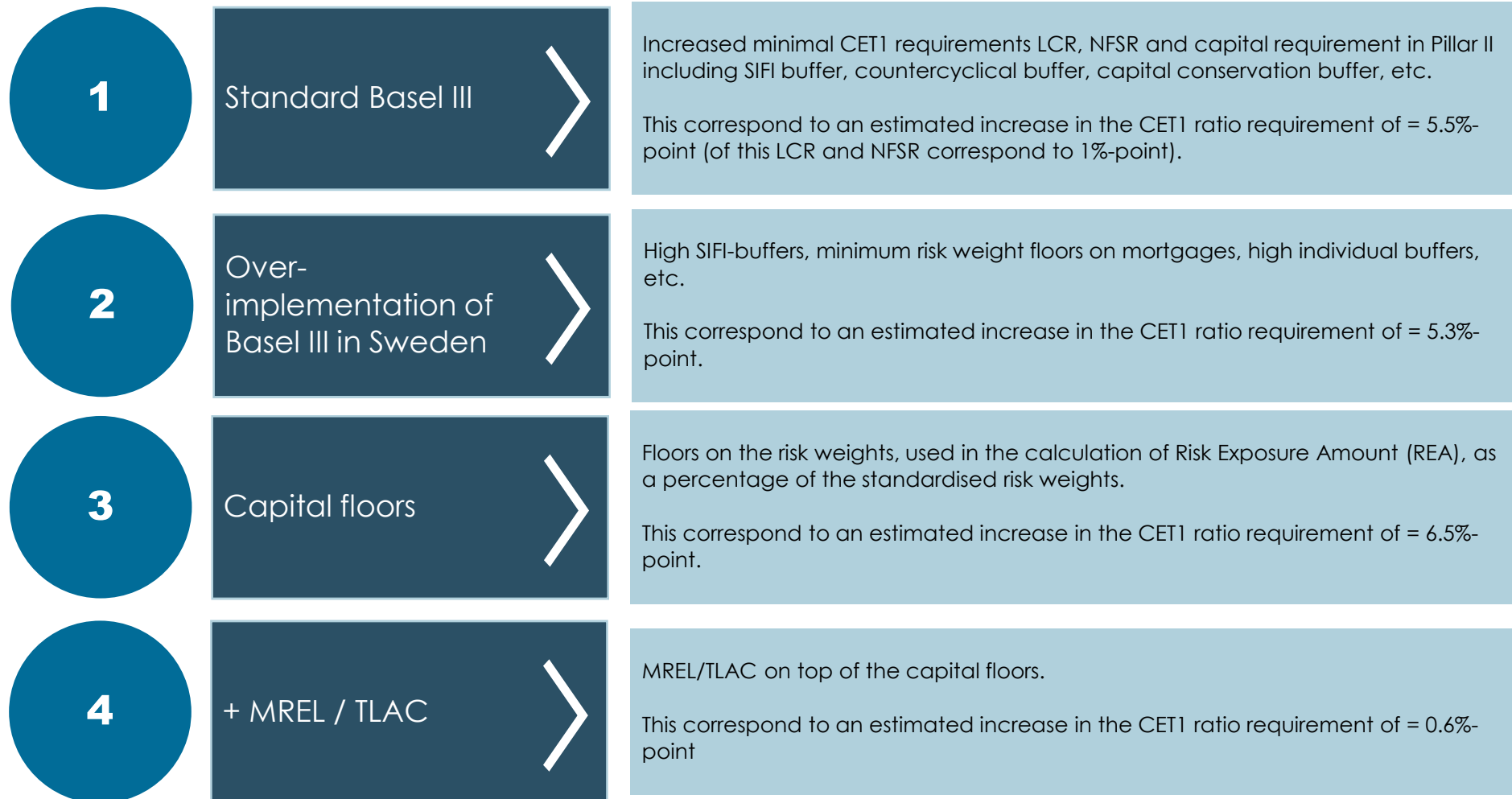
# Model appendix

# Overview of our estimations



The link between the balance sheet model and the macro-model is the increase in capital requirements

# We calculate the effects of 4 regulatory packages



## Estimation of the capital requirements

### METHODOLOGY

Three methods have been used to estimate the impact:

1. New capital requirements are bank specific and therefore need to be adjusted for market shares to evaluate the impact on the economy.
2. NFSR and LCR requirements affect the business model and ultimately the profitability of banks. We estimate the impact in a balance sheet model where banks are assumed to optimize their exposures to maximize profits.
3. The impact of capital floors and TLAC / MREL is analysed using EBA data and results from earlier studies.

The central questions are: How has the Basel III legislation been implemented in Sweden (as discussed in package 1 and 2), what is the effect of introducing capital floors (as discussed in package 3), and how do capital floors interact with MREL / TLAC requirements (as discussed in package 4)

### PACKAGE 1 AND 2: BASEL III

Under the Basel II regulation banks were required to have a CET1 ratio of 2 percent and total capital ratio of 8 percent. Historically the 4 large Swedish banks had a large buffer to the CET1 requirements with CET1 ratios of app. 8 percent in 2007. This can be compared to an average CET1 ratio of 19 percent today.

The capital requirements have increased substantially since the crisis. Today the four large Swedish banks are required to hold an average of

16.7 percent of CET1 capital over risk weighted assets.

Since 2007, large banks have shifted significantly towards internal IRB methods when evaluating risk weights. This generally makes it difficult to compare requirements from 2007 with current requirements. Hence, we rely on the difference in actual capitalisation as a measure of implicit and explicit changes capital requirements. This is equivalent to a 11.1 percent points increase in CET1 requirements for the four largest banks. The estimate has been corrected for the fact that smaller banks are not required to comply with IRB and SIFI measures. Using total lending to the public as the weighting variable results in a total increase in the CET1 ratio for the enter banking sector of 10.8 percentage points.

The over-implementation of the Basel III requirements is approximated by comparing the CET1 ratios of the four largest Swedish banks to the average of all large banks in the “Basel (2015): Basel III Monitoring report, June 30<sup>th</sup>”. This approximation captures the fact that 1) the implementation of Swedish regulation has been significantly accelerated compared to most countries and 2) that the requirements are set above the required minimum of the CRD IV / CRR legislation. Using this approach, the over-implementation is approximately 5.3 percentage points of the total 10.8 percentage point increase from Basel III.

The effects of the LCR and NFSR requirements have been approximated in a balance sheet model. We

have taken the most recent financial statements and considered a profit maximization response to removing the LCR and NFSR requirements. We have assumed that the NFSR requirement is already binding today. This assumption is supported by the fact that the four largest Swedish banks already comply with the NFSR requirement according to their most recent financial statement, given that the NBSF methodology applied by Nordea is equivalent to the NFSR requirement.

Our results suggest that the NFSR and LCR requirements are equivalent to raising the CET1 requirement by 0.9 percentage points for Nordea, 1.0 percentage point for Handelsbanken and SEB, and 1.1 percentage points for Swedbank. The approximations are found with an assumption of unchanged required return on equity of 8 percent and a risk free rate of 2 percent.





## Estimation of the capital requirement - continued

We stress that there is considerable uncertainty about the impact of the LCR and NFSR requirements, compared to e.g. new capital requirements. Fairly restrictive assumptions have been made to arrive at the approximations, e.g. demand elasticities of both assets and liabilities are assumed completely elastic. Furthermore, the balance sheet model is a simplified way of analysing the business models of banks and might not capture all relevant factors in the optimizing behavior.

The impact on the entire banking sector assumed to follow the effects of the four largest banks. However, the results suggest a moderate effect of LCR and NFSR requirements, which are generally in line with the estimated GDP effect in “BIS (2010): Estimating the costs of financial reform”.

The balance sheet model reveals some interesting qualitative results. If banks did not have to comply with the NFSR and LCR requirement, they would:

- Hold less cash and balances with Central Banks
- Increase exposures to retail/SMEs and mortgages
- Rely more heavily on short term interbank funding
- Issue fewer debt securities

### PACKAGE 3: CAPITAL FLOORS

The calculation is based on EBA transparency data from the second quarter of 2015 for the four largest banks in Sweden: Nordea, Swedbank,

Handelsbanken, and SEB. The impact of capital floors is calculated for banks independently and later aggregated.

The calculation is based on the following simplifying assumptions about the standardised approach of RWs on asset classes:

- Central banks and central government: 5%
- Corporates: 85%
- Retail – Secured on real estate: 35%
- Retail – Qualified revolving: 75%
- Retail – Other retail: 75%
- Equity: 250%
- Securitization: 100%
- Other non-credit-obligation assets: 100%

The estimated impact of capital floors is based on an assumption that the new capital floors is 75% of the standardised approach.

The EBA data allows us to approximate the impact of capital floors on REA based on exposures evaluated by the IRB method. All other risk exposures (market risk, operational risk, credit risk evaluated by the standardised approach, etc.) are assumed to be unaffected. By combining this information with capital requirements for individual banks, we can calculate capital requirements before and after introducing capital floors. We take into account that the Pillar II requirements with regards to Swedish and Norwegian mortgages are no longer binding

when capital floors are introduced.

Our estimates suggest that capital floors will increase capital requirements by SEK 215 bn (compared to the SEK 245 bn estimate in OW (2016)). We acknowledge that our estimate is conservative as the capital floors might be applied on origination values and not exposures, see “BIS (2015): Revisions to the Standardised Approach for credit risk”. As only large banks apply the IRB method, we correct the approximated change in CET1 ratio slightly. We find that the introduction of capital floors is equivalent to increasing the capital adequacy ratio by 6.5 percentage points.

## Estimation of the capital requirement - continued

### PACKAGE 4: MREL / TLAC + CAPITAL FLOORS

The calculation is based on information from a recent Riksbank study on the impact of TLAC on the four largest banks combined with EBA transparency data.

The study shows that the TLAC requirements, if introduced today for all four largest banks, are binding in regards to the requirements of the non-risk weighted assets. We assume that applies.

In the calculation of the impact of TLAC, the Riksbank does not take the introduction of capital floors into account, which implies that it is the TLAC requirement respect to the risk weighted assets that will be binding.

In regards to MREL, we use a study of BoE (2015).

The calculation is carried out as follows:

*First*, we assume that banks increase their CET1 capital in response to the new capital floors, one-to-one. *Second*, we assume that banks will hold a 2 percentage point buffer to the TLAC requirement (that is the minimum buffer held today if TLAC was introduced **without** capital floors).

Given these assumption, we calculate that the TLAC eligible liability shortfall is SEK 112 bn (aggregated for the four largest banks). Given an estimated cost of 62 bps of TLAC eligible liabilities compared to alternatives (from BIS (2015)), we get an extra funding cost of around SEK 700 million

annually for the four Swedish banks.

This can be converted into extra capital requirement given an assumption of unchanged required return on equity (RoE). Specifically, we assumed a required return on equity of 8 percent and a risk free rate of 2 percent. The TLAC requirement is only expected to affect large banks and therefore increase is adjusted accordingly.

The combination of MREL / TLAC and capital floors is equivalent to raising capital requirements by 7.1 percentage points (6.5 (capital floors) + 0,2 (MREL) + 0.3 (TLAC)).



Macro model:

## A DSGE-model with a detailed banking sector

### OVERVIEW OF THE MODEL

To estimate the macroeconomic effects, we use a model developed in Meh and Moran (2010). It is a so-called Dynamic Stochastic General Equilibrium (DSGE) model, which is a micro-based macroeconomic model. The model has a detailed financial sector, which enables us to analyse the effects of higher capital requirements.

### WHY WE CHOOSE THIS MODEL

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 generally respected in the academic literature, with numerous citations. In Swedish context, the 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.

### CALIBRATION OF THE MODEL

The model is calibrated to fit the Swedish economy. The calibration of the model implies that an 1 percentage point increase in capital requirements reduces long-run GDP by 0.2% (as mentioned, the result will be adjusted).

Below follows a description of the exact calibration of the model:

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

- A CET1 ratio of 19%, which is the current average capitalisation of the four largest Swedish banks. *Source: Annual reports*
- Equity/total financial assets of 50%. *Source: SCB*
- Return of bank equity of 8%. *Source: Estimation based on beta-coefficients of the four largest banks from Y-charts. In the calculation, we assume an average market return of 6%.*
- 4.5% of the employment are bankers. *Source: SCB*
- Annual inflation = 2%. *Source: Riksbanken's target*

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

- Habit-formation (=0.53)
- Quarterly depreciation of physical capital

(=1.2%)

- Income share of capital (= 0.36%)
- Calvo parameter (=0.84)
- The annual risk free long run interest rate is set to 2.14%.

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



Macro model:

## The model might overestimate the effects on GDP

### HOW THE CAPITAL REQUIREMENTS INCREASE IN THE MODEL

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 have 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.

### THE MODEL MIGHT OVERESTIMATE EFFECTS ON GDP

Our macroeconomic model might overestimate the effects on GDP. As a consequence, our model estimate will be adjusted, described in the last section in this appendix. Concretely, two aspects of the model could call for an adjustment:

- 1) In the model, the lending margin increase when capital requirements increase.
- 2) In the model, the required return on debt and equity are unchanged when capital requirements increase.

#### 1) Higher lending margin

As described, higher capital requirements mean higher monitoring costs, as the bank owners have more skin in the game. The increased costs are reflected in higher lending margin, i.e. the difference between the founding and lending rate. For high levels of equity, this effect might however be small, as banks already have incentive to monitor their loan sufficiently. Lending margins could however increase for example due 1) to higher compliance cost from the increased complexity of financial regulation or 2) impaired business model of the banks.

#### 2) Unchanged required return

In the model, the net return on equity is unaffected by change in the capital requirements (or the level of monitoring) and the share of monitoring costs of the banks gross return is constant.

The reason is that households cannot provide bank equity in the model – bankers have monopoly on banking activities.

The return on equity depends therefore on the market power of “bankers”, which depends on the value of monitoring. In the model, this will correspond to the difference between a good and a

bad investment project (as monitoring can ensure that borrowers choose the good project). Hereby, the net return on bank equity is unchanged when capital requirements increase.

However, some empirical studies find that higher capital requirements can lead to lower required return on bank equity, as “bankers” do not have monopoly on providing bank capital. Higher capital requirements could imply lower risk of bank equity, which could increase the demand and decrease the required return on bank equity.

These effects will be the topic in the next section.



Empirical findings:

# How banks total funding cost increase with higher capital requirements?

## HOW WE ANALYSE THIS

We analyse this by looking at the total funding cost of banks (equity and debt), summarised in the weighted cost of capital (WACC):

$$WACC = \frac{E}{D+E} \cdot r^e + \frac{D}{D+E} \cdot r^d$$

Here  $\frac{E}{D+E}$  and  $\frac{D}{D+E}$  are the share of the bank funded by equity and debt respectively, and  $r^e$  and  $r^d$  are the related required returns in the market.

To put it simple: higher capital requirements force a bank to have a share of equity funding ( $\frac{E}{D+E}$ ) and a lower share of debt funding ( $\frac{D}{D+E}$ ):

The central question is how this affect the total funding costs.

## TWO OPPOSING VIEWS

There are two opposing views to this question:

- The static view:** The required return on equity funding is much higher than the required return on debt funding. Hence, when forcing banks to shift from debt funding to equity funding, the total funding costs increase substantially.

- The Modigliani and Miller view:** With a simplistic view on finance, the total required return to owners (debt owners and equity owners) should be unaffected by how a bank is funded. When forcing a bank to have a higher share of equity funding it will be less risky for both equity and debt owners. Specifically, the loss capacity increases and the risk of bankruptcy falls. This will reduce the required return on both equity and debt exactly so that the total funding costs are unchanged. This is illustrated in the top figure (right-hand side).

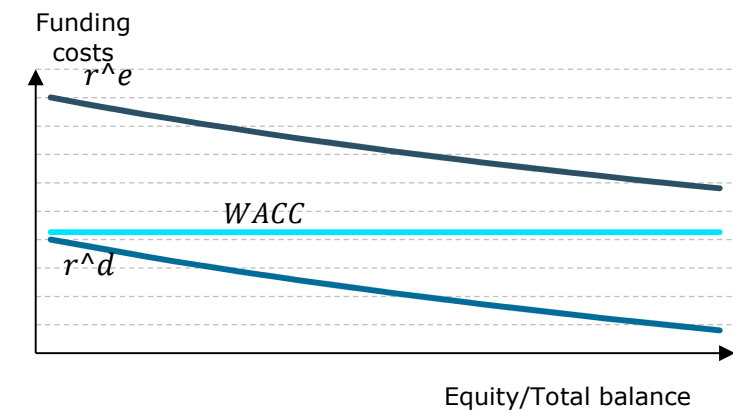
## PROBABLY SOME MODIGLIANI-MILLER EFFECTS

At least to some extent, the required return on both equity and debt should decrease when banks hold more equity as the risk decreases.

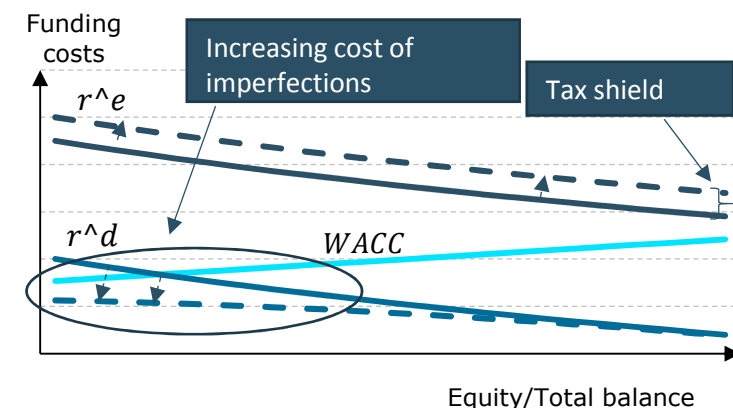
However, there are several reasons why total cost of funding could increase when capital requirements increase (see also chapter 1.3 in the main report):

- **Tax shield**
- **Explicit guaranties**
- **Implicit guaranties**
- **Creditors value bank debt highly**

## The Modigliani and Miller view



## A more realistic perspective



Empirical findings:

## What does the empirical literature say?

### OUR APPROACH

There are two main questions from the WACC equation, which will be analysed following standard methods:

1. **How is the cost of debt affected?** To analyse this, it is typical to look at how credit default swaps (CDS) spread are affected when the funding structure (the CET1 ratio) changes.
2. **How is the required return on equity affected?** A typical approach would be to calculate the required return on equity based on CAPM, and then analyse how the required return change when the CET1 ratio change.

### THE MAIN RESULTS IN THE LITERATURE:

In general, the results in the literature are very divided, and dependent on the data sample used; if it is only banks in a “normal situation”, or if it includes thinly capitalized banks during the financial crisis. When including the latter, the stressed banks might have strong influence on the overall results.

Concretely, in the litterateur analysing the effect on cost of debt:

- Some find that an 1% higher solvency (CET1 ratio) increases the cost of debt by more than 1%.
- Others find an effect close to zero (around 0.04 %).

This illustrates the very different effects in the different types of situations:

- The very high effects are mostly driven by observations in crisis periods 2007-2011. In these periods liquidity issues become solvency issues and we also see a strong effect from higher funding costs due to higher capitalisation.
- It can be very costly to issue new equity (especially during crisis).
- Even in normal times, there are non-linear effects where the funding costs increase rapidly when banks move below a certain threshold of capital.

### SPECIFIC PAPERS:

#### Cost of debt:

- **Schmitz et al. (2016)** estimates the endogenous relation between CET1 ratio and cost of debt (CDS spreads) for 54 large banks in 6 different countries 2004-13. Their results suggest that a 1 %-point increase in CET1 ratio decreases the cost of debt by 110 bp.
- **Hasan et al. (2016)** analyse 161 global banks 2001-2011 in a multivariate panel. Their results suggest that a 1 %-point increase in market-based leverage implies at 101 bp. increase in funding costs (CDS spreads). However, these effect are driven by extraordinary high effects after 2007.
- **Aymanns et. al (2016)** considers a large number of US banks 1993-2013, also in multivariate panel. Their sample consist of a larger period where the market is non-stressed. They find relatively small effects in normal times; a 1 %-point increase in solvency increases the cost of debt by 0.04 bp. In stressed times the effects are significantly higher.
- **Babihuga and Spalltro (2014)** considers 52 banks in 14 advanced economies 2001-2012 in a panel ECM. Their results suggest that a 1 %-point increase in CET1 decreases the cost of debt by 26 bp.

#### Cost of equity:

- **Miles et al. (2012)** analyse the effect of leverage ratio on cost of equity for a number of large UK banks using panel models, 1992-2010. Their results suggest that a 1 %-point increase in CET1 ratio decreases the cost of equity by about 15 bp. (translated to our average relation between leverage and CET1 ratio for large European in 2015).



Empirical findings:

# What does the data say?

## WHAT IS RELEVANT FOR THE SWEDISH BANKING SECTOR?

Swedish (and Scandinavian) banks are very well capitalised when comparing to banks in the rest of Europe. Therefore, it will be wrong to compare and analyse all banks across the board.

### Cost of debt:

The top figure to the right shows the relation between CET1 ratio and cost of debt for north and central European banks in 2012:

- In general, we see a clear negative relationship.
- As found in the literature, the effect is clearly decreasing when solvency increase. Southern European banks – if included – would have even lower CET1 and probably higher cost of debt.
- For the Scandinavian banks however the relation is very weak.

### Cost of equity:

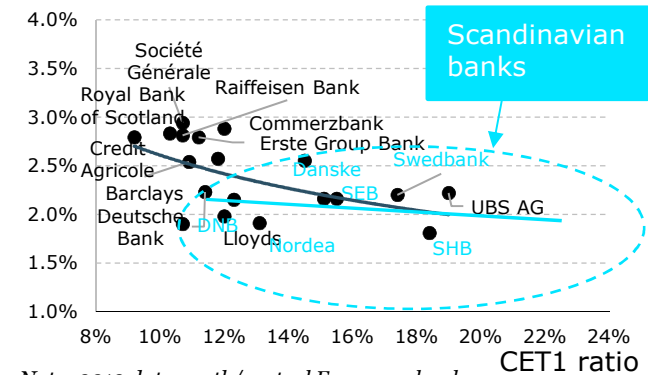
The bottom figure to the right shows a similar relation between CET1 and cost of equity of north and central European bank in 2012. The figure below shows the same relation for a sample bank across Europe in 2015 :

- As expected, the relation is also negative for equity.
- Again, for the Scandinavian banks the relation is very weak. In 2015 the relation is actually slightly positive.

Thus according to our empirical findings, there is no correlation between the cost of equity and CET1 ratio for Scandinavian banks.

## The cost of debt (2012 data)

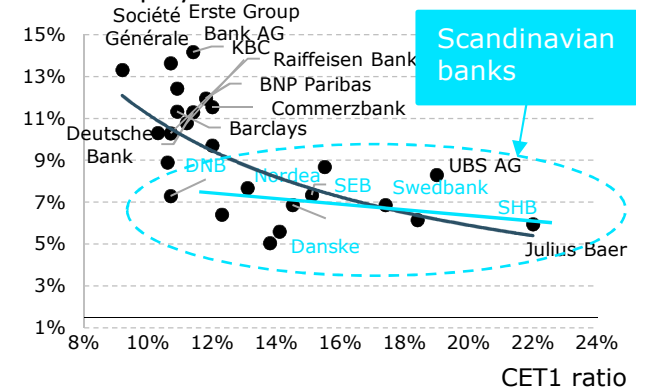
Cost of senior debt



Note: 2012 data north/central European banks  
Source: Danish Central Bank, Finansiell stabilitet 2013

## The cost of equity (2012 data)

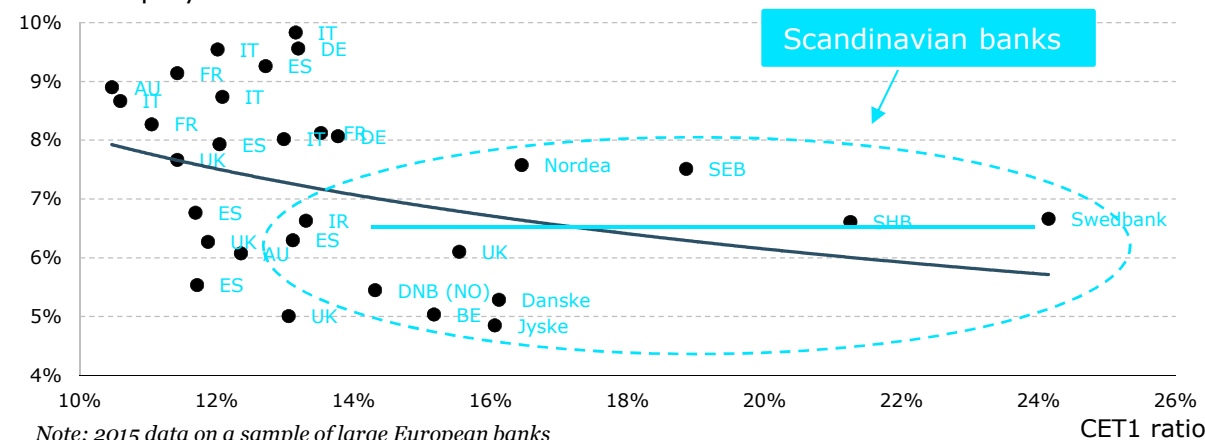
Cost of equity



Note: 2012 data and only north/central European banks  
Source: Danish Central Bank, Finansiell stabilitet 2013

## The cost of equity (2015 data)

Cost of equity



Note: 2015 data on a sample of large European banks  
Source: Danish Central Bank, Finansiell stabilitet 2016



Empirical findings:

## Higher capital requirements effect on funding costs

### OUR CALCULATIONS

We analyse the total cost of capital (WACC) for Swedish banks if their CET1 ratio is illustratively increased from 19% to 26% (roughly corresponding to the change in “Basel IV”). We do four estimations (or scenarios) of the WACC effect:

1. **The static view:** Assuming the required return on equity and debt is unaffected by the CET1.
2. **The M&M view:** Assuming Modigliani & Miller theorem holds, only accounting for tax shield.
3. **Main estimate:** Using the reaction in cost of equity and debt for Scandinavian banks found from our 2012/2015 data (see previous slide)
4. **Conservative estimate (lower bound):** A lower bound estimate for the cost of capital effect for Scandinavian banks (see details below).

#### Details on the calculations:

- We calculate the cost of funding on risk weighted assets (RWA), which is less than the total balance.
- The funding structure consist of equity (CET1), unsecured debt and secured debt (residual).
- Only the cost of equity and unsecured debt may react to changes in the CET1-ratio.
- From data on Scandinavian banks we find a very low and insignificant relation between CET1 ratio and cost of equity and debt. Only in 2012 we find a small effect on the cost of equity; when the CET1-ratio is increase from 10 % to 11 % the cost of equity decreases by 24 bp.
- As our conservative (lower bound) estimate – even though our data does not show any significant effect – we estimate the WACC effect when cost of debt react in accordance with the “normal times” estimate in the litterateur and cost of equity react as an average of our 2012 and 2015 estimate.

### OUR RESULTS

Our results are shown in the table:

1. **The static view:** Total cost of capital increase by 22.5% when we assume no reaction in the cost of equity/debt.
2. **The M&M view:** Total cost of capital increase by 1.1% if we assume full M&M and tax shield.
3. **Main estimate:** From our 2012/2015 data we find no significant effect on cost of debt or equity for Scandinavian banks when CET1 ratio change. Hence, our main estimate equals the static view.
4. **Conservative estimate (lower bound):** Being conservative, we find that the cost of capital for Scandinavian banks may react a bit less than the static view (only increase by 17%, which is 76 % of the static view effect).

where the sector was exposed to many extraordinary circumstances:

- The European financial debt crisis was still far from finished (in 2012), risk aversion was high
- Banks were exposed to a high risk of upcoming financial regulation, where they may have to raise more equity (which is costly).
- The growth crisis and expansionary monetary policy (zero deposit rate) have negative effect on banks’ earnings.

#### We should interpret the results with care:

The results are quite sensitive to changing assumptions in general. Further, they are based on a rather thin data sample from a period (2012/2015)

#### THE EFFECTS ON WACC WHEN CHANGING CET1 FROM 19% TO 26 %

	Change CET1 (%-point)	Change R <sub>e</sub> (%-point)	Change R <sub>d</sub> (%-point)	Change WACC (%)
The static view & main WACC estimate	+7	0,0	0,0	22,5
Modigliani and Miller	+7	-1.6	-0.2	1.1
Lower bound WACC estimate	+7	-0.3	-0.1	17

*Note: We only consider the cost related to REA. For the total balance all effects may be somewhat smaller.*

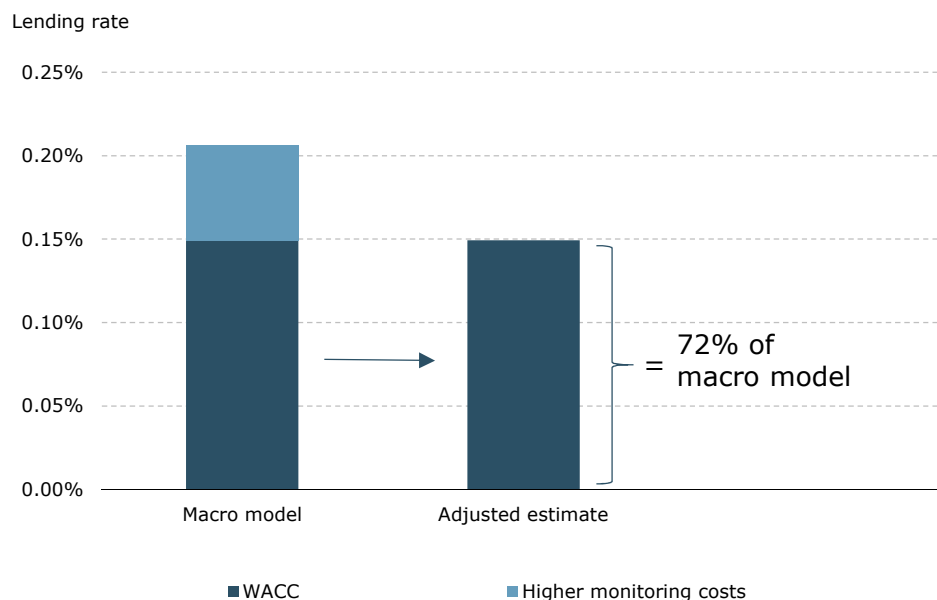


# Adjustment of the macro model estimate

In the macroeconomic model, the decline in GDP is a result of higher lending rates due to:

1. Higher funding costs, as the share of equity increase and the required return is constant.
2. Higher lending margin, as the monitoring costs increase since banks have more “skin the game” and monitor their loan better.

## Illustrative example of our adjustment: An increase in CET1 ratio requirements of 1 %-point



*Note: In the macroeconomic model, all loans runs one quarter. The investment based on the loan and the monitoring of the loan also takes place in the same quarter. As a result, it is difficult to compare the effects on lending rate to normal bank loans, which can run several years. The above example is based on a corporate loan with a risk weight of 100%, which runs 7 years, with an annual interest rate of 5.4%.*

Source: Copenhagen Economic

In regards to the adjusted estimate in the report, we ignore the latter effect of higher lending margin, and the increase in the lending rate is a consequence of higher funding costs (where it is assumed that there is no reduction in the required return).

The adjustment is a consequence of our empirical findings presented on the previous slides, where, for Scandinavian banks, there is no indication that the required return on debt and equity increase, when capital requirements increase. On the other hand, we assume that Swedish banks, with CET1 ratio levels of close to 20%, already have incentive to monitor their loan sufficiently and higher capital requirements will not further increase monitoring costs.

The adjustment results in an estimated decline in GDP of 0.14% for an increase in CET1 ratio requirement of 1 percentage point. This is about 72% of our model estimate with a decline in GDP of 0.20%.

## ADDITIONAL EFFECTS COULD PULL OUR ESTIMATE IN BOTH DIRECTIONS

As mentioned, it could be argued that going forward, when there is more clarity on the future banking regulation, there could be some reduction in the required return, when capital requirement increase.

This factor could pull in the direction of lower GDP-costs subsequent to higher capital requirements.

At the same time, it could be argued that the lending margin should increase, when financial regulation increase, due to higher compliance costs as the complexity increase or due to limitations in the business model of banks (as described in the main report in chapter 1.4). For example, the introduction of capital floors, gives a new dimension to capital adequacy, and partly removes the underlying link between the risk of an asset and the capital requirements of that asset.

This factor could pull in the direction of higher GDP-costs subsequent to higher capital requirements.