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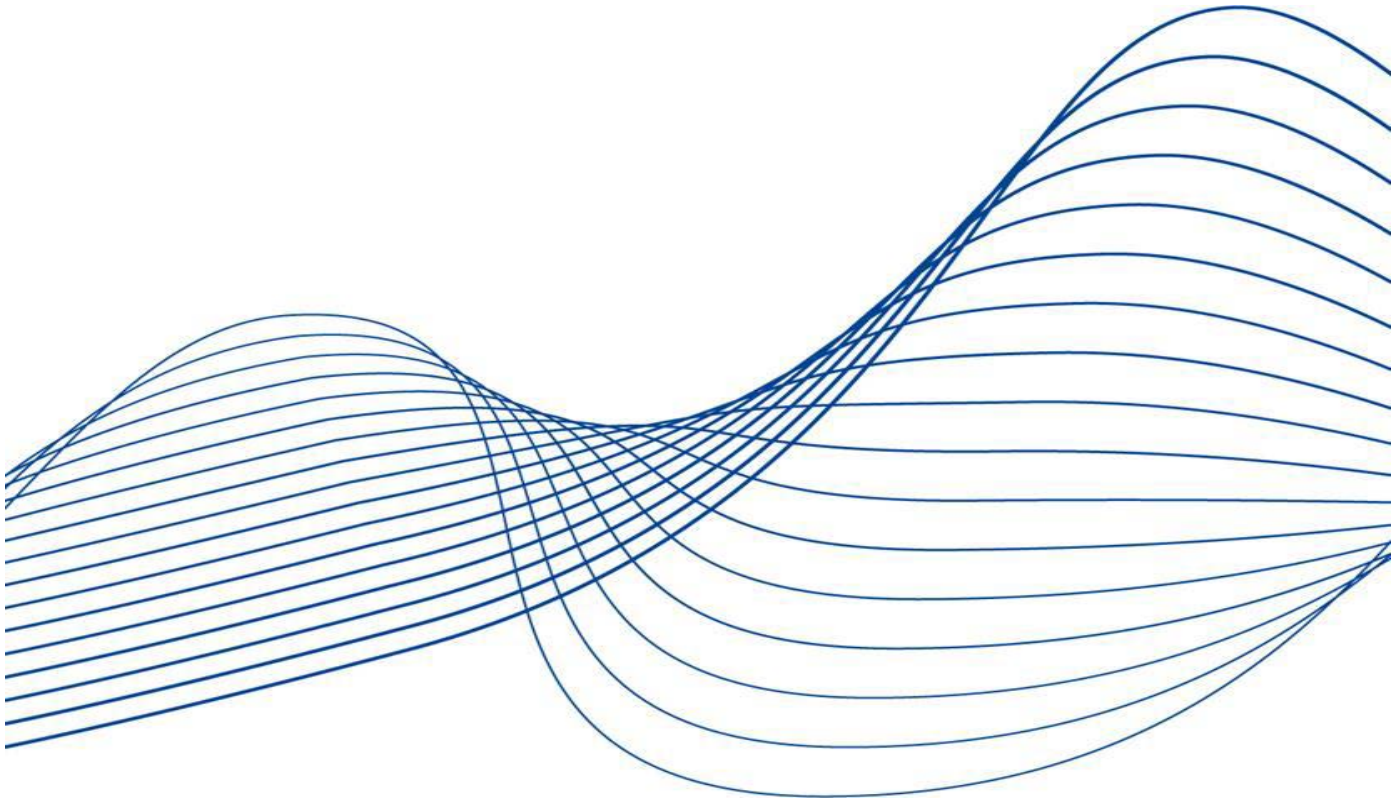
The ESRB Handbook on Operationalising Macroprudential Policy in the Banking Sector

Addendum: Macroprudential Leverage Ratios



ESRB
European Systemic Risk Board
European System of Financial Supervision

List of abbreviations

AT1	Additional Tier 1
BCBS	Basel Committee on Banking Supervision
CARW	critical average risk weight
CBD	consolidated bank data
CCB	countercyclical capital buffer
CET1	Common Equity Tier 1
CLRB	countercyclical leverage ratio buffer
CRD	Capital Requirements Directive
CRR	Capital Requirements Regulation
EBA	European Banking Authority
EU	European Union
FSB	Financial Stability Board
G-SIB	global systemically important bank
HQLA	high quality liquid assets
LCR	liquidity coverage ratio
NSFR	net stable funding ratio
RWA	risk-weighted asset
SII	systemically important institution
SRB	systemic risk buffer
SFT	securities financing transaction

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[1] This chapter was prepared by the Working Group on the Macroprudential use of the Leverage Ratio of the ESRB Advisory Technical Committee (ATC) Instruments Working Group, co-chaired by Sujit Kapadia and Peter Wierts. The members of the Working Group were Andreas Barth, Florin Balauta, Dina Raquel Batista, Oliver Bush, Moa Cedhamre, André Ebner, Michael Grill, Timo Kosenko, Alexandra Leonhard, Axel Löffler, Giancarlo Mazzoni, Katie Rismanchi, Victor Savin, Peter Strobl and Maarten Vleeschhouwer. The chapter benefited from the input of participants in a preparatory workshop held in Frankfurt on 2 September 2014, namely Harald Benink, John Geanakoplos, Esa Jokivuolle, Ilkka Kiema, Anna Lee Hewko, Galo Nuño, Erik van der Plaats and Carlos Thomas, and comments by members of the ATC Instruments Working Group, the Advisory Technical Committee and the Advisory Scientific Committee. The chapter was approved for publication by the General Board on 19 March 2015.

Executive Summary

A. Motivation

The ESRB Handbook on Operationalising Macroprudential Policy in the Banking Sector (ESRB (2014a)) provides detailed guidance to macroprudential authorities in the European Union (EU) on how to design and implement macroprudential policy for the banking sector. It is not binding on macroprudential authorities and does not prejudice the competence of the responsible authorities to determine their own policy stance, recognising the need for national flexibility.

This chapter extends the Handbook to include macroprudential leverage ratios, which can currently be used at the discretion of EU Member States. A leverage ratio requirement limits excessive on and off-balance sheet leverage by restricting a bank's total assets (including off-balance sheet) in relation to its equity.

The analysis on the design of macroprudential leverage ratios is timely, for the following reasons.

i. The possible usefulness of macroprudential leverage ratios as part of the overall toolkit has been highlighted by the ESRB in its Recommendation on intermediate objectives and instruments of macroprudential policy (ESRB (2013)), the Basel Committee on Banking Supervision (BCBS) and other international organisations.

ii. Authorities in several countries are currently implementing a leverage ratio from a macroprudential perspective, especially for systemically important institutions (SIIs).

iii. A harmonised minimum leverage ratio (foreseen in the EU from 2018 onwards) and any potential macroprudential add-ons are part of the same overall framework, so this chapter contributes to integrated and evidence-based decision-making.

The chapter can, therefore, contribute to enhancing coordination, with a view to supporting a level playing field while allowing for national specificities and circumstances to be taken into account and differences in systemic risk across institutions and countries to be addressed. At the same time, it should be noted that the European Banking Authority (EBA) and the BCBS are conducting analyses of a minimum leverage requirement as well as potential flexibilities, and wider work is underway internationally on the risk-weighting framework. This chapter can inform those discussions and, as a live document, it will be reviewed in 2017 following the outcome of this work.

B. Summary of key messages and conclusions

Macroprudential policy involves the differentiation of capital buffers across institutions (to address differences in their systemic relevance) and time (to address fluctuations in aggregate risk over the financial cycle). The introduction of a microprudential leverage ratio is currently being considered as a complementary measure alongside risk-weighted capital requirements. Within this setting, this chapter examines the interaction between variations in macroprudential risk-weighted capital buffers and the leverage ratio from a systemic perspective. Current legislation allows for flexibility over macroprudential risk-weighted

capital buffers according to the systemic importance of institutions, differences in structural risks and time-varying risks. However, if such instruments are adjusted to tackle systemic risk, macroprudential authorities may consider changing the leverage ratio as well to maintain their complementary roles and the balance of the overall capital framework.

Any macroprudential use of the leverage ratio should reflect national specificities and circumstances, including national credit cycles and structural differences across financial systems and institutions. From a technical design perspective, however, the relationship between risk-weighted capital requirements and the leverage ratio offers the possibility of deploying a guide rule linking the two. This may be simpler, may provide more certainty and transparency (including to banks), and may provide greater coherence in the overall approach towards the capital framework. But discretion allows for more flexibility and may make it easier for authorities to pursue different objectives using macroprudential leverage ratio requirements.

In particular, capital add-ons for SIIs require time-invariant decisions that apply to individual institutions and are not subject to reciprocity. So if national authorities choose to vary the leverage ratio for SIIs, this would also involve a simple time-invariant decision. Following a guide rule for this decision by maintaining the link between risk-weighted capital ratios and the leverage ratio would provide more transparency to institutions and foster a level playing field. But a discretionary approach could take the specific circumstances of the bank into account, such as the level of risk weights at different institutions. Time-varying requirements may require a different design. The calibration of the countercyclical capital buffer (CCB) is reviewed each quarter and is subject to a reciprocity mechanism.[2] Therefore, maintaining complementarity with the leverage ratio may be somewhat more complex in this case, especially under a distinct discretionary approach. If, however, authorities choose to adopt a time-varying leverage ratio, a rules-based approach that maintains a fixed link between the CCB at the institution level and the leverage ratio could, in principle, be feasible and imply automatic reciprocity based on the CCB regime (as analysed further in Section 5.5). But discretion allows for greater flexibility for authorities to pursue different objectives using time-varying leverage ratios.

All of the other design features for macroprudential leverage ratios (such as definitions) could be taken over from the ongoing discussions on the minimum (microprudential) leverage ratio and the existing architecture of risk-weighted macroprudential capital buffers to keep the framework simple. This chapter does not recommend any changes to these areas. This is consistent with the objective of maintaining simplicity and transparency as a target for any macroprudential leverage ratio framework.

[2] The CCB is an instrument designed to counter pro-cyclicality in the financial system. It is aimed at building up a capital buffer when threats to resilience are elevated or during periods of excessive credit growth and can be released when systemic risks materialise or abate.

C. *Underlying analysis*

Instrument design and policy architecture for macroprudential leverage ratios

This chapter starts by recalling the merits and complementarity of risk-weighted capital requirements and the leverage ratio in the microprudential framework. It notes the particular role of the leverage ratio in helping to tackle uncertainty, model risk and aggregate financial system risks linked to overall balance sheet size which may drive pro-cyclicality. It then discusses the potential macroprudential use of the leverage ratio in addressing systemic risk via both structural and cyclical intermediate objectives.

The *structural perspective* focuses on the role of the leverage ratio in tackling systemic risks arising from misaligned incentives and "too big to fail" issues surrounding SIIs.[3] The leverage ratio increases the resilience of large, complex and interconnected institutions against higher model risk and uncertainty. Given that large and complex institutions are more likely to rely on internal ratings-based approaches to set risk-weighted capital requirements and to have significant trading books with low measured risk, they are also more likely to be influenced by both model risk and uncertainty. This argument is corroborated by data showing that SIIs have, on average, lower risk weights and leverage ratios than other types of banks. Given that SIIs should be more resilient – to reduce systemic risks by reducing their probability of failure – this suggests that consideration should be given to supporting increases in risk-weighted capital buffers for these institutions with increases in their leverage ratio requirements.

The *cyclical perspective* focuses on the role of the leverage ratio in tackling systemic risks from excessive credit and leverage. A higher level of capital can help to mitigate deleveraging in a downturn and stabilise the flow of credit to the economy. As aggregate risk fluctuates over time, there is broad acknowledgement that capital requirements should also be varied over the cycle to ensure that banks remain sufficiently capitalised.

A rapidly growing theoretical and empirical literature underlines the link between pro-cyclical leverage and financial instability. New empirical evidence in this chapter confirms that banking sector leverage has been pro-cyclical at an aggregate level in almost all EU Member States, with average risk weights tending to fall in credit booms and rising in downturns. Whilst a static leverage ratio goes some way towards addressing pro-cyclicality during an upturn by operating as an automatic stabiliser that ensures capital moves in proportion with total exposure, aggregate risk varies over time. So a static leverage ratio could, in principle, be supported by active countercyclical use, whereby a buffer that is built up could help both to build resilience and to mitigate exuberance, with subsequent release when risks recede, or to help prevent harmful deleveraging when banks incur losses.

In addition, from both the structural and cyclical perspectives, imposing macroprudential risk-weighted buffers without corresponding leverage requirements has no impact on banks that

[3] The perception that certain financial institutions are too systemically important to fail leads to misaligned incentives and magnifies moral hazard.

remain constrained by the leverage ratio. In this case, risk-weighted macroprudential buffers do not provide any resilience against risks from SIIs and/or excessive credit growth and leverage. Furthermore, for the sector as a whole, if only risk-weighted capital buffers are varied to address systemic risk, the role of the leverage ratio in the overall capital framework (and the protection it offers against model risk, uncertainty and aggregate risk) is diminished. This is because it becomes relatively less stringent both for SIIs and during periods of high system-wide risk, potentially increasing incentives for the accumulation of seemingly low risk-weighted exposures. This chapter shows that proportional changes in risk-weighted capital requirements and the leverage ratio have the effect of keeping the floor in minimum average risk weights, or the "critical average risk weight" (CARW), constant and may mitigate some of these concerns.

Transmission mechanism, unintended consequences and links to other policies

From both the structural and cyclical perspectives, the transmission mechanism of the macroprudential leverage ratio is similar to that of existing capital instruments, such as the risk-weighted SII buffers and the CCB. The difference is that adjustments in portfolio structure and risk weights are no longer possible to meet the requirements.

This chapter also discusses how decision-making should take account of possible unintended consequences of macroprudential leverage ratios, such as leakage to unregulated sectors, "risking up" and effects on the repurchase (repo) and other financial markets. It is noted, however, that the empirical evidence on the relevance of "risking up" is not fully conclusive; macroprudential risk-weighted capital requirements should remain a counterbalance to this and theoretical models stress that the market for low-risk exposures would not disappear in equilibrium. Moreover, while a reduction in repo market activity might pose costs, such transactions can also drive a build-up in systemic risk.

Section 4.2 covering links to other regulatory policies highlights broader perspectives on excessive leverage in the economy and the complementary nature of different measures. It concludes that macroprudential leverage ratios are unlikely to conflict with other regulatory requirements, monetary policy or fiscal policy.

Design issues and reciprocity

This chapter ends with a summary of design issues that are important for any implementation of a macroprudential leverage ratio, i.e. the definition of capital, sanctions, the level of consolidation, disclosure requirements and legal issues. It notes how the design features and principles embodied in both the ongoing discussions on the harmonised definition of the microprudential leverage ratio and in the architecture of macroprudential buffers that already exists in the risk-weighted macroprudential capital framework could be adopted for macroprudential leverage ratios. The reliance on these design features would limit the additional complexity of macroprudential use of the leverage ratio.

This section also discusses how cross-border spillovers and reciprocity are as relevant for the leverage ratio as for other exposure-based measures, such as the CCB. One solution would be to reciprocate decisions on the leverage ratio as taken by macroprudential authorities abroad. But a legal framework for international reciprocity does not currently exist,

even if coordination in the EU could be promoted by the ESRB which could increase the chances of reciprocation and thus the effectiveness of macroprudential leverage ratio measures. Another option is to maintain the CARW constant at the institution level by setting a fixed proportionate link between the institution-specific CCB and the leverage ratio. This amounts to automatic reciprocity, building on the existing CCB reciprocity framework.

1. Introduction

The ESRB Handbook on Operationalising Macroprudential Policy in the Banking Sector (ESRB (2014a)) provides detailed guidance to macroprudential authorities in the EU on how to design and implement macroprudential policy for the banking sector. It provides *operational guidance* on instruments that already have a legal basis in the Capital Requirements Regulation (CRR) and Directive (CRD), such as the CCB and risk-weighted capital buffers for SIIs.[4] It provides *guidance on the design* of instruments that do not (yet) have a formal basis in EU legislation but may be used at the discretion of Member States, such as macroprudential liquidity instruments.

This chapter now extends the Handbook to include macroprudential leverage ratio buffers as potential add-ons to microprudential leverage ratios. The macroprudential leverage ratio is part of a broader set of instruments that target different forms of systemic risk (ESRB (2013, 2014a, 2014b). Interactions between the leverage ratio, the CCB and capital buffers for SIIs are at the core of the analysis in this chapter. Throughout, the chapter also strives to maintain simplicity in the approaches it discusses towards a possible macroprudential leverage ratio framework.

This extension is timely given that macroprudential authorities in several countries are already implementing a leverage ratio from a systemic perspective, especially for SIIs (Table 1) while discussions are ongoing in other countries.[5] This includes authorities from EU Member States that are using the national flexibility that currently exists. This chapter provides a high-level overview on considerations linked to the use of macroprudential leverage ratios, while fully respecting the competence of the responsible authorities to determine their own policy stance.

This chapter is also timely given that the possible usefulness of macroprudential leverage ratios as part of the overall regulatory toolkit has been highlighted by the ESRB and other international organisations. In its Recommendation on intermediate objectives and instruments of macroprudential policy (ESRB (2013)), the ESRB identified the prevention of excessive credit growth and leverage as intermediate macroprudential objectives and noted that a macroprudential leverage ratio instrument could contribute to addressing this. The BCBS (BCBS (2013), p. 16-17) has also suggested that:

"Beyond the current proposals, other ideas to further strengthen the benefits of the leverage ratio within the regulatory framework could include:

[4] Regulation (EU) No 575/2013 of the European Parliament and of the Council of 26 June 2013 on prudential requirements for credit institutions and investment firms and amending Regulation (EU) No 648/2012 (OJ L 176, 27.6.2013, p.1) and Directive 2013/36/EU of the European Parliament and of the Council of 26 June 2013 on access to the activity of credit institutions and the prudential supervision of credit institutions and investment firms (OJ L 176, 27.6.2013, p.338). The new rules provide for the adoption of numerous delegated and implementing acts providing further details on compliance with the obligations in the CRD/CRR. The Commission Delegated Regulation on the leverage ratio amends CRR Article 429. Commission Delegated Regulation (EU) 2015/62 of 10 October 2014 amending Regulation (EU) No 575/2013 of the European Parliament and of the Council with regard to the leverage ratio (OJ L 11, 17.1.2015, p. 37-43).

[5] In Denmark, an expert group on the leverage ratio was established in October 2014. The group is expected to give its recommendations concerning leverage requirements in Denmark to the Danish government around July 2015. In Norway, the Ministry of Finance has asked the Finanstilsynet (Financial Supervisory Authority) to give a recommendation by June 2015 on how a leverage ratio should be implemented.

- adjustments to the design and calibration of the leverage ratio, such as adopting a similar "buffer" structure for the leverage ratio as has been done for the risk-based capital requirements under Basel III; and/or
- the inclusion of stronger leverage ratio requirements for G-SIBs, so that the leverage ratio maintains its relative strength as a backstop for the most systemically important banks."[6]

Furthermore, the potential role of the leverage ratio as a macroprudential tool has also been discussed by authors from the International Monetary Fund (IMF) (Lim et al. (2011)) and the World Bank Group (D'Hulster (2009)). This interest is partly motivated by the growing academic literature that analyses leverage from a system-wide perspective, on which this chapter draws.[7]

By taking a system-wide perspective, this chapter supplements ongoing discussions about the definition and calibration of a minimum leverage ratio, which is expected to be harmonised in the EU as of 2018. Work on the design and calibration of the microprudential leverage ratio is being taken forward by the BCBS and by the European Banking Authority (EBA) in the EU. The analysis in this chapter is therefore also timely since the harmonised minimum and flexibility for any potential macroprudential add-ons would form part of the same overall framework. For example, the choice whether a minimum leverage ratio is introduced via Pillar 1 or Pillar 2 may interplay with the ease of integrating macroprudential leverage ratios into the overall framework. At the same time, the precise definition and calibration of the microprudential leverage ratio is beyond the scope of this chapter, although the analysis in it is robust to different choices.

In addition, pursuant to Article 511 CRR, based on the results of a report from the EBA, the European Commission shall submit by the end of 2016 a report on the impact and effectiveness of the leverage ratio to the European Parliament and the Council. More generally, work is underway internationally on the risk-weighted framework. This chapter will be reviewed in 2017 once this work is complete to ensure that interactions between the microprudential regime and any macroprudential add-ons are assessed.

Against this background, the chapter recalls the motivation for a microprudential leverage ratio as a complement to risk-weighted capital requirements. It then analyses the possible role of macroprudential leverage ratios in tackling both the structural and cyclical dimensions of systemic risk (Section 2); discusses possible instruments (Section 3); sets out transmission mechanisms, including unintended consequences, and discusses links to other regulatory, monetary and fiscal policies (Section 4). Finally, the chapter considers design issues, including around reciprocity (Section 5). Annex 1 details how risk-weighted capital ratios and leverage ratios are related. Annex 2 presents new empirical evidence on the cyclicality of leverage and risk weights for EU Member States. Policy options for enshrining flexibility for macroprudential add-ons to the minimum leverage ratio in the CRD/CRR are

[6] G-SIBS refers to global systemically important banks.
[7] Moreover, leverage plays a key role in other parts of the financial system, as reflected, for example, in macroprudential discussions on loan-to-value (LTV) ratios and minimum haircuts for securities financing transactions.

outside the scope of this chapter.

Table 1: Recent initiatives to increase the leverage ratio above 3%

Country	Measure
United States	The United States recently introduced a higher leverage ratio, called the Enhanced Supplementary Leverage Ratio (eSLR), for global systemically important banks (G-SIBs) at the level of the bank holding company and at the level of their insured depository institutions (IDIs). Under these rules, G-SIBs must meet a leverage ratio of 5% by 2018, while their IDIs must meet a leverage ratio of 6%. This comprises a 3% minimum component and a buffer component.[8] The US agencies will use a definition of the leverage exposure measure which is consistent with the BCBS revised rules text (BCBS (2014a)).[9]
Switzerland	A leverage ratio has been applied to systemically important banks since 1 January 2013, requiring them to meet a leverage ratio of between 3.1% and 4.56% by 2019, depending on the level of their risk-weighted requirements in the national framework.[10] This requirement comprises a minimum component and a buffer component. The components may be Common Equity Tier 1 and Additional Tier 1. The current leverage exposure measure is based on the original 2010 BCBS definition, but the exposure measure will be harmonised with the Basel revised definition (BCBS (2014a)), for application from 1 January 2016.[11]
The Netherlands	Following recommendations from the Dutch Ministry of Finance in August 2013, De Nederlandsche Bank has imposed an expectation on four systemically important banks that they meet a minimum 4% leverage ratio by 2018. The leverage ratio is expected to be met with CRD/CRR end-point Tier 1 capital, and uses the BCBS (2014a) definition of the leverage exposure measure.[12]
United Kingdom	The Financial Policy Committee concluded a review of the leverage ratio as a microprudential and macroprudential instrument in October 2014. This proposes applying a minimum leverage requirement of 3% to all firms based on the Basel III definition as implemented in the EU, to impose supplementary leverage ratio buffers to systemically important firms and to have the power to set a countercyclical leverage ratio buffer for all firms. Before 2018, the requirements would only apply to UK G-SIBs and other major domestic UK banks and building societies. Both supplementary and countercyclical leverage buffer rates would be set at 35% of the equivalent risk-weighted buffer rates to ensure a complementary relationship is maintained between leverage and risk-weighted requirements over time and across firms. The Committee intends to limit the role of Additional Tier 1 capital in the numerator to 25% of the minimum requirement, with all leverage ratio buffers being met by CET1.[13]

[8] Final rule adopted in April 2014: http://www.federalreserve.gov/newsevents/press/bcreg/20140408a.htm.
[9] Final rule adopted in September 2014: http://www.federalreserve.gov/newsevents/press/bcreg/20140903b.htm.
[10] Capital Adequacy Ordinance, SR 952.03.
[11] Verordnung über die Banken und Sparkassen, April 2014.
[12] Hebbink, Kruidhof and Slingenberg (2014).
[13] See Bank of England (2014).

2. Motivation for macroprudential leverage ratios

To achieve Europe's macroprudential policy goal of safeguarding financial stability, the ESRB has identified four intermediate objectives (ESRB (2013)).[14] Two of these are particularly relevant for the leverage ratio: (i) a structural objective of limiting the impact of misaligned incentives and reducing moral hazard; and (ii) a cyclical objective of mitigating and preventing excessive credit growth and leverage. This section analyses the possible case for macroprudential leverage ratios from these perspectives. It begins by recalling the rationale for a leverage ratio in the microprudential capital framework, placing particular emphasis on the advantages and disadvantages of the leverage ratio and its relationship with risk-weighted capital requirements. This provides the context for a subsequent discussion on the possible motivations for considering structural and cyclical macroprudential leverage ratios and possible alternatives.

2.1 Rationale for including the leverage ratio in the capital framework

The objective of the capital framework is to ensure that there is sufficient capital for banks to absorb unexpected losses and continue lending in periods of stress. Under the revised Basel III capital framework, the BCBS has committed to review the calibration of a minimum leverage ratio requirement by 2017, with a view to introducing a Pillar 1 standard by 1 January 2018, so that banks would be subject to both risk-weighted capital requirements and a leverage ratio. Both measures have their respective strengths and weaknesses and differ in their ability to mitigate different types of risk, underlining why they are necessary as complements to each other.

The merits of risk-weighted capital requirements

Risk-weighted capital requirements oblige banks to assign risk weights to their assets at a granular level, with the capital requirements being commensurate to the measured riskiness of each asset. Risk weights are computed using either a standardised risk-weighting approach set by the regulator (the standardised approach) or through use of a bank's own internal risk-weighting models based on the bank's historical experience (the internal ratings based (IRB) approach). The more risk a bank takes, the more capital it must have, with a view to ensuring that banks have adequate capital to absorb potential losses.

When risks are adequately measurable, risk-weighted capital requirements are indeed the best way to achieve the aim of the capital framework (Gordy (2003)). It is sensible to require banks to fund assets which have a higher probability of default (PD) and have higher losses given default (LGD) with more capital than safer assets. Such risks could be estimated from historical data which shed light on the risk distribution facing a bank. As banks and regulators

[14] The ESRB Recommendation on intermediate objectives and instruments of macroprudential policy (ESRB (2013)) also included a fifth objective to strengthen the resilience of financial infrastructures. This objective was omitted from the Handbook, because it does not fall within the scope of the macroprudential framework for the banking sector, as provided under the CRD/CRR.

can measure these risks accurately, they can be thought of as “known knowns”.

A risk-weighted approach to setting capital requirements can also help to mitigate risk-shifting incentives, whereby banks take on riskier portfolios to boost return on equity. Indeed, one of the arguments made for the IRB approach in particular is that it can help to promote more effective risk management practices in the banking industry.

The merits of the leverage ratio

The Basel III leverage ratio is designed to serve as a simple complement to the risk-weighted framework and guard against the build-up of excessive leverage, a key cause of the global financial crisis (BCBS (2014a)). In particular, as risk weighting relies on knowable and quantifiable risks, there is a possibility that the assumptions underlying banks’ risk models or the standardised approach are not satisfied in the real world. Uncertainty and the possibility of structural breaks mean that the distributions of PD and LGD might not be fully known for certain types of exposure. Dermine (2015) shows that the leverage ratio limits the risk of a bank run where there is imperfect information on the value of a bank’s assets. More generally, models are simplifications of the real world and the ways in which they are simplified may lead to miscalibration (Daníelsson (2002)). In this sense, the leverage ratio can help to protect against “unknown unknowns”. Research on capital to asset ratios in ten European countries has shown that such protection has been on a long-term decline (Benink and Benston (2005)). Starting with a capital to asset ratio of around 30% in 1850-1880, the average ratio declined to about 15% in 1915-1933, 7.5% in 1945, 5-6% through 2001 and around 3% just before the financial crisis. This structural decline in leverage ratios has been attributed to factors such as looser regulation, the increase in implicit government guarantees, the role played by large banks, and increased diversification.

Research also shows that in environments which are characterised by complexity, small samples and uncertainties, simple indicators or metrics, such as the leverage ratio, sometimes outperform more complex, risk-weighted ones in offering robust protection against default (Aikman et al. (2014)). And empirically, the leverage ratio tended to outperform risk-weighted capital ratios in predicting bank failure during the global financial crisis (e.g. IMF (2009); Demirgüç-Kunt et al. (2010); Mayes and Stremmel (2014); Brealey et al. (2012); Berger and Bouwman (2013); Blundell-Wignall and Roulet (2013); and Hogan et al (2013); Aikman et al. (2014)). As such, complementing risk-weighted capital ratios with a leverage ratio requirement gives banks better protection against uncertainties and risks that are hard to model compared with a standalone risk-weighted requirement (Morris and Shin (2008)).

Beyond model risk and uncertainty, the fact that leverage ratios also place an absolute restriction on the size to which individual bank balance sheets can grow for a given level of equity may mean they are better suited to containing aggregate risk in the financial system. This feature may give better protection against losses which are rare but highly correlated across the system given that microprudential risk weights do not take account of these correlations. This is especially relevant for the cyclical dimension of systemic risk, as discussed further in Section 2.3.

In addition, even if risk weights reliably reflect eventual default rates and loss experiences, market perceptions of risk can have an immediate effect on financial stability. For example, if market participants have a highly negative view of certain classes of mortgages, prices might collapse, potentially causing a temporary erosion of capital or loss of liquidity even if the mortgages do not subsequently perform worse than envisaged by the risk weights. By contrast, leverage ratios can safeguard against the risk of temporary changes in risk perception, especially in relation to assets which typically have low risk weights.

Finally, while the underlying measure of bank exposures is quite complex, the final leverage ratio is a relatively simple, comparable and consistent measure across both banks and countries, making it more readily understood by market participants. In particular, risk-weighted capital ratios can sometimes be difficult to assess as they depend on the underlying risk assigned to different asset classes. For example, supervisors have found that banks assigned materially different risk weights to an identical hypothetical benchmark portfolio (BCBS (2013b)). Such findings are consistent with a degree of risk weight "optimisation" – a potential scenario in which banks might attempt to reduce modelled risk weights – and may help to explain greater investor confidence in leverage ratios compared with risk-weighted capital ratios at certain times during the global financial crisis.

Disadvantages of the leverage ratio

At the same time, the leverage ratio also has several drawbacks which highlight the importance of maintaining a strong role for risk-weighted capital requirements in the overall regulatory framework. Most importantly, the leverage ratio is insensitive to assessments of the riskiness of different assets. Used on its own, it can incentivise banks to regulatory arbitrage by taking on riskier assets. Moreover, some bank failures are caused by losses on high-risk assets, which a leverage ratio is unable to penalise.

The risk-insensitivity of leverage ratios may also have particular implications for certain financial markets or have unintended consequences in inducing a shift of activities with low measured risk to less regulated sectors, as discussed further in Section 4 (Acharya et al. (2012)). Some research also suggests that bank portfolios could become more similar to one another, and therefore more correlated, under a leverage ratio. If this is the case and risk crystallised in some asset classes more banks would be affected, undermining overall stability, unless model risk is low or leverage ratio requirements sufficiently high (Kiema and Jokivuolle (2014)).[15] This view, however, is contrasted by an empirical study of more than 2000 banks in 77 countries by Beck and De Jonghe (2013), which found that systemic risk increases when banks are more specialised.

Finally, while it is not necessarily a cost, using the leverage ratio as a capital requirement means that it could lose its value as a useful indicator for signalling the risk of bank default

[15] Their models suggest that the overall supply of low risk loans would, however, not be lower in equilibrium. They define model risk as a situation in which the actual default probability of low-risk loans is higher than the measured one.

(Goodhart's law).[16] With regulatory constraints on leverage ratios at book values, the relevance of market-based leverage ratios as a possible indicator could therefore increase.

The interplay between the leverage ratio and the risk-weighted requirements

The advantages and disadvantages of both risk-weighted capital requirements and the leverage ratio suggest that the two measures can be very useful complements. Both ratios may be expressed in terms of Tier 1 capital in the numerator, so they only differ in the denominator between using risk-weighted assets (RWAs) or total exposure (which relates to total assets). This implies that there is a relationship between them based on a bank's average risk weight across the portfolio. In particular, in a framework with both a leverage ratio and risk-weighted requirements, banks with low average risk weights will be constrained by the leverage ratio, while banks with high average risk weights will be constrained by the risk-weighted requirement.

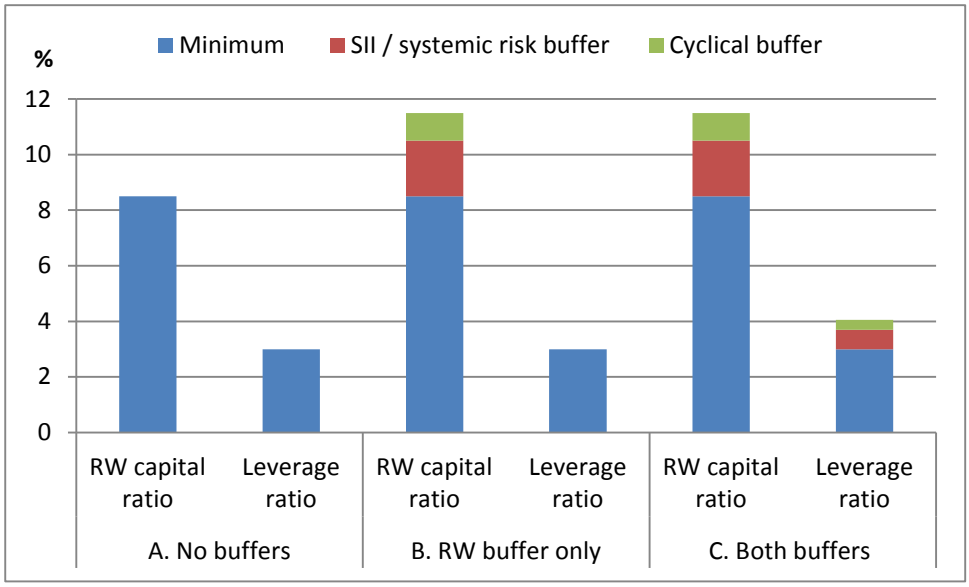
Figure 1 shows how the relationship between the two regimes could change as buffers are introduced. In case A, there is a minimum leverage ratio requirement of 3% and a minimum risk-weighted capital ratio requirement of 8.5% (6% minimum plus 2.5% capital conservation buffer). A bank which "just" satisfies each requirement would have an average risk weight of 35% (the ratio of 3% to 8.5%).

Cases B and C show what would occur when the bank is required to be more resilient (e.g. because it is systemically important or because it is subject to a positive systemic risk buffer (SRB) or CCB rate). In case B, the firm is required to have a risk-weighted buffer of 3%, but no additional leverage ratio buffer. In this case, banks with average risk weights lower than 26% (i.e. 3/11.5) are not required to have any additional capital than in case A. Hence, banks that have low risk weights and capital levels to begin with will not become more resilient. Section 2.2 will show that this particularly applies to SIIs. Moreover, banks with higher risk weights could meet the buffer requirement by rebalancing their portfolio towards assets with lower risk weights.

In case B, the leverage ratio becomes relatively less stringent and no longer plays such an important backstop role to the risk-weighted ratio. In particular, the leverage ratio in case A prevents banks just meeting risk-weighted capital requirements but at the same time having an average risk weight below 35%. In case B, in which the authorities would like the bank to be more resilient, the bank can just satisfy both requirements with an average risk weight of only 26%. Note that this same broad point applies even if a bank has a surplus of capital over both requirements to start with, either voluntarily or owing to market constraints – in case B, the bank would end up with a larger capital surplus over the leverage ratio requirement relative to its surplus over the risk-weighted capital requirement.

[16] Goodhart (1975). See also Annex 9.1 to the Handbook.

Figure 1: The relationship between risk-weighted and leverage ratio requirements



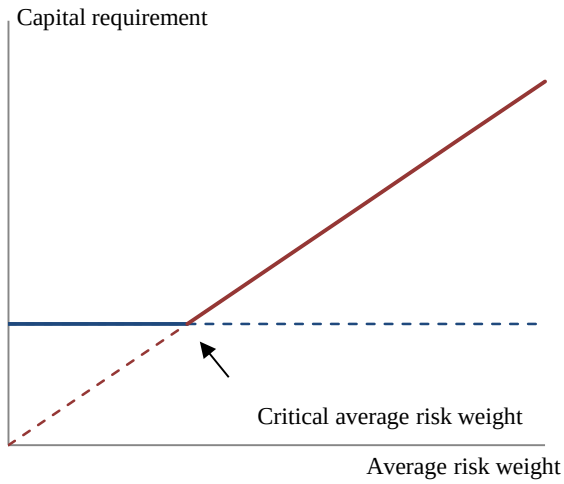
Source: ESRB calculations

Notes: Case A shows the base case with no macroprudential buffers; case B illustrates how the relationship between risk-weighted and leverage ratio requirements changes if risk-weighted macroprudential buffers are activated; and case C illustrates how authorities may wish to consider activating macroprudential leverage ratios in these circumstances.

By contrast, in case C, a leverage ratio buffer of 1.05% is also applied. This ensures that the leverage ratio continues to play the same backstop role and that capital levels increase as intended. A firm with an average risk weight below 35% would continue to be constrained by the leverage ratio. The imposition of leverage ratio buffers would have broadly the same effect as a floor on average risk weights for banks which only just meet the risk-weighted capital ratio requirements.

The precise point in average risk weights at which the leverage ratio stops being the most stringent factor – and instead the risk-weighted requirements result in the higher capital requirement – may be viewed as the critical average risk weight (CARW) and depends on the relative calibration of the two requirements. Figure 2 illustrates this point, with the blue line representing the leverage ratio requirement and the red line representing risk-weighted capital requirements. Left of the intersection, the leverage ratio is the more stringent requirement, while right of the intersection, the risk-weighted requirements are more stringent. The CARW is the point at which both result in equal capital requirements. The CARW is discussed more formally and in greater detail in Annex 1.

Figure 2: Stylised capital requirements implied by the leverage ratio and the risk-weighted capital requirement



Source: Taken from Bank of England (2014, p. 14)

Notes: Assumes constant balance sheet size. The red line shows the risk-weighted capital requirement; the blue line shows the leverage ratio capital requirement. A change in the risk-weighted capital requirement would be shown as a change in the slope of the red line; a change in the leverage ratio requirement would be shown as a shift in the blue line.

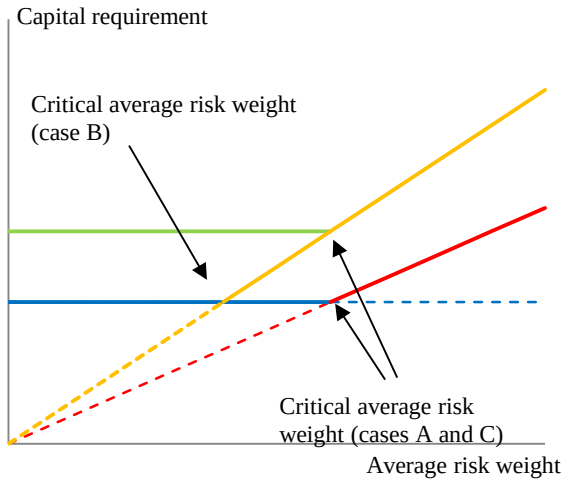
The ratio of the leverage ratio requirement to the risk-weighted capital requirement maps approximately to the CARW, although not precisely because total assets and the exposure measure for leverage purposes are not the same.[17] Thus, to a broad approximation, if a bank faces a 3% leverage ratio and a 6% RWA requirement (Tier 1, excluding the capital conservation buffer), the CARW is 50% and a bank with an average risk weight below 50% will be constrained by the leverage ratio, while a bank above 50% will be constrained by the risk-weighted requirement. If, however, the 3% leverage ratio is viewed as comparable to a 8.5% RWA requirement (Tier 1, including the capital conservation buffer), then the conversion factor is approximately 35% (see Section 3.1 for further discussion of this point). More generally, for any different calibration of the minimum leverage ratio, which is beyond the scope of this chapter, a CARW would still apply but with different numbers. This analysis also abstracts from changes in the determination of RWAs, which would affect the stringency of risk-weighted capital requirements but not the leverage ratio, although this issue is discussed briefly in Section 2.4.

At present, Basel III does not include a role for the leverage ratio beyond the proposed minimum requirement. Therefore, the CARW decreases as macroprudential risk-weighted buffers are introduced, corresponding to a shift in the risk-weighted constraint from the red line to the orange line, as in Figure 3. This implies, as in case B above, that the leverage ratio becomes relatively less stringent for SIIs and during times of high system-wide risk. For

[17] The leverage ratio is defined with respect to the "leverage exposure measure" which is a broader measure of exposures than total assets (the basis for the calculation of RWAs) (see Section 3.1). An exact specification of the CARW is equal to the product of (i) the ratio of the leverage ratio requirement to the risk-weighted capital requirement and (ii) the ratio of the leverage exposure measure to total assets.

example, no banks in the area above the blue and orange lines are affected by the increase in risk-weighted requirements. This diminishes its relative strength as a backstop in protecting against the risks it addresses and thus its function in the overall capital framework, as discussed further in Sections 2.2 and 2.3. In case C above, leverage ratio buffers are also imposed. In Figure 3 this is represented by an increase in the capital requirement for low average risk-weight banks from the blue line to the green line. This would result in low average risk-weight firms also facing an increase in capital requirements, maintaining the role of the leverage ratio in the overall framework and the original CARW.

Figure 3: Stylised capital requirements implied by the leverage ratio and the risk-weighted capital requirement (with buffers)



Source: ESRB calculations

Notes: Assumes constant balance sheet size. The red line shows the risk-weighted capital requirement in case A. The blue line shows the leverage ratio capital requirement in cases A and B. The orange line shows the risk-weighted capital requirement in cases B and C. The green line shows the leverage ratio requirement in case C.

2.2 A structural perspective

The CRD provides for two risk-weighted buffers designed to mitigate structural risks. The SRB is a flexible tool which can be used to fulfil the ESRB's intermediate objectives of limiting the direct and indirect concentration of exposures and mitigating and preventing excessive leverage. The other tool is a buffer for SIIs, also included in Basel III. This can help to achieve the ESRB's intermediate objective of limiting the systemic impact of misaligned incentives with a view to reducing moral hazard. Some jurisdictions have gone beyond the risk-weighted surcharges by imposing or proposing similar leverage surcharges on SIIs (see Table 1). In the interests of simplicity, this chapter focuses on leverage ratio buffers for SIIs, but the arguments and design considerations for a leverage ratio buffer akin to the SRB are similar.

The main considerations for introducing a higher leverage ratio for SIIs would be to significantly reduce their chance of failure and contribute towards ending the "too big to fail" issue and reducing implicit subsidies. The rationale behind the higher risk-weighted capital

buffers for SIIs is that the economic consequences of their distress or failure are more severe than for other banks (BCBS (2011); FSB (2013)).

The impact of Basel III is regularly monitored and assessed both at the global level (by the BCBS) and in the EU (by the EBA). For a global sample, while global systemically important banks (G-SIBs) on average have higher risk-weighted capital buffers, they currently have materially lower leverage ratios than the full group of larger and internationally active banks (so-called "Group 1" banks, which includes G-SIBs) and all other banks participating in the exercise ("Group 2" banks) (BCBS (2014d)).[18] When focusing specifically on the CRD IV/ CRR/ Basel III monitoring exercise for European banks as of end-2013, the EBA finds that the G-SIBs have a weighted average leverage ratio of 3.6%, Group 1 banks (including G-SIBs) have a weighted average leverage ratio of 3.7%, while Group 2 banks have a weighted average leverage ratio of 4.5% on the basis of the Basel revised definition. In part, these differences are the result of a stronger reliance by large banks on their own internal risk-based models, which typically drive lower risk weights, and because large banks often have significant trading books that are generally associated with lower measured risk. Thus, the banks that should have the most capital actually appear to have the least from a leverage perspective. And the leverage ratio is likely to be particularly important for this set of banks given their greater exposure to model risk.

Moreover, misaligned incentives for SIIs may give rise to funding subsidies on debt, which have been estimated to be around 60-90 basis points in the euro area in 2013 (IMF (2014)). This funding subsidy may give such institutions an incentive to finance themselves to a relatively stronger degree with debt instead of equity. Hence, a leverage ratio would directly address this misaligned incentive by restricting debt financing.

Therefore, in order fully to attain the goal of limiting misaligned incentives, reducing moral hazard and contributing towards ending the "too big to fail" issue, a leverage ratio surcharge for SIIs could be considered. This would also help to provide greater protection for SIIs against the risks that the leverage ratio is designed to protect against, including model risk; without it these firms could operate at the same levels of leverage as their non-systemic competitors. Furthermore, if only risk-weighted capital surcharges are introduced for SIIs, they may either not need to take any action if the leverage ratio always remains their more stringent constraint (i.e. they may face no additional capital requirements from the higher risk-weighted buffers applying to them), or they could be incentivised to rebalance their portfolios towards lower risk-weighted assets, meaning that only very little or no extra capital would be needed to comply with the higher requirements (see Figure 3). Authorities may, therefore, want to consider maintaining the relative relationship between the risk-weighted requirements and the leverage ratio to prevent a distortion of risk-taking incentives. This

[18] Note that the BCBS identifies global systemically important banks and domestic systemically important banks, whereas the CRD focuses on global systemically important institutions and other systemically important institutions. Group 1 banks are those that have Tier 1 capital in excess of €3 billion, are well diversified and are internationally active. This includes the G-SIBs as a subset, defined according to a common methodology (see http://www.bis.org/bcbs/gsib/gsibs_as_of_2014.htm). Group 2 banks are banks with Tier 1 capital of less than €3 billion or which are only domestically active (hence a bank could be either internationally active or large and still belong to Group 2).

would also help to ensure that the leverage ratio continues to function as an effective backstop for SIIs, remaining as relatively stringent for them as it is for non-systemic banks. This issue also highlights questions on how such leverage add-ons might be related to risk-weighted capital requirements, as discussed further in Section 3.4.

A further consideration is that the 20 largest listed EU banks contributed the most to the rise in leverage in Europe before 2009 (ESRB (2014e)). So a leverage ratio add-on for SIIs could also help to complement the cyclical leverage policies discussed in the next section.

2.3 A cyclical perspective

With regard to the cyclical dimension of macroprudential policy, the first intermediate objective is to mitigate and prevent excessive credit growth and leverage. As aggregate risk fluctuates over time, there is broad acknowledgement that capital requirements should also vary over the cycle to ensure that banks remain sufficiently capitalised. When systemic risk is judged to be elevated, higher capital ratios are called for to enhance resilience and reduce the risk of subsequent deleveraging during a downturn, leading to a more stable flow of credit to the economy (Hellwig (2009)). Restrictions on leverage – motivated from a systemic perspective – are considered as one of the potential instruments for achieving this (ESRB (2013)). This link between leverage and the time dimension of systemic risk is underlined by an increasing theoretical and empirical literature on leverage cycles.

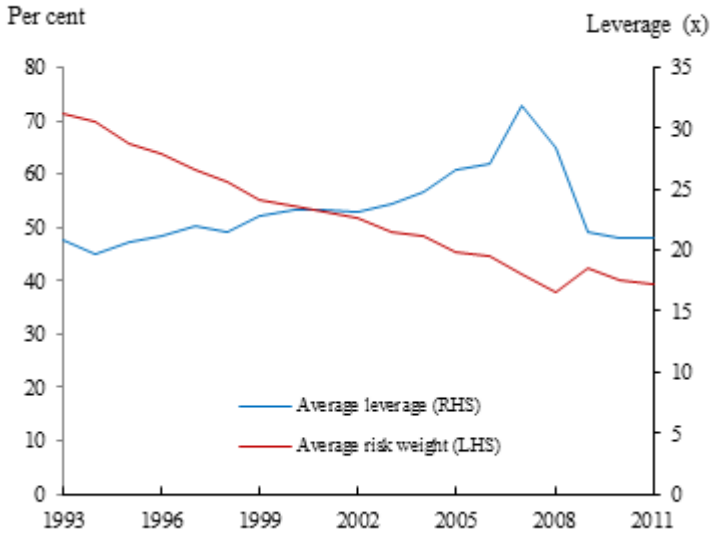
Theoretical models have been used to demonstrate the links between fluctuations in credit (Kiyotaki and Moore (1997)), leverage and systemic risk (Geanakoplos (2010) and Nuño and Thomas (2013)). They show that in good times, measured default risk is low, haircuts on collateral decrease and leveraged financing increases. Once imbalances have been building up, relatively small shocks – that change perceptions on default risk – can precipitate significant deleveraging and losses. As a result, leverage cycles, credit cycles and periods of financial instability (when the cycle turns) are all correlated. Economic literature distinguishes varying drivers of such leverage cycles, such as herding, short-termism, myopia about risk, value-at-risk modelling and uncertainty (Gennaioli et al. (2012), Adrian and Shin (2013), Aymanns and Farmer (2015) and Aikman et al. (2015)). Some of these models also show a stabilising effect of countercyclical leverage policies on the financial system (Aymanns and Farmer (2015)).

A rapidly expanding empirical literature also underlines the need to analyse leverage from a systemic perspective. As the ESRB report entitled “Is Europe Overbanked?” shows, the European banking sector increased significantly in size and concentration between the 1990s and 2007 (ESRB (2014e)). This increase was matched by an increase in leverage at the largest European banks. While only a few of the 20 largest banks had leverage ratios below 4% in the late 1990s, only a minority had leverage ratios above 4% ten years later. This increase in leverage was, in turn, made possible by falling average risk weights, allowing Tier 1 capital ratios to remain at roughly around 8%. Indeed, for a set of global banks, average risk-weights fell from around 70% in 1993 to below 40% just before the crisis (see Figure 4). When the crisis hit, banks deleveraged significantly and credit was reduced.

More generally, empirical evidence for pro-cyclical leverage is found for individual US broker-

dealers (Adrian and Shin (2008)); US banks, even commercial ones, highly involved in securitisation (Beccalli et al. (2015)); and credit institutions with significant investment banking activity in Europe (Baglioni et al. (2013)). Overall, leverage is higher for banks than for non-financial corporations and often exhibited a pro-cyclical pattern prior to the crisis in the case of the former but not for the latter (Kalemli-Ozcan et al. (2012)).

Figure 4: Average risk weights and leverage since 1993



Source: The Banker and own calculations.

Notes: Leverage measured as Assets/Tier 1 capital. The series represent the weighted average across the sample of 17 global banks. The sample includes Bank of America, Barclays, BNP Paribas, BNY Mellon, Citigroup, Commerzbank, Deutsche Bank, HSBC, ING, J.P. Morgan, Lloyds Banking Group, RBS, Santander, State Street, UBS, UniCredit and Wells Fargo.

In line with the ESRB's EU-wide perspective, this chapter complements the above-mentioned studies by focusing on aggregate data at the country level. Beyond data on capital and assets, aggregate time series on average risk weights in the banking sector as a whole are included. The reason is that developments in risk weights may explain different patterns in risk-weighted capital ratios and leverage ratios. Risk weights may be pro-cyclical given that measured credit risk falls/increases in good/bad times, especially when credit risk is estimated by using relatively short samples (Heid (2007) and Aikman et al. (2014)). Hence, even when risk-weighted capital ratios are subject to a regulatory constraint, leverage ratios may still show cyclical patterns.

Given that data for the sector as a whole in each Member State are used, it is expected that the results on the cyclicality of leverage will be less pronounced than in previous studies focusing on large and complex institutions.[19] Overall, the results indicate that at the

[19] Moreover, given that our data on total assets do not correct for securitisation, the results can be considered as a lower bound for pro-cyclicality.

aggregate level of the banking sector as a whole, changes in assets did not move fully proportionately with changes in equity in almost all of the Member States, underscoring the pro-cyclicality of leverage (see Annex 2). Consistent with this, the data confirm pro-cyclicality in average risk weights, i.e. a statistically significant negative correlation between percentage changes in average risk weights and total assets.

Taking a broader perspective, it should be noted that similar pro-cyclical leverage cycles can arise in many parts of the financial system. In particular, Brunnermeier and Pedersen (2009) study the link between haircuts (and thereby leverage) and loss and margin cycles in securities financing, while Almeida et al. (2006) underline the link between collateral, loan-to-value (LTV) limits (and thereby leverage) and financial cycles. This underpins why addressing pro-cyclical leverage is a key concern for macroprudential policy**.**

There is good evidence that the Basel III leverage ratio is significantly more countercyclical than the risk-weighted regulatory capital ratio: it is a tighter constraint for banks in booms and a looser constraint in recessions (Brei and Gambacorta (2014)). For the banking sector, a static leverage ratio therefore already goes some way towards addressing pro-cyclicality during an upturn given that it operates as an automatic stabiliser (i.e. capital moves in proportion with total exposure) and places some limit on balance sheet size for a given level of Tier 1 capital. However, there is also good evidence (e.g. Borio and Lowe (2002)) that aggregate risk varies over time. In particular, aggregate risk builds in the upturn of the credit cycle. This is the rationale for the CCB. A constant leverage ratio on its own may go some way to preventing pro-cyclical leverage ratios but may not be sufficient to ensure that the banking system is sufficiently capitalised at the height of a boom.

In particular, even if the CCB is raised, banks for which the static leverage ratio remains the more stringent constraint will not be required to build-up additional capital buffers despite the rising risks in the system, which are likely to have prompted activation of the CCB (see Figure 3). This will especially be the case if risk weights are falling which may well coincide with the activation of the CCB during a period of exuberance and could therefore make the higher risk-weighted standard easier to meet precisely when it is needed most. Furthermore, although uncertainties, model risk and excessive balance sheet growth may be particularly acute at the peak of a credit boom, no bank will gain extra protection against these risks via a higher leverage ratio requirement.

In addition, on their own, increases in time-varying risk-weighted requirements may precipitate unintended changes in banks' portfolios through the cycle as the CARW changes. In particular, the imposition of a risk-weighted CCB may not sufficiently strengthen resilience by mitigating and preventing excessive credit growth and expansions of banks' balance sheets, as banks could continue to grow by investing in low (and, in some cases, zero) risk-weighted assets. This would effectively reduce the impact and role of the leverage ratio in the suite of capital metrics. Furthermore, low risk-weighted assets may play an important role in the credit cycle and their contribution to systemic risk may not be fully factored into risk weights (e.g. owing to the fact that risk weights do not fully take default correlations into account).

Consequently, a static leverage ratio could be supported by possible countercyclical use,

somewhat similar to the proposal in Gersbach (2014) for a time-varying system-wide leverage ratio. A buffer that is built up could help to build resilience and mitigate exuberance, with subsequent release when risks recede or to help prevent harmful deleveraging when banks incur losses.[20] Taken together with the CCB, this could increase regulators' ability to protect the banking sector from time-varying aggregate risk and dampen the credit cycle. As with structural leverage ratios, authorities may want to consider maintaining the relative relationship between the risk-weighted requirements and the leverage ratio to prevent a distortion of risk-taking incentives. This would also help to ensure that the leverage ratio continues to function as an effective backstop at all points in the cycle. This issue also highlights questions over how countercyclical leverage ratios might be related to risk-weighted capital requirements, as discussed further in Section 3.4.

2.4 Alternatives and complements to macroprudential leverage ratios

The above analysis suggests that macroprudential leverage ratios would be helpful complements to risk-weighted buffers and would ensure that the leverage ratio maintains its role as a backstop for systemically important firms and in periods of elevated systemic risk. Leverage ratio buffers would sit alongside other macroprudential instruments, such as sectoral capital requirements (ESRB (2014a)), in the same way as aggregate risk-weighted buffers: when risk is clearly building up in one particular sector and there is concern about asset commonality and the risk of correlated losses across different banks, a sectoral measure may be more efficient. Likewise, work to improve the calculation of microprudential risk weights is still extremely important, even with the leverage ratio as a backstop. This section considers whether other existing prudential instruments could fulfil some of the objectives of a leverage ratio framework and finds that they would be imperfect substitutes.

First, instead of implementing a macroprudential leverage requirement, regulators could impose higher risk-weighted buffers at either the aggregate or sectoral level. But if the CCB is used to dampen banks' low risk-weighted exposures and raise the resilience of firms with low average risk weights, regulators might need to impose large increases in capital requirements, which may therefore come with an efficiency cost. Such policies would have no effect on banks for which the leverage ratio remains the most stringent constraint. Sectoral capital requirements are more targeted to ensuring resilience against particular shocks but it may be difficult to identify the appropriate sector to target or calibrate measures appropriately, given uncertainties. Stress tests offer a tool for the calibration of capital buffers, but tend to focus on a low number of scenarios that do not cover "unknown unknowns". So while capital requirements based on stress testing are an important component of the policy toolkit, they do not offer the same kind of protection against uncertainties offered by the leverage ratio.

Floors on individual risk weights or internal model requirements in relation to specific asset classes could also be envisaged (BCBS (2014b)). In principle, such an approach might be

[20] At the beginning of a crisis, capital usually erodes more quickly than balance sheets shrink.

better than using a leverage ratio if the model risk associated with a particular asset class is known. In particular, for a firm that specialises in one asset class, setting a risk-weight floor on that asset class and setting a minimum leverage ratio requirement could have a similar effect.

However, risk-weight floors are unlikely to be an appropriate solution in the face of uncertainty related to correlations across exposure classes, model risk across the balance sheet, or more fundamental "unknown unknowns", which make it difficult to gauge the "true risk", and thus the appropriate risk-weight floor, for each asset class. Furthermore, risk-weight floors might be less effective than the leverage ratio in addressing concerns about excessive balance sheet growth. Since floors would also constrain firms with relatively low leverage if they had exposures to the affected asset classes, they may be a less efficient method than the leverage ratio of reducing risks surrounding high leverage more generally. Faced with floors on individual asset classes, some firms might simply move to other low risk-weighted assets or to asset classes not subject to a floor – so leverage would not be constrained. Although this "waterbed" effect could be mitigated with additional floors, the result might be a complex set of requirements and a burden on regulators to keep assessing the sectors to which risk might shift next, with associated difficulties and complexities in calibration.[21] In addition, floors on specific asset classes are generally less transparent and observable than a leverage ratio and therefore may be more complex to communicate.

Asset class floors and the leverage ratio might therefore serve different and complementary purposes. It might be appropriate to restrict the amount of leverage for particular asset classes, for example because of model risk or macroprudential concerns about risks in specific sectors. Floors might be best at mitigating these concerns. But if regulators are also concerned about model risk across the balance sheet, fundamental uncertainty or unsustainably high balance sheet leverage, the leverage ratio might be a simpler, more direct and transparent solution.

Separate from asset class floors, a broad floor based on standardised approaches can be complementary to the leverage ratio. This is because such a floor can address the risks around internal models even where average risk weights are high (i.e. where the leverage ratio is not a relevant constraint). The BCBS is currently assessing a replacement for the Basel I capital floor which would be based on the revised standardised approaches for credit, market and operational risk. Calibration is outside the scope of this assessment; given the links between capital floors, standardised risk weights and other elements of the capital framework, including the leverage ratio, the BCBS will review their calibration holistically when their design has been finalised.[22]

More generally, changes in the design of the risk-weighted regime may have some implications for the link between the risk-weighted capital requirements and the leverage

[21] The Committee on the Global Financial System (CGFS) describes the waterbed effect as a situation where raising capital requirements for some specific sectors may simply shift exuberance to other sectors, assuming that the source of exuberance is general (e.g. owing to abundant liquidity and/or aggregate mispricing of risk) (CGFS (2012)).
[22] In December 2014 the BCBS published a consultative paper on the design of a capital floor framework based on standardised, non-internal modelled approaches (BCBS (2014b)).The consultation period closed at end-March 2015.

ratio. For instance, the risk-weighted regime can become tougher (or looser) through a broad change in risk weights, as happened under Basel 2.5 and as might occur following the outcomes of the work of the BCBS Task Forces on Simplicity and Comparability and on Standardised Approaches. If risk weights become higher (lower) on average, the percentage of banks constrained by the risk-weighted capital requirements instead of the leverage ratio would increase (decrease). This could potentially be a reason to revise the mapping between the risk-weighted capital ratio and the leverage ratio.

3. Instrument design of macroprudential leverage ratios

The arguments in Section 2 point to the possible usefulness of macroprudential leverage requirements from both a structural and cyclical perspective. After a brief discussion of the proposed microprudential leverage ratio, given its role as a baseline, this section considers possible macroprudential leverage instruments which correspond to different static and time-varying buffer requirements in the risk-weighted framework. In principle, to maintain simplicity, a macroprudential leverage ratio framework could broadly adopt the design features and principles embodied both in the ongoing discussions on the harmonised definition of the leverage ratio and in the architecture of macroprudential buffers that already exists in the risk-weighted capital framework (CRD/CRR). The section then assesses whether and how any macroprudential leverage add-ons might be aligned to corresponding add-ons in the risk-weighted capital framework, discussing the merits and drawbacks of linking them via a guide rule.

3.1 Microprudential leverage ratio

The leverage ratio was introduced in EU legislation (the CRR) as a complement to risk-weighted capital ratios. The CRR sets out a timeframe with a view to implementing a leverage ratio requirement in Europe as of 2018.[23] Banks have been required to report data on their leverage ratios under Common Reporting since 2014; mandatory disclosure of leverage ratios started on 1 January 2015.

According to the latest definitions agreed at international (Basel III) level and implemented in the EU by the Delegated Regulation amending the CRR, the leverage ratio is defined as Tier 1 capital (as defined for the purposes of the numerator of the Tier 1 capital ratio in the risk-weighted capital framework) divided by a non-risk-weighted measure of an institution's on- and off-balance sheet items (the "exposure measure"). The exposure measure of the leverage ratio comprises the following.

- Assets excluding derivatives and credit derivatives measured at their accounting value.
- An add-on for counterparty credit risk for securities financing transactions (SFTs) such as repurchase agreements (repos).
- Derivatives measured at the replacement cost and an add-on for potential future exposure. Cash variation margin received can be deducted from the exposure measure. In the case of written credit derivatives, the effective notional amount is included in the exposure measure. Under certain conditions, netting between protection sold and protection bought on the same underlying reference entity is permitted.

[23] As mentioned previously, in January 2014 the BCBS finalised a definition of how the leverage ratio should be computed. The final calibration, and any further adjustments to the definition, will be completed by 2017, with a view to migrating to a Pillar 1 measure (minimum capital requirement) treatment on 1 January 2018. For more information on the Basel III and EU transition path for the leverage ratio, see BCBS (2014d) and European Commission (2015).

- Off-balance sheet items, weighted using credit conversion factors between 10% and 100%.

The calculation of the exposure measure is close to being accounting-rules neutral, i.e. it is calculated in a way that eliminates the main accounting differences between the US GAAP (Generally Accepted Accounting Principles) and the IFRS (International Financial Reporting Standards). The exposure measure is aligned with the regulatory scope of consolidation to ensure consistency with the risk-weighted solvency requirements.

There is currently no internationally-agreed final calibration of the leverage ratio. The Basel Committee is currently monitoring a 3% minimum leverage ratio requirement to inform its final decision about calibration in 2017. The CRR entails the possibility of imposing different leverage ratio requirements according to the business model of the institution.[24] Set against the requirement for Tier 1 capital of 6% of RWA in the risk-weighted framework, a 3% leverage ratio would be equivalent to a conversion factor, or approximate CARW, of 50%, as discussed in Section 2.1. However, the risk-weighted capital framework also includes a 2.5% Common Equity Tier 1 (CET1) capital conservation buffer that will supplement the basic capital requirements when the regulatory transition period ends in January 2019. The capital conservation buffer may be drawn down during a period of stress, subject to increasing dividend and bonus restrictions. Taking account of the capital conservation buffer, total Tier 1 capital requirements before macroprudential add-ons will amount to 8.5%. From this perspective, the conversion factor from a 3% leverage ratio would be viewed as 35% (3%/8.5%).

The conversion factor has implications for the size of any leverage ratio buffers and therefore the proportion of banks bound by the leverage ratio but not by the risk-weighted regime. Furthermore, the inclusion or otherwise of the capital conservation buffer has implications both for how closely the structures of the two regimes match and for the simplicity of the leverage ratio framework.

In practice, however, the conversion factor will also depend on how the leverage ratio is implemented as a Pillar 1 standard. Given the complementarity of the leverage framework and the risk-weighted framework it is clear that coordination between microprudential supervisors and macroprudential authorities will be key to ensuring a meaningful calibration of macroprudential leverage ratio requirements.

It is important that a macroprudential leverage ratio framework builds on the principles of the microprudential one, i.e. uses the same definition of the leverage ratio and method of

[24] CRR Article 511 requires the EBA to report to the European Commission on the appropriateness of the leverage ratio framework to suppress the risk of excessive leverage and other related questions. Based on the results of the EBA's report, the Commission must submit by 31 December 2016 "a report on the impact and effectiveness of the leverage ratio to the European Parliament and Council. Where appropriate, the report shall be accompanied by a legislative proposal on the introduction of an appropriate number of levels of the leverage ratio that institutions following different business models would be required to meet, suggesting an adequate calibration for those levels and any appropriate adjustments to the capital measure and the total exposure measure … ". It is therefore possible that different minimum requirements will apply in the EU. Specifically, CRR Article 511 requires the EBA to take account of the impact of a leverage ratio requirement on, among others, "business models and balance-sheet structures of institutions; in particular as regards low-risk areas of business, such as promotional credit by public development banks, municipal loans, financing of residential property and other low-risk areas regulated under national law".

calculation (including the same exposure measure). The definition of the microprudential leverage ratio is complex, reflecting the fact that it is difficult to capture all of a bank's relevant exposures.[25] But this definition can simply be imported into the design of a macroprudential leverage ratio framework.

3.2 Structural macroprudential leverage ratios

Section 2.2 motivates why it might be useful to have the possibility of deploying structural macroprudential leverage ratios to sit alongside similar buffers in the risk-weighted framework. Under the CRD, the buffers for global systemically important institutions (G-SIIs) and other systemically important institutions (O-SIIs, that is, institutions that are systemically important either at Member State or EU level) are intended to ensure that such institutions have higher risk-weighted capital requirements. These buffers will be implemented gradually from 1 January 2016 and the capital add-ons will range from 1% to 3.5% for G-SIIs and from 0% to 2% for O-SIIs. The intermediate objective targeted by the SII buffers is to ensure extra protection against the distress or failure of banks which pose systemic risks because they are perceived to be "too big to fail". In addition, the CRD provides for an optional systemic risk buffer (SRB) which aims to prevent and mitigate structural systemic risks, such as common exposures, interconnectedness and concentration risks stemming from SIIs or from the size of the banking sector.

In principle, the architecture of possible structural macroprudential leverage ratios could mirror the SII and SRB buffers in the risk-weighted framework. Such a set-up would provide different leverage buffers which could address the different risks discussed in Section 2.2.

3.3 Cyclical macroprudential leverage ratios

Section 2.3 motivates why it might be useful to have the possibility of deploying time-varying macroprudential leverage ratios to sit alongside similar buffers in the risk-weighted framework. The CRD provides for a time-varying buffer requirement on domestic exposures – the CCB. Its objectives are (i) to protect the banking sector from time-varying aggregate risk so that the banking sector is able to maintain the flow of credit in periods of stress without jeopardising its solvency; and (ii) to "lean against" the build-up of aggregate risk. It is calibrated in steps of 0.25 percentage point or multiples, with mandatory reciprocity for settings up to 2.5%. The CCB is built up in "good" times and released in "bad" times, with the credit-to-GDP gap, other indicators and judgement being used to inform its setting (ESRB (2014d)).

In principle, the architecture of possible countercyclical macroprudential leverage ratios could mirror the CCB in the risk-weighted framework. This would provide an instrument which could be used to tackle the different risks discussed in Section 2.3. It would also raise similar challenges to those which arise under the CCB, for example concerning cross-border spillovers and reciprocity arrangements, as discussed further in Section 5.

[25] See Article 1 of the Delegated Regulation replacing CRR Article 429 on the calculation of the leverage ratio.

3.4 Guide rules versus discretion

Any macroprudential use of the leverage ratio should reflect national specificities and circumstances, including national credit cycles and structural differences across financial systems and institutions. Decision-making on macroprudential instruments is almost always influenced by expert judgement and therefore is at least partly discretionary, even when it is supported by quantitative analysis. But a specific feature of the macroprudential leverage ratio is that – in principle – it could be feasible to design a rules-based approach by maintaining a fixed proportion between the leverage ratio and the risk-weighted capital requirements (i.e. keeping the CARW constant) and thus maintaining their relative stringency in the overall capital framework. For example, following the discussion in Section 3.1, macroprudential leverage ratios could be specified to be either 35% or 50% of the corresponding macroprudential capital buffers, mirroring corresponding relationships in the microprudential framework. More generally, a constant CARW could, in principle, be set at any percentage level, being determined by or determining a Pillar I leverage ratio requirement.

The desirability of each decision-making option depends on the trade-off between rules and discretion. To sketch out both ends of the spectrum, the pros and cons of guide rules and discretion are discussed. An intermediate policy stance of guided discretion could also be envisaged, under which the CARW could serve as an indicator.

In general terms, rules make policy simpler and more predictable (especially for firms), make it easier to achieve reciprocity and a level playing field and help to prevent inaction bias. In this particular context, compared with a situation in which the two frameworks can be changed independently, maintaining a link between the leverage ratio and risk-weighted capital buffers may be considered simpler and more predictable, especially for a countercyclical application which may entail regular adjustments, as envisaged for the CCB. For example, the same set of indicators could be used to guide the setting of both macroprudential capital buffers and macroprudential leverage ratios. Moreover, if macroprudential authorities in EU Member States all followed the same rule, this may help to ensure a level playing field which may be important given the cross-border activities of SIIs. In addition, commitment to guide rules may increase the coherence of the capital framework as a whole.

To improve the effectiveness of cyclical buffers, coordination between home and host authorities and mechanisms to handle cross-border spillovers have been built into the CCB framework, which mandates reciprocity of the buffer up to 2.5% of the RWA of domestic exposures. Hence, CCB rates are likely to differ across countries, thus affecting individual banks differently depending on the composition of their geographical exposures. If authorities want to adopt a time-varying leverage ratio, a rule-based approach may also help to handle cross-border spillovers and support reciprocity in a simple way, as discussed further in Section 5.5.

By contrast, discretion gives policy-makers the flexibility to change policy whenever they believe it is merited. A case-by-case approach could be most useful in taking time-invariant decisions like the imposition of SII or structural buffers, either risk weighted or leverage-

based. For example, in the case of SIIs, a discretionary approach could take specific circumstances of the bank into account, such as the level of risk weights at different institutions. Further, as explained in Section 2.4, changes in the risk-weight regime or underlying risk weights may give rise to a change in the relationship between the risk-weighted and unweighted minimum requirements (and thus any buffers as well), giving another reason to retain discretion to change the CARW by setting macroprudential leverage ratios independently of risk-weighted buffers.

By the same token, the maintenance of a constant CARW may not be the only factor to determine time-varying leverage requirements and there can be circumstances in which macroprudential authorities put more emphasis on risks that could be addressed by the risk-weighted framework and/or the leverage framework.[26] For example, macroprudential authorities may put more emphasis at times on systemic risks emanating from excessive leverage of SIIs. Furthermore, in times of acute stress, a relatively greater reduction of leverage requirements (relative to risk-weighted requirements) may be more effective in preventing an aggressive deleveraging. More generally, a discretionary approach allows for greater flexibility in the ability of authorities to pursue different objectives using macroprudential leverage ratio requirements.

[26] In addition to being the arithmetic result from the relationship between leverage requirements and risk-based requirements, the CARW can be interpreted as an indication of the macroprudential authority's risk aversion, in particular regarding model risk and tail risks that are not accurately reflected in estimated risk weights. Hence, if authorities change their view on these risks, they may intentionally increase the CARW, imposing an automatic restriction on balance sheet growth for a determined level of capital.

4. Transmission mechanism, unintended consequences and links to other policies

To comprehend the overall effect of a macroprudential leverage ratio, it is important to understand how it affects banks' incentives and adjustment strategies. This section discusses the transmission mechanism of a leverage requirement, the potential unintended consequences and the impact on repurchase (repo) markets. It also covers interactions with other, non-capital-based, regulatory policies such as minimum haircuts and liquidity requirements, stressing the complementary nature of different measures. The section concludes by pointing out how the leverage ratio might interact with monetary and fiscal policy.

4.1 Transmission, unintended consequences and spillover effects

Transmission mechanism of macroprudential leverage ratios

The channels through which the leverage ratio affects banks' decision-making, the credit cycle and ultimately financial stability are very similar to those of risk-weighted capital requirements.

On the micro level, with higher capital levels, banks are able to absorb larger losses without becoming distressed or insolvent. In addition, they are less prone to agency conflicts and gain fewer benefits from distortive implicit debt guarantees.[27] Thus, their investment decisions are less biased and incentives for excessive borrowing and risk-taking are lower.

On the macro level, the realignment of incentives contributes to a more stable flow of credit to the economy as the amplitude of leveraging and deleveraging is reduced. Compared with risk-weighted capital requirements, leverage requirements have a more dampening effect on credit growth during credit booms when risk weights tend to fall, reducing the probability and severity of adverse shocks.

In the cross-section, in periods of stress higher levels of capital reduce the risk of contagion between financial institutions, acting as a kind of "circuit breaker". A static macroprudential leverage ratio, complementary to the SII buffers and the SRB, would increase resilience structurally by improving the loss-absorbing capacity of SIIs.

In the short term, a static macroprudential leverage ratio may also affect credit and business cycles as banks adjust to the new rules (ESRB (2014a)).[28] A time-varying leverage ratio, similar to the CCB in addressing cyclical risk, is likely to be adjusted more frequently and consequently will more often have an impact on credit and business cycles. Unless a bank is willing to comply with a (tightened) leverage ratio by reducing any available voluntary buffer,

[27] Agency conflicts arise if, for instance, depositors are less informed about (and/or have less incentive to monitor owing to deposit insurance) banks' asset risks than bank owners (hidden information problem). The interest rate does not therefore fully reflect the risk of bankruptcy and bank owners might exploit depositors by increasing asset risk and/or leverage (Jensen and Meckling (1976)).
[28] Banks adjust to the activation of a structural requirement but also to its possible suspension when the structural risk recedes.

it has two options in terms of adjustment.

First, it can build equity through issuance of new capital, retained earnings and reductions in dividend payments, thus increasing the numerator of its leverage ratio. Insofar as funding costs are contingent on the funding structure, a higher capital ratio may reduce banks' profitability or incentivise them to increase the cost of credit provision.[29] However, when debt is subsidised by taxation and implicit and explicit state guarantees and thus its cost does not reflect its social costs, higher funding costs will be an intended effect of the leverage ratio. If the increase in the leverage ratio were achieved solely through higher equity, a 1% increase in the leverage ratio could raise total EU bank equity by 15-20%.[30]

Second, a bank can lower its total exposure, the denominator. However, in contrast to risk-weighted capital requirements, a bank cannot adjust by lowering its risk-weighted assets through portfolio rebalancing in favour of low risk-weighted assets. Thus, the repricing of lending is also likely to affect assets carrying low risk weights. With higher lending spreads and stricter credit conditions, the credit cycle may be dampened which could lead to lower economic growth. This can be an intended effect when credit growth is excessive; however, particular attention has to be paid to the activation of structural requirements that are not based on cyclical developments (although reducing the size of SIIs may be one way to reduce their systemic importance). Empirical evidence suggests, however, that the quantitative impact of an increase in capital requirements on bank lending spreads tends to be modest, especially at longer horizons (e.g. Elliott (2009) and Macroeconomic Assessment Group (2010)).

When leverage requirements are lowered, banks may respond by reversing the above-mentioned adjustments, increasing their extension of credit and retaining less of their earnings. When the regulatory requirement is explicitly countercyclical, the transmission channels will be strengthened during an upturn, while avoiding pro-cyclical deleveraging as the cycle turns. Similar to the CCB, expectations will then play an even more important role as banks and their customers try to anticipate a change in policy measures. During periods of stress, however, market expectations may render the loosening of the leverage ratio less effective. Concerns about banks' resilience and the future policy stance could, however, be mitigated when initial buffers have been large and macroprudential authorities credibly commit not to raise capital requirements again for an indicative period. In general, given that a change in the policy stance only takes effect with a lag, timely communication is important for macroprudential policy to be effective.

Unintended domestic consequences

A macroprudential leverage ratio could exacerbate some of the potential drawbacks discussed in Section 2.1. Higher capital ratios tend to increase banks' refinancing costs and

[29] According to Modigliani and Miller (1958), funding costs are invariant to the funding structure under certain conditions, which in practice, however, do not fully hold. Reasons include a preferential tax treatment of debt over equity, mispriced deposit guarantees and asymmetric information (Miller (1995) , Admati et al. (2011)).
[30] Assuming all banks raised their leverage ratio by 1% and the total EU banking system leverage ratio was 6% (as it was for EU domestic banks in June 2014 on an accounting balance sheet basis (Consolidated banking data, available on the monetary and financial statistics section of the ECB's website).

it is even possible under certain conditions that they erode banks' charter value (Keeley (1990), Gennotte and Pyle (1991) and Rochet (1992)). They could also result in more leverage-constrained banks that are incentivised to restore profit margins by taking greater portfolio risk, although the presence of complementary risk-weighted requirements should constrain their ability to do this.[31] Others contend that the costs to banks and the real economy of higher capital or leverage requirements are likely to be limited (e.g. Admati et al. (2011)).

As with risk-weighted capital requirements, the effectiveness of the leverage ratio could be reduced by regulatory arbitrage and leakages to non- or less-capital-regulated sectors. Non-financial companies may substitute credit from banks that face higher capital requirements with credit from shadow banks or by issuing bonds to raise funds (ESRB (2014a)). But the incremental effects of this from macroprudential leverage ratio buffers beyond those associated with risk-weighted buffers may be limited.

In addition, inappropriate timing in setting, reducing or releasing macroprudential capital requirements – irrespective of whether risk-weighted or not – can have pro-cyclical effects. If the macroprudential add-on is released too late, for example, deleveraging might be reinforced. Releasing it too early, on the other hand, may reduce banks' loss absorbing capacity if they choose to increase leverage as a result.

Potential effects on financial markets

A macroprudential leverage ratio could potentially have negative consequences for the repo market. According to some market participants, repos which are associated with low risk-weighted assets might suffer with the introduction of the new rules, leading to increased costs of market-making in these markets and hence to reduced trading volumes. The repo market has traditionally been a low-margin business that involves high gross notional numbers on which the leverage ratio weighs most heavily. If these fears are justified, the costs imposed on dealers may trickle down to end-users as traders try to meet return-on-equity targets, with the risk that the market segments and that certain bespoke products are not traded or are traded by appointment. Some of these concerns were mitigated by the introduction of provisions in the Basel revised rules text on the leverage ratio (BCBS (2014a)) – and replicated in the EU legislation amending the CRR – to allow the cash legs of repos to be netted against the cash legs of reverse repos with the same counterparty under certain conditions. Given the recent introduction of the Basel leverage ratio disclosure regime, the materiality of the impact of a leverage regime on repo market volumes is not yet clear.

More generally, it is argued that disincentives to participate in securities financing transaction (SFT) activities or sovereign securities markets may make these markets less liquid, which would increase the cost of government debt. Finally, small banks – which may not have direct access to wholesale funding because of their size/credit eligibility – may suffer negative spillovers arising from the deleveraging of large and complex financial intermediaries affected by a constraining leverage ratio requirement, although they may still

[31] Refinancing costs increase if the assumptions of the Modigliani-Miller theorem do not hold.

resort to central bank open market operations.

On the other hand, repos contributed significantly to the build-up of risk prior to the crisis (Gorton and Metrick (2012), Copeland et al. (2010 and 2011)) and contagion between financial institutions when this risk crystallised. Thus, requiring banks participating in these transactions to be supported by additional loss-absorbing capacity and curbing excessive repo activity is consistent with the objectives of the leverage ratio to ensure that banks have sufficient capital against all forms of exposure, and with the agenda of the Financial Stability Board (see further below). Similarly, risk may have been previously underpriced, with prices now being corrected. Finally, while questions on netting may remain, repo trading cleared via central counterparties (CCPs), which is eligible for netting under the Basel III rules, has in fact been growing since the crisis and can offer advantages from a financial stability standpoint.

Cross-border spillover effects

In general, the improvement of banks' resilience owing to higher capital levels in one country should have positive external effects for other countries as the likelihood of cross-border financial contagion is reduced. Given internationally integrated markets, however, differences in capital requirements across countries can provide scope for regulatory arbitrage and leakages.

For instance, one of the problems which contributed to the financial crisis was the "originate-and-distribute" business model in which banks extended loans and unloaded them into warehouses for securitisation and sale (Hellwig (2009)). This business was partly driven by entities being subject to different regulatory regimes (Shin (2012)). US banks were often constrained by a leverage ratio that induced them to put these loans off-balance sheet. In turn, the high credit rating of the re-packaged loans made them an attractive purchase for European banks, which were subject to risk-weighted capital requirements but not a leverage requirement. Other more lightly or unregulated entities often intermediated between US and EU banks. Thus, a consistent regulatory framework building on the complementarity between risk-weighted and leverage requirements seems warranted to safeguard financial stability. Part of such a consistent framework is a reciprocity arrangement, which is discussed in more detail in Section 5.5 with respect to a macroprudential leverage ratio.

4.2 Link to regulatory, monetary and fiscal policies

Interaction with regulatory initiatives on minimum haircuts

At the international level, the Financial Stability Board (FSB) has issued policy recommendations to limit the extent to which the shadow banking system is able to lever itself by conducting securities financing transactions. Financial institutions often finance the securities they hold with borrowed money. They can increase their leverage by using those securities as collateral in repos, which allows them to borrow additional money to be invested into further securities which then can be pledged in another repo transaction and so forth. Taking a systemic perspective, the compound system-wide leverage can be further increased if the collateral received is rehypothecated by the cash lenders. The overall

leverage that can be generated in this way is limited by the haircut on the collateral cash lenders demand.[32] The FSB policy recommendations (FSB (2013)) call for minimum haircuts for certain SFTs, namely those in which banks lend cash to non-banks such as hedge funds, and an extension to "non-bank to non-bank" transactions is envisaged.[33] The FSB initiative and the leverage ratio are complementary measures as the former targets leverage in the shadow banking sector, while the latter focuses on banks. The leverage ratio has a wider reach as it does not only target SFTs.

Interaction with liquidity requirements

The liquidity coverage ratio (LCR) requires banks to hold a quantity of highly liquid assets (high quality liquid assets (HQLA)) to provide insurance against short-term liquidity risks. These HQLA include zero risk-weighted sovereign bonds, potentially strengthening the bank-sovereign nexus and accumulating concentration risks. Alternatively, in order to comply, banks could increase their reliance on central bank repo operations to swap non-LCR qualifying assets with HQLA. In this case the central bank would accumulate risks. The leverage ratio could potentially increase the amount of capital that banks would have against HQLA, as these typically receive low risk weights in the capital adequacy standards. This, however, is consistent with the leverage ratio's aim to ensure that banks hold sufficient capital to protect against model risk arising from such assets. Moreover, on cyclicality, Duijm and Wierts (2014) find that early applications of the LCR have not constrained a rapid extension and contraction in bank balance sheets through SFTs (including repos) over the financial cycle. They show that the numerator of the LCR (i.e. liquid assets) and the denominator (which is based on short-term financing) can show large synchronised changes while the LCR itself remains rather stable. Duijm and Wierts therefore point to the complementary role of the leverage ratio in reigning in excessive balance sheet stretch.

The net stable funding ratio (NSFR) and the leverage ratio are likely to complement one another to the extent that both are expected to diminish incentives to rely excessively on short-term wholesale funding, a source of funding particularly associated with instability in the recent crisis.

Interaction with regulatory initiatives to increase banks' loss-absorbing capacity

In the context of resolving the "too big to fail" issue, regulators are requiring banks to maintain a minimum amount of loss-absorbing capacity in order to facilitate their orderly recovery and resolution without the need for public funds. According to FSB proposals, G-SIBs should have additional equity and/or debt instruments, suitable for a bail-in when a firm is a "gone-concern", above the going-concern capital requirement; together the going and

[32] When the cash lent on repo trades is lower than the current market value of the security used as collateral, the discount is referred to as the haircut. Haircuts therefore act as the inverse of leverage and are used as a risk control measure.
[33] The minimum haircuts should only apply to non-centrally cleared SFTs and exclude transactions in which sovereign bonds are pledged as collateral. Currently, the FSB initiative on minimum haircuts is limited to static requirements that are fixed over time (see FSB (2013)). In principle, margin requirements could also be varied over time. In the United States, the Federal Reserve System has the power to set certain initial margin requirements on national exchanges (known as Regulation T).

gone-concern requirements define the total loss-absorbing capacity (TLAC).[34] The TLAC will be benchmarked to (i.e. expressed as a percentage of) risk-weighted assets and a total exposure measure as defined by the Basel III leverage ratio, whereby the higher of the two ratios applies. Similarly, in the EU, the Bank Recovery and Resolution Directive (BRRD) requires banks to fulfil a minimum requirement of own funds and eligible liabilities (MREL) based on total liabilities.[35] Should banks fulfil the MREL or TLAC requirement mainly by issuing additional debt instruments rather than by restructuring existing debt or issuing equity, their leverage will increase. Thus, for a given calibration of MREL or TLAC, a constraining leverage ratio will give banks incentives to meet a larger proportion of the requirements with equity.

Interaction with real estate-related instruments

On the one hand, instruments targeting borrowers' leverage or debt-servicing capacity, such as loan-to-value (LTV), loan-to-income (LTI), debt-to-income (DTI) or debt service-to-income (DSTI) limits tend to lower the demand for credit which might make it easier for banks to meet the leverage ratio. On the other hand, as the leverage ratio might induce risk shifting, real estate-related instruments focusing on borrower characteristics may help to prevent a build-up of high-risk real estate credit exposures at banks. Therefore, it is expected that a macroprudential leverage ratio would be complementary to quantity-based real estate-related instruments.

Interaction with monetary policy

Just as with risk-weighted capital requirements, a leverage ratio requirement may interact with monetary and fiscal policy in several ways. In general, by improving the shock-absorbing capacity of the banking system and stabilising the flow of credit to the economy, macroprudential policies contribute to financial stability, which is a precondition for price stability and sustainable economic growth. In particular, a resilient financial system helps to ensure that the monetary transmission mechanism works effectively and predictably and helps to protect fiscal balances from large bank recapitalisations.

Monetary policy influences the interest rates set by lenders and charged to borrowers and thus affects the aggregate level of borrowing or spending in the economy. In addition, commercial bank interest rates also depend on mark-ups and margins in financial intermediation, determined – among other factors – by financial regulation including capital requirements (BIS (2011)).[36] The academic literature, however, is somewhat inconclusive on the direction and the extent of the interplay between banks' capital adequacy and monetary policy.[37]

[34] Note that additional buffers such as the capital conservation buffer and the countercyclical capital buffer will not count towards TLAC. TLAC will become part of the Pillar I requirements and authorities may set additional Pillar II requirements above the common minimum.
[35] The BRRD entered into force on 1 January 2015, providing a single rulebook for the resolution of failing banks in all EU Member States.
[36] In response, central banks can consider capital adequacy standards in their interest rate strategy. See Cecchetti and Li (2008).
[37] For a survey of the literature on the role of regulatory bank capital in monetary transmission, see Borio and Zhu (2012).

Some studies suggest that capital-constrained banks may react more strongly to changes in interest rates than unconstrained banks (Kishan and Opiela (2000) and Bolton and Freixas (2006)). Other studies come to the opposite conclusion (Kashyap and Stein (1994), Tanaka (2002) and Peek and Rosengren (1995)). Furthermore, the impact of monetary policy on bank lending may not only depend on the capital adequacy of the banking sector in aggregate but also on its distribution (Van den Heuvel (2002)) and the extent of informational asymmetries (Ehrmann et al. (2001)).

More generally, the possible spillovers between monetary and macroprudential policy highlight the importance of considering their interactions and coordinating them to the extent possible. This holds in particular for macroprudential instruments with a potentially dampening effect on credit and asset price cycles. In this vein, coordination with monetary policy may be even more important when there is a countercyclical component of the leverage ratio as well as a static one. Coordination might be warranted when the real and financial cycle move in sync and a leverage ratio requirement may prevent higher risk-taking when monetary policy needs to be accommodative (Jimenez et al. (2014) and Spencer (2014)).

Separately, monetary policy operations that use repos (instead of outright purchases) expand banks' balance sheets by increasing their debt, thus worsening their leverage ratio. The materiality of this issue is limited under normal circumstances because central bank refinancing only accounts for a small amount of most EU banks' balance sheets. This may change in stressed situations when central banks provide more liquidity or act as lender of last resort. Any possible negative effect on the banks' leverage ratio of the central bank's liquidity provision as lender of last resort is, however, mitigated as this liquidity tends to substitute private liquidity with likely little effect on the size of the recipient banks' balance sheets.[38] By contrast, additional liquidity provision to banks via non-standard measures aiming to boost credit supply to the economy can potentially increase banks' balance sheet size and thus their leverage if no substitution takes place.

A cyclical leverage ratio requirement should prevent the build-up of systemic risk in the financial system and thereby lower the probability of financial crisis situations demanding exceptional central bank measures in the future. When stress does occur, a cyclical leverage ratio would be lowered, providing banks with the scope to increase their leverage (assuming the regulatory constraint on leverage was initially binding). Any cyclical reduction of the leverage ratio would reduce the extent to which banks fall below their leverage requirements even as capital losses are incurred, thereby limiting the extent to which banks may need to take action to reduce leverage which might adversely affect the cost and supply of credit to the real economy. In this sense, a macroprudential leverage ratio is not expected to conflict with the objectives of monetary or other central bank policy in times of crisis. While the provision of additional liquidity through non-standard central bank measures need not be associated with an increase in banks' leverage, to the extent that this substitutes for a

[38] In addition, it is important to distinguish the current stress setting (longer-term refinancing operations (LTROs)/full allotment) and the monetary policy framework which should prevail in the future.

reduction in private sources of liquidity, it is possible that the net effect of changes in public and private liquidity during a crisis would be an increase in banks' leverage ratios. In such circumstances, the cyclicality of the leverage ratio would also mitigate any undesirable interaction between central banks' non-standard liquidity measures and the leverage constraint.

Interaction with fiscal policy

Risk-weighted capital requirements incentivise banks to concentrate their holdings in low and zero risk-weighted assets. Many government bonds, including all euro-dominated ones in the euro area, are attached with zero risk weights according to current EU capital regulation. A leverage ratio requirement imposes equal treatment of government and private sector claims, as it does not favour any special kind of asset and can thereby contribute to a weakening of the bank-sovereign nexus.

Fiscal policy in turn often sets incentives for higher leverage when the tax treatment of debt is more favourable than that of equity. This distorts financing decisions and may increase the systemic risk that a leverage ratio will mitigate.[39]

[39] For a discussion of taxation and financial stability see IMF (2013).

5. Design issues and reciprocity

This section explores some considerations for the design of a macroprudential leverage ratio framework, discussing possible issues around the specification of the leverage ratio numerator, sanctions, the level of firm consolidation, disclosure and reciprocity. It also covers legal issues. In broad terms, the design features and principles embodied in the risk-weighted capital framework may be a useful guide for a macroprudential leverage ratio framework and adopting them could help to maintain the simplicity of macroprudential leverage ratios.

5.1 Quality of capital

The risk-weighted capital framework specifies minimum going-concern capital requirements in terms of minimum Common Equity Tier 1 (CET1 – the highest quality capital) and Tier 1 capital ratios. Risk-weighted buffers must be met entirely with CET1.

Currently, the capital measure (numerator) of the leverage ratio for disclosure purposes is Tier 1 capital. There is no CET1 leverage ratio for disclosure purposes. If the leverage ratio for the purposes of macroprudential leverage requirements were only specified as a Tier 1 requirement there would be no restriction on the amount of Additional Tier 1 (AT1) capital which could be used to meet minimum or buffer leverage requirements, in contrast to the approach taken in the risk-weighted framework.

Mirroring the risk-weighted framework in the leverage ratio framework would imply that the quality of capital required for each component should relate to the nature of the leverage requirement, e.g. whether a minimum or a buffer. In particular, it is important to consider whether AT1 contingent convertible instruments, which were envisaged to provide loss-absorbing capacity within the risk-weighted framework, are designed appropriately to absorb losses for highly leveraged firms. Given that within the minimum risk-weighted requirements, AT1 may only comprise up to 25% (1.5/6 percentage points) of the minimum Tier 1 requirement, a similar restriction on AT1 for the numerator of a minimum leverage ratio requirement would ensure symmetry with the capital quality requirements in the risk-weighted framework. Likewise, since only CET1 may be used to meet buffer requirements in the risk-weighted framework, a similar restriction could be applied to buffers in the leverage framework.

5.2 Buffer design features and sanctions

If the leverage framework includes buffers, they could operate in the same manner as the CRD risk-weighted combined buffers meaning that the consequences of a breach would be automatic. For example, the schedule of automatic restrictions on distributions which affect regulatory capital could be mirrored. Alternatively, the consequences of failing to meet a buffer requirement could be set at the discretion of the national supervisor, more akin to the consequences of a breach of Pillar 2 requirements. In general, national supervisors have a range of tools to respond to breaches of capital requirements; the consequences for a firm of failing to meet its buffer requirements are less severe than the consequences of breaching

the minimum (basic) requirements.

Similarly to buffers in the risk-weighted framework, the different leverage buffer components could be considered additive. In this case, a breach of any of the buffers would activate the relevant sanctions.

5.3 Level of firm consolidation

The EU regulatory framework CRD/CRR envisages the application of risk-weighted capital requirements at a consolidated level as well as at sub-consolidated and individual entity levels. Preserving symmetry between risk-weighted and leverage requirements would imply that the leverage ratio framework would ultimately be applied both to whole groups and to the important individual entities that are subject to risk-weighted minimum and buffer requirements.

When considering add-ons to the minimum leverage requirement, interactions with the levels at which the risk-weighted buffers are applied should be considered.

5.4 Disclosure

Currently, the CRD/CRR imposes granular disclosure requirements for the purposes of the leverage ratio, including disclosure of the leverage ratio and the components of the exposure measure. If a more advanced leverage framework is adopted, the leverage disclosure template may need to be updated in order to clarify (i) the total leverage ratio requirement applying to an individual firm (i.e. including any systemic and time-varying buffer components); and (ii) whether the firm is meeting its leverage requirements using the required quality of capital.[40] This latter point would be relevant if a limitation on the use of AT1 for meeting minimum or buffer requirements is applied (see Section 5.1).[41]

5.5 Reciprocity

To be more effective as a macroprudential tool, policy-makers also have to take the international activity of banks into account when setting the leverage ratio requirement. This section explains why this is the case and discusses the measures which authorities could take to reduce the scope for negative cross-border spillover effects and leakages. Again, there are strong analogies with the risk-weighted framework on this issue and much carries across simply to a leverage ratio framework.

Reciprocity implies that a Member State recognises the regulatory requirements set in other Member States and applies them to the corresponding (foreign) exposures of the financial institutions that it regulates. Reciprocity has already been implemented in the rules on the CCB, in which case the firm-specific CCB rate is the exposure-weighted average of domestic

[40] Following the adoption of the Commission Delegated Regulation on the leverage ratio, the EBA has developed amendments to the current implementing technical standards on reporting. The proposed amendments to the leverage ratio reporting instructions and templates are, however, limited and mainly reflect an alignment with the Basel standards. (EBA (2014b))
[41] The Commission Delegated Regulation on the leverage ratio changed the calculation and reporting period to refer to end-of-quarter values (point in time) instead of a three-month average in order to align the leverage ratio with solvency reporting data. However, if necessary, supervisory authorities can ask for higher frequency reporting under Pillar 2.

and foreign CCB rates.[42] This ensures that the application of the CCB in a given jurisdiction does not distort the level playing field between domestic and foreign bank lending to counterparties in that jurisdiction, reduces the risk of leakages, and ensures the buffer's effectiveness in protecting banks from potential losses from abroad (ESRB (2014a)). Reciprocity is important for the effectiveness of the cyclical use of the leverage ratio (given that it is exposures-based), but is not required for institution-based measures such as SII add-ons.

There is a strong argument for international coordination between macroprudential authorities with respect to countercyclical leverage ratio buffer (CLRB) rates for similar reasons as for the CCB. First, it may be important to ensure that banks with foreign exposures remain sufficiently protected against uncertainties and risks which are difficult to model when there are credit booms abroad. This suggests that all elements of the leverage ratio framework should apply both to banks' domestic and foreign exposures. Second, a country with unsustainable growth in low risk-weighted assets will only go so far in "leaning against the wind" with a domestic macroprudential leverage requirement if this development is (partly) driven by entities that are regulated abroad. Thus, it will be helpful for macroprudential authorities to coordinate to protect the stability of financial systems.

In principle, one option is simply to mirror the CCB reciprocity arrangements for the CLRB. There is currently no corresponding framework for a macroprudential leverage ratio but the arguments above may strongly support the development of one. This would mean that institution-specific CLRB rates would be calculated as the exposure-weighted averages of the CLRB rates set in the jurisdictions where the institution has exposures. This approach would ensure a level playing field, as the same CLRB rate would apply to both domestic and foreign banks' exposures within a given country. The CARWs would, however, only be constant for banks within a given country if all countries adopt the same guide rule for setting their domestic CLRB rate.

In the absence of such a reciprocity framework, there are ways in which authorities could unilaterally address some of the concerns discussed above when setting CLRB rates. Several options, which involve a trade-off between keeping the CARW constant and ensuring a level playing field, are available. One option would be for authorities to require that banks regulated by them maintain institution-specific CLRB rates as a fixed proportion of their institution-specific CCB rates. In other words, each authority would set the CARW for banks in its jurisdiction. If all Member States were to adopt such an approach and follow the same guide rule for setting the CLRB, as discussed in Section 3.4, this would achieve the effect of reciprocity in a way which would maintain a constant CARW for firms in different countries and a level playing field. If authorities set different CARWs (including zero, i.e. no CLRB at all), this option would deliver constant CARWs across firms within an authority's jurisdiction but could lead to differences with other firms operating internationally that fall under the

[42] The current reciprocity mechanism is not able to mitigate cross-border spillover effects fully. For instance, reciprocity is only mandatory up to 2.5% and a change in the CCB rate in one country still has the potential to create cross-border spillovers if banks move business to countries with lower capital requirements (ESRB (2014a)).

jurisdiction of a different authority.

When applying a time-varying leverage ratio, policy-makers should consider how best to take into account the concerns discussed above about the potential for negative cross-border spillover effects and leakages. Risks arising from domestic lending by banks regulated abroad can, however, only be tackled by some sort of reciprocity mechanism. For this, international coordination between macroprudential authorities will be important for safeguarding financial stability. If coordination in the EU could be promoted by the ESRB, this could increase the chances of reciprocation, thus increasing the effectiveness of such measures.

5.6 Legal considerations

The CRR (as amended by the Commission Delegated Regulation on the leverage ratio) requires institutions to calculate, report and disclose their leverage ratios in accordance with a common methodology, but does not yet provide for a minimum requirement.[43]

According to Recital 18 of the CRR, harmonisation of a leverage ratio in the EU is envisaged as of 2018. Until then, Member States can apply such measures as they consider appropriate, including measures to mitigate macroprudential and systemic risk in a specific Member State.

CRR Article 511 requires the EBA to report to the European Commission on the appropriateness of the leverage ratio framework to suppress the risk of excessive leverage and other related questions. Based on the results of the EBA report, the Commission must submit by the end of 2016 a report on the impact and effectiveness of the leverage ratio to the European Parliament and the Council. This report may be accompanied, where appropriate, by a legislative proposal to introduce the leverage ratio as a capital requirement, together with any connected flexibility measures if necessary, including appropriate amendments to CRR Article 458 (national flexibility measures). In its response of 30 April 2014 to the call for advice by the Commission on the review of macroprudential provisions in the EU capital requirements framework pursuant to CRR Article 513, the ESRB stated that it had started deliberating the use of the leverage ratio in a macroprudential context (ESRB (2014c)).

[43] CRR Articles 429, 430 and 451 respectively.

6. Conclusion

The ESRB Handbook on Operationalising Macroprudential Policy in the Banking Sector (ESRB (2014a)) provides detailed guidance to macroprudential authorities in the EU on key considerations and design issues for developing and implementing macroprudential policy for the banking sector. It is not binding on macroprudential authorities and does not prejudice the competence of authorities to determine their own policy stance, recognising the need for national flexibility.

This chapter extends the Handbook to include macroprudential leverage ratios. It assesses their potential role in tackling both the cyclical and structural dimensions of systemic risk, describes their transmission mechanism and links to other policies, and discusses key design issues. Throughout, it strives to maintain simplicity in the approaches it discusses.

At the same time, it should be noted that the EBA and the BCBS are conducting analyses of a minimum leverage requirement as well as potential flexibilities, and wider work is underway internationally on the risk-weighting framework. This chapter can inform those discussions and, as a live document, it will be reviewed in 2017 following the outcome of this work.

Annex 1: The critical average risk weight: concept and derivation

There is a relationship between the levels of risk-weighted capital and leverage ratio requirements in a regulatory capital framework that includes both. Specifically, their relative calibration will determine how often each of the ratios would be expected to be more stringent, both across firms and over time.

At all times, a bank's capital charge would be determined by (that is, it will be "constrained" by) at least one of the requirements; in some cases both requirements may be equally stringent, i.e. both could imply the same capital charge. A simple illustration of the interaction is shown in Figure 2 (Section 2.1). In Figure 2, the situation where both requirements are equally stringent is shown by the point at which the two lines intersect. The figure illustrates that this occurs at a particular portfolio average risk weight – labelled the "critical average risk weight" (CARW).[44] Firms with average risk weights below the CARW will be constrained by the leverage ratio; firms above the CARW will be constrained by the risk-weighted ratio. Importantly, if the level of the risk-weighted ratio relative to the level of the leverage ratio changes, this implies a change in the implied CARW.

This interaction can also be expressed analytically in the following equations.

The capital charge implied by the leverage requirement is given by:

$$K^{LR} = LR * TA \quad (1)$$

K^{LR}: Capital charge implied by leverage ratio requirement
LR: Leverage ratio requirement (percentage)
TA: Total assets.

Note that this is a simplification for expositional purposes. Strictly, the leverage exposure measure is used to determine the capital charge implied by the leverage ratio. See discussion at the end of this Annex.

The capital charge implied by the risk-weighted capital requirement is given by:

$$K^{RWCR} = RWCR * RWA \quad (2)$$

K^{RWCR}: Capital charge implied by risk-weighted capital requirement
RWCR: Risk-weighted capital requirement (percentage)
RWA: Total risk-weighted assets

[44] This is an approximation only because total assets and the exposure measure for leverage purposes are not the same. This is explored at the end of this Annex.

RWA can be rewritten as the product of the portfolio average risk-weight ($\overline{RW}$) and total assets, i.e.:

$$RWA = \overline{RW} * TA \quad (3)$$

Inserting (3) into (2), gives:

$$K^{RWCR} = RWCR * \overline{RW} * TA \quad (2')$$

It can be seen from the above that the capital charge implied by the leverage requirement will be greater than or equal to that implied by the risk-weighted requirement when K^{LR} derived from (1) is greater than or equal to K^{RWCR} derived from (2'), i.e. when:

$$LR * TA \geq RWCR * \overline{RW} * TA$$

$$\overline{RW} \leq LR / RWCR \quad (4)$$

Therefore, it is useful to define a concept to observe the relationship between the levels of the risk-weighted and leverage ratio requirements; the CARW. This is defined as the portfolio average risk weight at which both the leverage ratio and the risk-weighted capital ratios are equally stringent (i.e. when (4) holds with equality).

$$\overline{RW}^{critical} = \frac{Leverage\ ratio\ requirement}{Risk\text{-}weighted\ requirement} \quad (5)$$

The CARW is equal to the ratio of the leverage ratio requirement to the risk-weighted capital requirement. For example, under a 3% Tier 1 static leverage ratio requirement and a 6% Tier 1 risk-weighted minimum requirement, the leverage ratio will be more constraining than the minimum risk-weighted requirement if a bank's average risk weight across its balance sheet is below a "critical" average risk weight of 50%.

Equation (5) also shows that when the risk-weighted capital requirement is changed, the implied CARW also changes and the *relative stringency* of the two requirements is altered. The only way to change the risk-weighted capital and leverage requirements so that they are equally constraining (at the same average risk weight) is to vary them in equal proportions (e.g. by doubling both requirements).

Discussion and qualifications

The above analysis is simplified for expositional purposes in order to show the concept of the implied CARW. However, it abstracts from the fact that the leverage ratio is defined with respect to the leverage exposure measure, which is a broader measure of exposures than

total assets (the basis for the calculation of RWAs).[45] For this reason, therefore, a more precise specification of the critical (portfolio) average risk-weight is:

$$\overline{RW}^{critical} = \frac{Leverage\ ratio\ requirement}{Risk\text{-}weighted\ requirement} \times \frac{Leverage\ exposure\ measure}{Total\ assets} \qquad \textbf{(5')}$$

i.e. LR = α x β x risk-weighted requirement
α: $\overline{RW}^{critical}$* RWCR

β: Total Assets / Leverage exposure measure

This would suggest that in order to maintain strictly the same level of stringency of the leverage ratio and risk-weighted requirements, it would be necessary to vary the leverage ratio requirements proportionately by a factor which is specific to each firm's balance sheet (reflecting the size of its leverage exposure measure relative to total assets).

Further, the derivation does not take into account possible differences in the numerator of the risk-weighted and the leverage ratio requirements. In the above equations, one type of capital (K) was considered although, in reality, going-concern capital requirements can be met with some mix of CET1 and AT1 capital. Strictly, to maintain the same relative stringency of the requirements, the greater stringency of meeting a CET1 requirement would need to be taken into account.

However, adjusting the calculation for differences in the exposure measure and capital quality would add an additional degree of complexity. The cost of this would have to be weighed against the possible benefits of greater accuracy.

[45] Both on and off-balance sheet items are measured differently under risk-weighted and leverage frameworks owing to differences in the recognition of collateral, the permissible netting and the treatment of off-balance-sheet items for the purposes of the leverage exposure measure.

Annex 2: Leverage, risk weights and pro-cyclicality: findings for EU Member States

The question of whether or not leverage is pro-cyclical is fundamental for macroprudential policy-makers. This Annex complements existing studies that look at individual bank data by using aggregate data for all EU Member States, in line with the ESRB's focus. Previous studies have found evidence of pro-cyclical leverage, mainly for large and complex institutions. The question is whether this result also holds at the aggregate level for the banking sector as a whole.

We follow the empirical approach of Adrian and Shin (2010), who find a pro-cyclical pattern in leverage for US investment banks (but not for commercial banks). A similar approach was applied by Bruno and Shin (2013). An acyclical pattern would imply that the level of capital fluctuates proportionally with total assets, so that the leverage ratio remains constant. Less than proportionate fluctuations of capital with total assets would indicate pro-cyclicality, i.e. the leverage ratio falls (increases) when total assets increase (decrease).

Including cyclical patterns of risk weights in this analysis is particularly relevant in the case of a regulatory constraint on risk-weighted capital ratios. A constant risk-weighted capital ratio (measured as capital divided by total assets times the average risk weight) can coincide with pro-cyclical leverage (i.e. capital does not move proportionally with total assets) if the average risk weight is cyclical (i.e. falling/increasing in good/bad times when measured credit risk is low/high).

Data needs versus availability

In studying the cyclicality of leverage, it is essential to use sufficiently long time series to capture the financial cycle. Ideally, the relevant variables should also be defined in line with the definitions used in the policy debate. Two data sources are available for analysing aggregate trends in the banking system in EU countries: monetary statistics and consolidated banking statistics. For a full comparison, see Borgioli et al. (2013). The main features are as follows.

Monetary statistics

- Based on national accounts data.
- Comprise the monetary and financial institutions (MFI) sector, i.e. credit institutions, other financial institutions (mainly money market funds) and central banks (which have been excluded from the data used in this analysis).
- Residency basis – foreign branches and subsidiaries of domestic institutions are not included.
- Time series for capital[46] and assets are available but not for risk-weighted assets. Definitions do not match the Basel III definitions on leverage.

[46] Capital is defined as capital and reserves in the monetary statistics, which includes (i) equity capital; (ii) non-distributed benefits or funds; and (iii) specific and general provisions against loans, securities and other types of assets.

- Availability – quarterly data in the ECB's Statistical Data Warehouse available since 1997 but (much) longer at national central banks.

Consolidated banking data

- Based on supervisory data.
- Comprise domestic credit institutions.
- Consolidated basis – foreign branches and subsidiaries of domestic institutions are included;
- All series are available,[47] including risk-weighted assets. Definitions do not match the Basel definitions on leverage.
- Availability – according to Borgioli et al. (2013) since 2002 on an annual basis; in the ECB's Statistical Data Warehouse for the period since 2007-08. Longer time series and higher frequencies are available at national central banks but the sample period is still shorter than for the monetary statistics.

In sum, sufficiently long time series that match the Basel III definitions of the leverage ratio are not available. The consolidated banking data (CBD) provide the best coverage but are available for a limited period of time (often since the mid-2000s at best), mostly at (half)-yearly intervals. The monetary statistics are available for much longer periods and on a monthly/quarterly basis. On the one hand, the national perspective and residential scope match with the dominant perspective of macroprudential policy. On the other hand, this residential scope could be problematic for a country with an international banking system and/or many foreign branches (which may not themselves be funded with much or any capital but are part of a well-capitalised group). Overall, both datasets are therefore collected from national sources to maximise the length of the time series, include risk-weighted assets and allow for robustness checks.

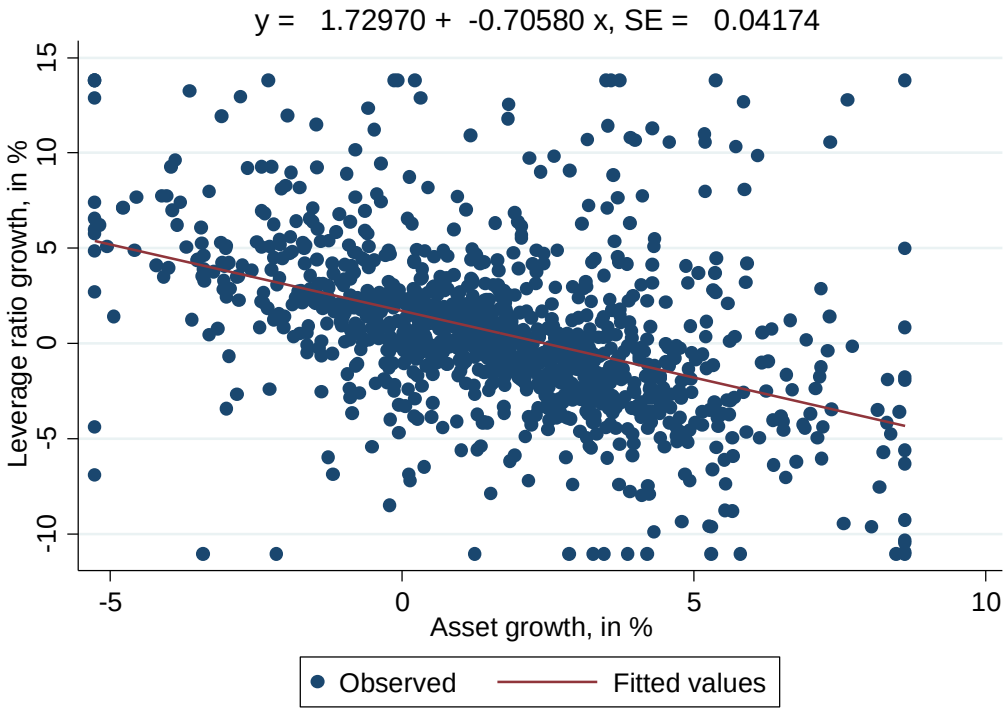
During the collection process, several statistical experts from Member States that joined the EU after 2004 expressed concern about the interpretation of the results for their country, given the dominance of foreign players and/or the dominant role of a few banks only. The country results indeed show that the correlations are more similar for the EU15 Member States (i.e. the EU before the enlargement in May 2004) than for the "new" Member States. Therefore, aggregate results for the EU15 are shown in the main figures below. Country-specific results for all countries are included when sufficiently long time series are available (i.e. for the correlation between changes in leverage ratios and total assets), while results for the whole sample of all EU Member States are also reported.

[47] Two series for capital were collected: capital and reserves and Tier 1 capital. Results are very similar for both series given that they are highly correlated. Results as reported in this Annex are based on the series for capital and reserves, given that the time series are longer.

Results

The results indeed indicate that capital moves less than proportionally with total assets (not reported), so that the leverage ratio is pro-cyclical. Results from a panel regression for the correlation between quarterly percentage changes in the leverage ratio and total assets are shown in Figure 5 (EU15; monetary statistics). It shows that the correlation is -0.71 for the EU15 as a whole: increases (decreases) in the growth rate of total assets of 1 percentage point correlate with percentage point decreases (increases) in the growth rate of the leverage ratio of 0.71%. An easy way to interpret this coefficient is to start from a constant leverage ratio in long-run equilibrium (i.e. zero growth), which corresponds to relatively low asset growth (Figure 5). If asset growth were now to increase (decrease) by, for example, 10 percentage points, this would lead to a decrease (an increase) in the leverage ratio of 7%.

Figure 5: Quarterly percentage changes in the leverage ratio and total assets in EU15.



Source: BSI Statistics, ECB.

Notes: The vertical axis indicates quarterly percentage changes in the leverage ratio, against quarterly percentage changes in asset growth on the horizontal axis. The sample of countries and time periods is the same as indicated in Table 2. Data are winsorised at the 1% level to limit the impact of strong outliers.

For the sample as a whole (i.e. also including the “new” Member States), the coefficient drops from -0.71 to -0.47. Moreover, as a robustness check, the period since the second quarter of 2007 is excluded, given that this may have been a period of exceptionally strong deleveraging. This leads to a drop in the coefficient from -0.71 to -0.63, although it remains highly statistically significant. Finally, the results are broadly similar when using annual data or the CBD instead of the monetary statistics, even though the definitions differ and the sample is much shorter (not reported).

Country-specific correlations are shown in Table 2 for sample periods as determined by data availability. In almost all cases, the correlation is negative and statistically significant; it is never positive and statistically significant. Again, the period from the second quarter of 2007 is left out as a robustness check (not reported). Overall, this leads to the same pattern in the results, even if they become somewhat less statistically significant (owing to the lower number of observations), and some differences in coefficients at the country level (in both directions). Overall, the results indicate that at the aggregate level of the banking sector as a whole, changes in assets did not move fully proportionately with changes in capital in almost all Member States, underscoring the pro-cyclicality of leverage.

Table 2: Country-specific correlations: percentage changes in leverage ratio and total assets

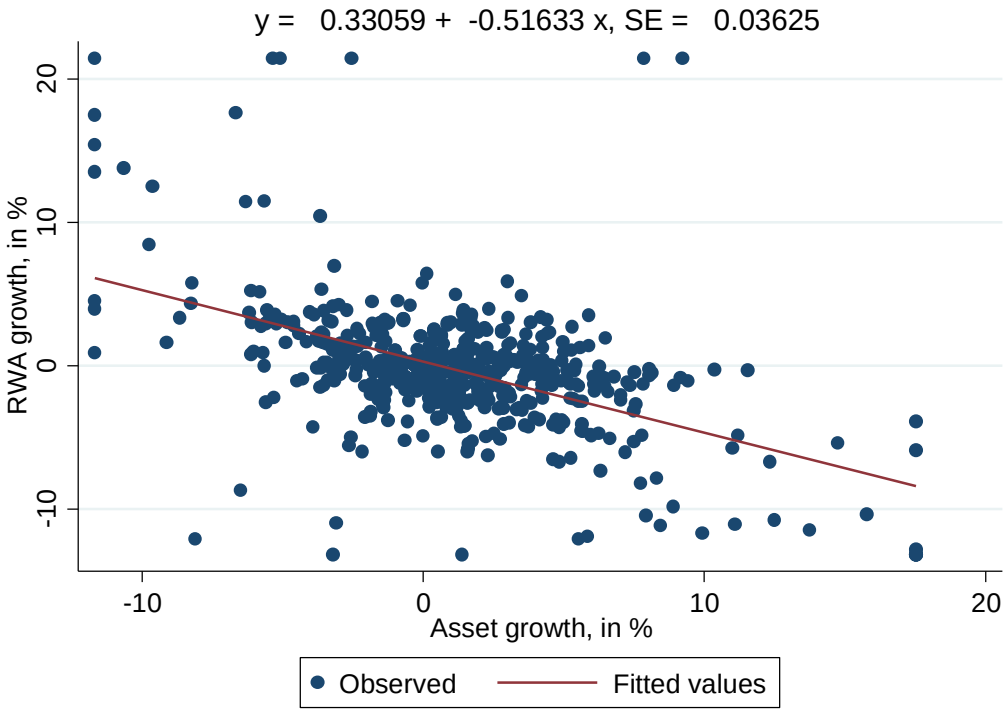
	Coefficient	p-Value	Observations	Sample period	Coefficient (pre-crisis period)	p-Value (pre-crisis period)
AT	-0.48*	0.073	68	1997 Q4 - 2014 Q3	0.35	0.478
BE	-0.73***	0.002	71	1997 Q1 - 2014 Q3	-1.48***	0.000
BG	-0.27**	0.042	42	2004 Q2 - 2014 Q3	-0.75**	0.001
CZ	-0.90***	0.000	50	2001 Q2 - 2014 Q3	-0.85***	0.002
DE	-0.64***	0.000	183	1969 Q1 - 2014 Q3	-0.60***	0.001
DK	-1.10***	0.000	56	2000 Q4 - 2014 Q3	-1.11**	0.029
EE	-0.30*	0.054	78	1995 Q2 - 2014 Q3	-0.34	0.161
ES	-0.65***	0.000	58	2000 Q1 - 2014 Q2	-0.76***	0.003
FI	-0.70***	0.000	68	1997 Q4 - 2014 Q3	-0.21	0.592
FR	-0.78***	0.000	68	1997 Q4 - 2014 Q3	-0.67***	0.001
GR	-0.63*	0.056	66	1998 Q2 - 2014 Q3	-0.27	0.371
HR	-0.55**	0.049	11	2012 Q1 - 2014 Q3	No data	
HU	0.023	0.892	58	2000 Q2 - 2014 Q3	-0.39*	0.099
IE	-0.77***	0.000	68	1997 Q4 - 2014 Q3	-0.67**	0.019
IT	-0.56***	0.001	75	1996 Q1 - 2014 Q3	-0.66**	0.047
LT	-0.47***	0.000	42	2004 Q2 - 2014 Q3	-0.73**	0.047
LU	-0.82***	0.000	68	1997 Q4 - 2014 Q3	-0.69**	0.012
LV	-0.13	0.345	69	1997 Q3 - 2014 Q3	0.08	0.722
MT	0.14	0.687	44	2003 Q4 - 2014 Q3	-0.80**	0.014
NL	-0.38**	0.041	127	1983 Q1 - 2014 Q3	-0.45***	0.008
NO	-0.32**	0.014	62	1999 Q2 - 2014 Q3	-0.25	0.214
PL	0.0093	0.951	42	2004 Q2 - 2014 Q3	-0.04	0.858
PT	-0.95***	0.000	46	2003 Q2 - 2014 Q3	-0.24	0.546
RO	-0.36***	0.002	39	2005 Q1 - 2014 Q3	-0.79**	0.033
SE	-0.57***	0.009	74	1996 Q2 - 2014 Q3	-0.48*	0.091
SI	-0.41	0.212	42	2004 Q2 - 2014 Q3	-0.01	0.959
SK	-0.97***	0.000	42	2004 Q2 - 2014 Q3	-0.78***	0.000
UK	-0.59***	0.001	68	1997 Q4 - 2014 Q3	-1.12***	0.000

Source: BSI Statistics, ECB.

Notes: Regression results of quarterly percentage changes in the leverage ratio against quarterly percentage changes in asset growth. Data are winsorised at the 1% level to limit the impact of strong outliers. ***, ** and * imply statistical significance at the 1%, 5% and 10% level. While columns 2 and 3 present the results for the overall data, columns 6 and 7 present the results only for the pre-crisis data, i.e. data from the beginning of the sample period until 2007 Q2.

As indicated, as an additional exercise, correlations between percentage changes in average risk weights and total assets are also calculated. These calculations can only be based on the shorter sample period from the CBD; therefore, country-specific results are not reported. Figure 6 shows that the correlation is -0.52 for the EU15 as a whole: on average a 1 percentage point increase (decrease) in the growth rate of total assets correlates with a percentage point decrease (increase) in the growth rate of average risk weights of 0.52%. This correlation drops to -0.32 for the sample as a whole (i.e. also including the "new" Member States), while remaining highly statistically significant.

Figure 6: Quarterly percentage changes in average risk weights and total assets in EU15.



Source: Consolidated banking data, ECB.

Notes: The vertical axis indicates quarterly percentage changes in average risk weights, against quarterly percentage changes in asset growth on the horizontal axis. Data are winsorised at the 1% level to limit the impact of strong outliers.

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