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Regulating the Financial Cycle: An Integrated Approach with a Leverage Ratio

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Abstract

We propose a regulatory approach for restricting debt financing as an amplification mechanism across the financial system. A small stylised model illustrates the trade-off between static and time varying limits on leverage in dampening the financial cycle. The policy section proposes its application to highly leveraged entities and activities across the financial system. Whereas the traditional view on regulation focuses on capital as a buffer against exogenous risks, our approach focuses instead on debt financing, endogenous feedback mechanisms and resource allocation. It explicitly addresses the boundary problem in entity-based financial regulation and provides a motivation for substantially lower levels of leverage – and thereby higher capital buffers – than in the traditional approach.

Keywords: Financial cycle, macroprudential regulation, financial supervision, (shadow) banking.

JEL Classifications: E58, G10, G18, G20, G58.

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1. Introduction

In the aftermath of the financial crisis, there is a shift in thinking about financial regulation. While the regulatory focus was solely on individual financial institutions, there is increasing recognition that the focus should also be on the financial system as a whole. The financial system is pro-cyclical and thus amplifies financial shocks. Yet, there is no agreement on the objective of regulating the financial cycle. Some authors (e.g. Borio, 2014) aim to increase the resilience of the financial system against financial shocks, by increasing capital buffers in good times. Others (e.g. Gersbach and Rochet, 2014) are more ambitious and aim to stabilise the credit cycle. This paper fits in the latter strand of the literature on macroprudential regulation. It is further motivated by a long history of debt financed booms and busts, with severe implications for financial stability and the real economy (Reinhart and Rogoff, 2009; Lo and Rogoff, 2015).

There are various financial accelerator or amplification mechanisms at work in the financial system. The basic mechanism is that debt financing (leverage) is increased to maximise profits during good times, when asset values (collateral) are high and measured risk is low.[1] A first example is banks, which expand their business with high levels of debt during good times (Adrian and Shin, 2010; Gersbach and Rochet, 2014; Langfield and Pagano, 2015). Another example is housing finance, where increasingly large mortgages are granted during a housing boom (Almeida *et al*, 2006). Finally, financial markets can also be pro-cyclical when haircuts for securities financing transactions are reduced in good times (Brunnermeier and Pedersen, 2009; Gorton and Metrick, 2012).

While the underlying mechanism is general, macroprudential regulation is developed in silos. The Basel policy response with a countercyclical capital buffer and a leverage ratio is only directed at banks (sectoral). By contrast, loan-to-value (LTV) ratios are activity based and apply to all financial institutions that grant mortgages. Other policies such as the Financial Stability Board (FSB) proposals for haircuts floors on securities financing transactions are mixed (FSB, 2014).

But these sectoral macroprudential regulations intensify the boundary problem (Goodhart, 2008). When regulation for one sector is tightened, business will shift beyond the boundary to another sector with a less binding requirement, or to the unregulated sector. The contribution of this paper is to develop an integrated functional approach. The key question is how to regulate debt financing in a system-wide way.

The paper develops a small model illustrating how debt financing can amplify financial shocks within the economy. Next, we introduce a countercyclical leverage ratio to stabilise the financial cycle. By harmonising the terminology, such as leverage ratio, haircuts and LTV ratios, we derive a general applicable policy framework. This new framework differs from the traditional view on regulation of

[1] See Kiyotaki and Moore (1997) and Bernanke *at al* (1999) for early theoretical contributions on amplification mechanisms. More recent contributions are Brunnermeier and Sannikov (2014) and Kubler and Geanakoplos (2014).

equity as a buffer against unexpected losses. Whereas the ‘buffer view’ can only motivate relatively small capital buffers, our framework calls for much lower levels of leverage in the system.

This paper is organised as follows. Section 2 models the amplification mechanism as a function of initial leverage. Section 3 develops a countercyclical leverage ratio to stabilise the financial cycle. Next, Section 4 indicates how our integrated approach can be applied system-wide solving the boundary problem. Section 5 concludes.

2. Debt financing and amplification mechanisms

Adrian and Shin (2010) show that when balance sheets are continuously marked to market, asset price changes appear immediately as changes in net worth. This may in turn elicit responses from financial intermediaries who adjust the size of their balance sheets. This section models the leverage mechanism and shows the aggregate consequences of intermediaries’ behaviour.

By definition, it holds on any balance sheet that:

$$A_0 \equiv E_0 + D_0 \quad (1)$$

where A_0, E_0 and D_0 are the initial values (i.e. price times quantity) of assets, equity and debt. Leverage can be defined in various ways (see Section 4 for the robustness of our results to different definitions of leverage). It is always a measure of the proportion of debt-based financing. For ease of exposition, we define leverage L as debt to equity:

$$L_0 = D_0/E_0 \quad (2)$$

For ease of exposition, we assume that the initial prices of assets, debt and equity are 1, and that the nominal value of debt is constant. This allows us to define the effect of a change in asset prices and equity on balance sheet values:

$$A_t = (1 + g_t^a)A_0 = (1 + g_t^e)E_0 + D_0 \quad (3)$$

where subscript *t* is for time, *g* is the growth rate in the price of assets or equity, superscript *a* and *e* are for assets and equity respectively.

Substituting (2) in (3) gives:

$$g_t^e = g_t^a(1 + L_0) \quad (4)$$

If there is no initial leverage $L_0 = 0$ (i.e. only equity financing), the value of equity moves in proportion with asset prices. Leverage (i.e. debt-based financing) amplifies the effect of asset prices changes on the value of equity. Substituting (3) and (4) in (2), it follows that:

$$L_t = \frac{1}{(1+g_t^a(1+L_0))} * L_0 \quad (5)$$

This equation shows that the higher initial leverage and/or asset price growth, the more leverage subsequently will drop. This effect occurs because leverage amplifies the effect of asset prices on the value of equity.

The next question is how financial institutions would respond to such a change in their actual leverage. Individual institutions trade off private return r^e versus private risk (i.e. mainly credit and market risk). Leverage will amplify the impact of asset returns on the private return (Danielsson, 2013):

$$r_t^e = r_t^a + \left(r_t^a - r_t^d\right)L_t \quad (6)$$

Hence, the incentive to leverage up depends on the return difference of assets and debt.[2 3] For example, when low interest rates decrease funding cost (lower return on debt) and increase asset prices (higher return on assets), the effect of higher leverage on return on equity is stronger. A profit maximising bank will maximise its leverage for a given risk, when asset returns are higher than the cost of debt (asset boom), and vice versa (asset bust).

Adrian and Shin (2010) assume that financial institutions will actively manage their balance sheet by bringing back leverage to its initial level trough balance sheet adjustment. In fact, they show that this would even be a conservative assumption for the US investment banks, given that leverage was pro-cyclical for those institutions in the run-up to the financial crisis. Similarly, ESRB (2015) shows that leverage has been pro-cyclical at aggregate level in the EU banking system as a whole: increasing leverage before the financial crisis and deleveraging after the start of the crisis. More generally, Geanakoplos (2010) and Gersbach and Rochet (2014) indicate that measured risk is low (high) in good (bad) times, so that leverage and haircuts are low (high).

For ease of exposition, we use the conservative assumption regarding the behavioural response, and assume that a profit-maximising financial institution would 'only' bring leverage back to its initial level L_0.[4] Given that debt has a constant value in nominal terms, this allows the level of debt to grow with the same growth rate as the price change in equity:

$$D_t^b = (1 + g_t^a(1 + L_0))D_0 \quad (7)$$

where superscript b indicates that this is a behavioural response. Hence, this would produce a second round behavioural effect on assets:

$$A_t^b = (1 + g_t^a(1 + L_0))A_0 \quad (8)$$

This shows that the initial leverage amplifies the effect of asset price changes on assets. In principle, this can lead to adjustment in the level of assets or their price, depending on the price elasticity of supply. Insofar an increase (decrease) in asset prices leads to further price increases (decreases), this will set the same amplification process again in motion, and amplify the initial effects. This

[2] Note that banks can maximise profits in three ways according to (6). First, banks can increase leverage L_t, as analysed in this paper. Second, banks can reduce the funding costs r_t^d by increasing the maturity mismatch between assets and liabilities (for an upward sloping yield curve). Third, banks can increase the return on assets r_t^a by assuming more credit risk. Maturity mismatch and credit risk are other fundamental drivers of systemic risk next to leverage. Whereas maturity mismatch and credit risk are outside the scope of this paper, they are incorporated in our basic framework.

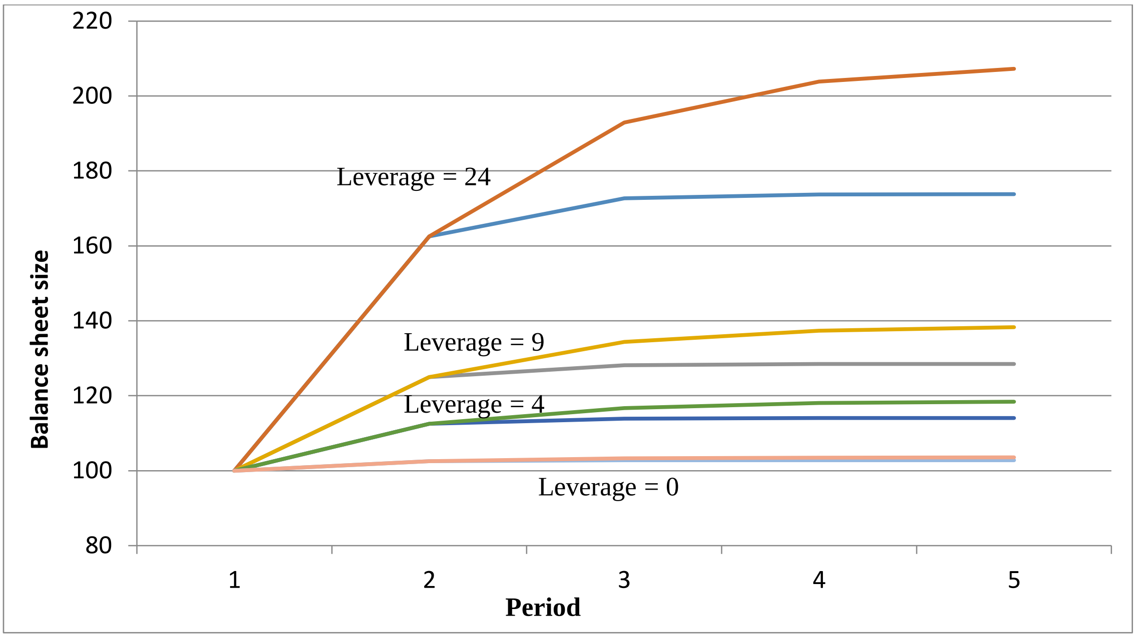
[3] An important distortionary factor is interest rate deductibility. As paid interest is deductible for corporate tax, corporates (both financial and non-financial) have a bias towards debt financing.

[4] Our assumption is a first approximation which will get close to the optimal solution. Danielsson, Shin and Zigrand (2012) solve the problem further in a setting whereby financial institutions react endogenously.

amplification effect is not internalised by profit maximising financial institutions. It leads to welfare-decreasing externalities that provide the basic justification for macroprudential regulation (e.g. Brunnermeier *et al*., 2009; Gersbach and Rochet, 2014).

Figure 1 illustrates the effect on a financial institution's balance sheet with leverage and feedback effects on asset prices. We assume asset price growth of 2.5 per cent in period 1, and a feedback effect of 0.1 and 0.3 in each period on the asset price growth rate in the previous period, so that it drops to zero in a few periods and the size of the balance sheet stabilises. Various levels of initial leverage are used: $L_0 = 24 = 96/4$; $L_0 = 9 = 90/10$; $L_0 = 4 = 80/20$. We also show the case of no leverage $L_0 = 0$. It is clear that the balance sheet expands very rapidly for higher levels of initial leverage, which shows that leverage can amplify asset shocks very strongly. In the extreme case of an initial leverage of 24, which is not uncommon for banks, an initial asset price shock of 2.5 per cent can cause an expansion of the balance sheet from 100 to 175 (feedback effect of 0.1) or even to over 200 (feedback effect of 0.3). In the moderate case of an initial leverage of 9, the asset price shock leads to an expansion from 100 to 130 and 140 respectively. Restricting maximum permissible leverage would dampen amplification.

Figure 1. Illustration of balance sheet growth with leverage and feedback on asset prices



Note: Assumed price growth is 2.5 per cent. The feedback effect is assumed to be 0.1 (lower lines) and 0.3 (higher lines) for each simulated leverage $L_0 = 0;\ 4;\ 9;\ 24$.

3. Stabilising the financial cycle

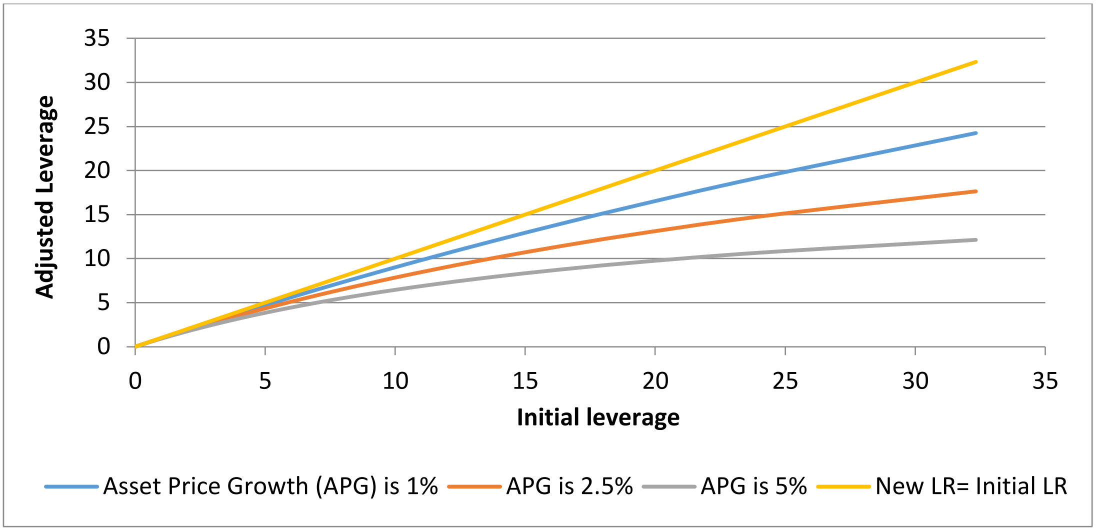
Various authors (e.g. Kiyotaki and Moore, 1997; Adrian and Shin, 2010; Brunnermeier and Sannikov, 2014) have highlighted the amplification mechanism, described in Section 2, using different terminology and different models. As a policy response, Brunnermeier *et al*. (2009) and Drehmann *et al*. (2010) propose a countercyclical capital buffer in banking, which has subsequently been introduced in the Basel III capital accord. Gersbach and Hahn (2010) discuss a new requirement for bank capital, which depends on total banking capital. Under this requirement a bank's required level of equity capital is monotonically increasing in the realised equity capital of the total banking system to alleviate pro-cyclicality. Gersbach and Rochet (2014) derive a countercyclical capital buffer requirement for banks. The main difference is that we do not restrict our analysis to banking only, which focuses on the countercyclical buffer to improve the resilience and minimise the probability of a financial crisis. Rather we highlight the general role played by debt financing as an amplifier of risk.

The justification for policy intervention in our model is that individual institutions do not internalise the second round effect of debt-based finance on the prices and quantities of assets. Gersbach and Rochet (2014) only highlight the price effect. Experience shows that financial cycles can lead to severe misallocation in the real economy. Gros and Alcidi (2013), for example, show the impact of the housing boom on construction (increasing from 15 per cent of GDP in 1999 to well over 20 per cent in 2006) and house prices in Ireland and Spain.

A stable leverage requirement will limit amplification in our framework, but will not stabilise the financial cycle. To do so, the leverage requirement should adjust in a countercyclical fashion to 'neutralise' the behavioural effect of the price changes.[5] The benchmark is the case in which policy would fully neutralise the financial cycle. The new maximum leverage requirement is given by equation (5). As indicated, its value depends on the percentage change in asset prices and initial leverage. Figure 2 shows the relationship between the cyclical regulatory leverage requirement that would be needed to stabilise the financial cycle and initial leverage, for asset price changes of respectively 1, 2.5, and 5 per cent (please note that these asset price changes are in excess of the rate of return on debt, which is set at 0 per cent). For comparison, the yellow line shows no policy change (adjusted LR = initial LR). Figure 2 indeed highlights that for higher initial leverage, the policy adjustment would need to be stronger. Our earlier example with extreme initial leverage of 24 ($L_0 = 24$) and asset price growth of 2.5 per cent ($g_t^a = 0.025$) leads to an adjusted leverage of 15 ($L_t = 14.8$), which is a decline of 38 per cent. In the case of moderate initial leverage of 9 and asset price growth of 2.5 per cent, the adjusted leverage drops to 7.2, a decline of 20 per cent. In sum, our model highlights a policy trade-off between lower (i.e. more restrictive) static limits on leverage and a stronger countercyclical adjustment.

[5] An important implementation issue is which asset price measure gives the right signal. Consumer price inflation is not sufficient as it only measures the prices of goods in the household basket. An appropriate asset price index needs to be constructed.

Figure 2. Cyclical regulatory leverage and initial leverage.



Note: The lines indicate the relationship between the adjusted cyclical regulatory leverage requirement (vertical axis) and initial leverage (horizontal axis), for each simulated asset price growth: $g_t^a = 0.01;\ 0.025;\ 0.05$.

4. Integrated application

The amplification mechanism of leverage is not only at work in banking, but also in other parts of the financial system. Brunnermeier and Pedersen (2009) and Gorton and Metrick (2012) show how very low haircuts facilitated the expansion of securities financing transactions, such as repos, in the run-up to the financial crisis. Similarly, Acharya and Schnabl (2009) illustrate how banks played the leverage game by securitising assets and moving them to special purpose vehicles with very high levels of leverage. Another example is housing finance, where mortgages were issued with high LTV ratios (Almeida *et al*, 2006).

As each sub-sector of the financial system uses its own terminology, regulators have followed suit with differing requirements, which gives rise to the boundary problem. Goodhart (2008) explains very vividly how business moves to another segment of the financial system with less or no requirements if regulatory requirements are increased in one segment. For example, during the run-up to the financial crisis, mortgage loans at the balance sheet of the banks were often transformed into residential mortgage-backed securities at special purpose vehicles (SPVs) that were subject to lower regulatory requirements. And in recent years, the lightly regulated market for private equity investments in combination with leveraged loans or leveraged buy-outs has been booming in the context of search for yield. In physics, the phenomenon that activities 'flow' to the least constrained segment is known as the law of communicating vessels. The obvious way to get an equal level of fluid in connected vessels is to 'harmonise' the pressure across the vessels. The alternative is trying to disconnect the vessels, which is less successful in finance as financial innovation is often able to arbitrage across the segments of the financial system. Time-variation in the intensity of macroprudential regulation intensifies the boundary problem.

Merton and Bodie (2005) propose a functional approach, which implies that profit-maximising financial institutions adapt to inefficiencies. When applied to regulation, it implies that institutions react to entity-based regulation. The primary function of the financial system is an efficient allocation of resources. In this context, an integrated rather than entity-based approach to regulate leverage is necessary to stabilise the financial cycle across the financial system as a whole. Regulating leverage would help to prevent misallocation of resources from cyclical fluctuations, as explained in Section 3.

Before discussing regulatory requirements, we need to harmonise the terminology on leverage. Leverage – i.e. the proportion of debt financing - can be defined in different ways. Under the Basel III capital requirements, the leverage ratio for banks is[6]:

$$LR = \frac{Equity}{Total\ Assets} \tag{9}$$

Using (1) and (2), we get $L = 1/LR - 1$. The leverage ratio can be used for any type of debt financed financial institution, such as banks, special purpose vehicles (SPV), or hedge funds.

Moving to financial markets, Figure 3 illustrates the elements of a collateralised transaction, such as securities financing transactions (e.g. repos) or mortgages. As the value of assets can vary due to credit and market risk, the transaction is typically 'overcollateralised', whereby more assets are provided than the underlying loan (debt). This excess is called a haircut:

$$Haircut = \frac{(Asset*price) - Debt}{Asset*price} = \frac{Equity}{Asset*price} \tag{10}$$

Figure 3. Collateralised finance

Assets	**Liabilities**
Asset*Price *(collateral)*	Equity Debt

Housing finance is using its own terminology. A typical indicator used by mortgage providers is the loan-to-value ratio, which is defined as follows:

$$LTV = \frac{Debt}{Asset * price} \tag{11}$$

Comparing the different yardsticks for leverage, we get the following relationship:

$$LR = Haircut = 1 - LTV \tag{12}$$

To align our terminology with Basel III, we propose to use the leverage ratio, which is defined as a

[6] We abstract for now from definitional issues, such as the Basel III definition for total exposure in the denominator of the LR.

minimum equity requirement, as the basis for a system-wide regulatory leverage requirement. This is equivalent to a maximum debt financing requirement, as discussed in Section 3. The haircut also uses the minimum equity requirement. Using (12), the maximum allowed loan under the LTV ratio can easily be translated into a minimum equity requirement.

An integrated approach would imply that static leverage ratio requirements and/or their countercyclical use (depending on policy preferences as regards their trade-off) are applied to debt-based financing across the financial system. This excludes entities or activities that are fully or largely financed by equity, such as mutual or investment funds. It also excludes entities or activities that are financed by premiums instead of debt, such as insurance companies and pension funds. Leverage ratio requirements would only be applied once debt financing of assets surpasses a certain limit, so that it would only apply to entities and activities that are highly debt financed.[7]

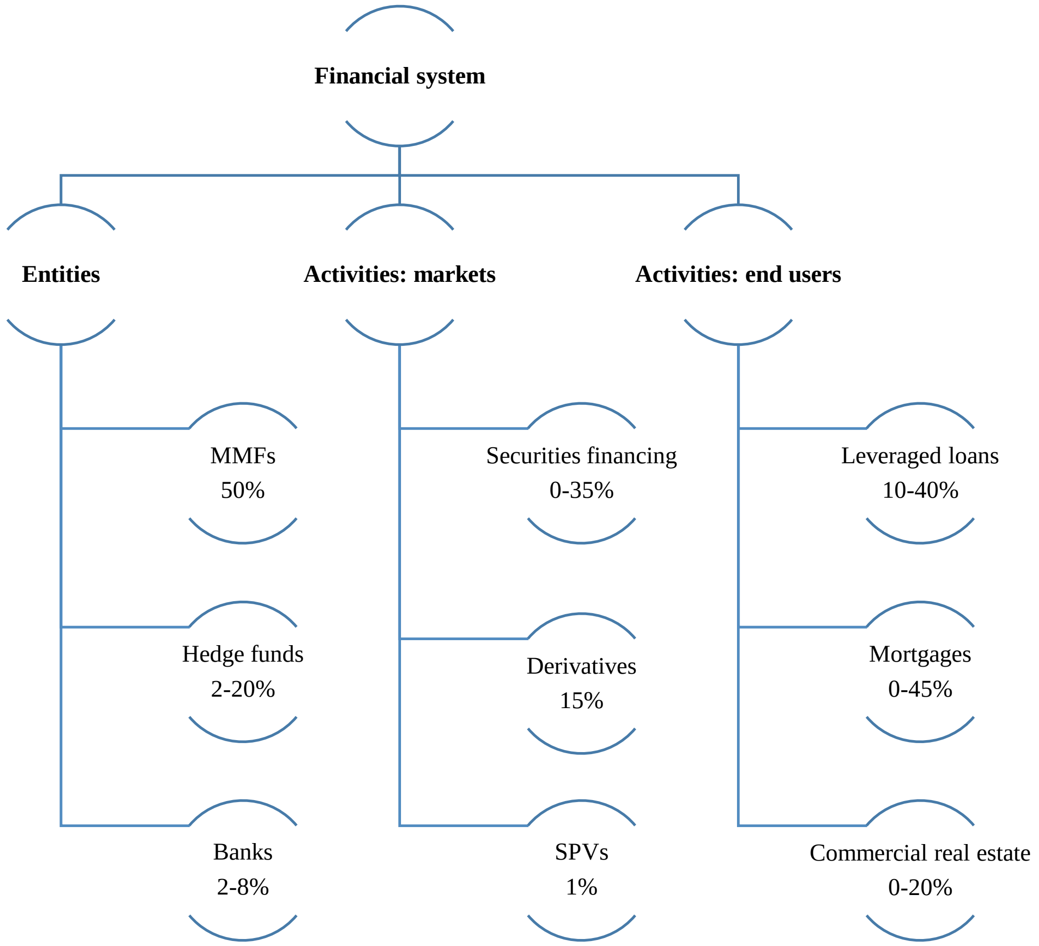
Microprudential regulation attunes the leverage ratio for each (regulated) segment to the underlying risk for an individual institution or market. The haircut for a repo transaction with a US Treasury is typically lower than that for a transaction with an asset backed security (ABS). Figure 4 summarises the observed leverage ratio in important segments of the financial system that rely strongly on debt-based financing, which can be divided in entities and activities. Given the differences in the underlying risk, we find a wide range of leverage ratios across the financial system from 1 per cent for special purpose vehicles to 50 per cent for money market funds. Some segments are already subject to the possibility of regulation on leverage, such as banks (Basel III), hedge funds and private equity (the so-called Alternative Investment Fund Managers Directive (AIFMD))[8] and LTV restrictions at national level. Other parts are under discussion, such as haircuts on securities financing transactions. Our policy proposal would be to develop an integrated approach.

Such an integrated approach would address the migration of highly leveraged activities due to regulatory arbitrage. Some of the segments in Figure 4 are dependent and endogenous to other segments. As discussed above, there is an endogenous link between the leverage ratio for banks and SPVs, when banks are considering loan securitisation. Other links are those between private equity and leveraged loans and between leverage ratios for banks and securities financing transactions (especially the repo market).

[7] The authors would like to thank Charles Goodhart for pointing out the difficulties of a financial system-wide application that would include insurance companies, pension funds, mutual funds and the like.

[8] Under the AIFMD, debt exposure contained in a financial structure controlled by a private equity party is included in the calculation of leverage. In Figure 4, these debts are listed under leveraged loans.

Figure 4. Leverage ratios across the financial system.



Note: The numbers are indicative and reflect the observed leverage ratios (defined as equity divided by total assets) for each segment of the financial system.
Source: The appendix details the data sources.

Sections 2 and 3 introduce the role of a minimum leverage ratio to dampen the financial cycle, possibly supported by a time-varying use to stabilise it further. This macroprudential requirement should override the microprudential requirements, as the stability of the financial system is more important than that of the individual components (Kremers and Schoenmaker, 2010). Moreover, the macroprudential requirement internalises the endogenous effects of leverage (Brunnermeier and Sannikov, 2014). We illustrate our integrated approach with a hypothetical example of a minimum leverage ratio requirement of 10 per cent at the macro level (which is equivalent to a leverage of 9 in Figure 1).[9] This 10 per cent would then serve as a minimum across all debt financed financial system

[9] Our levels for leverage in Figure 1 are related to proposals in the literature. The current low leverage ratio requirement of 4 per cent (equivalent to a leverage of 24) relates to the new Basel III leverage ratio of 3 per cent plus 1 per cent (several countries, such as the Netherlands, Sweden, Switzerland, the UK and the US, have increased the minimum leverage ratio). The moderate leverage ratio requirement of 10 per cent (equivalent to a leverage of 9) is calculated as optimal by Miles *et al* (2013). The higher leverage ratio requirement of 20 per cent (equivalent to a leverage of 4) is proposed by Admati and Hellwig (2013).

segments. The 10 per cent minimum would aim to dampen the financial cycle, while addressing the boundary problem. In individual segments, the minimum leverage ratio could be higher if and when micro considerations require a higher minimum requirement. A case in point is mortgages, where several countries have implemented a 20 per cent minimum requirement (i.e. a maximum LTV ratio of 80 per cent) to contain the housing boom bust cycle.

The common minimum leverage ratio would also solve the boundary problem. In its approach to shadow banking, the FSB (2014) proposes, for example, different haircut floors for different types of securities (corporations, securitised products) and for different maturities. First, the approach is partial, as it formulates haircut floors for '*non-centrally cleared securities financing transactions in which financing against collateral other than government securities is provided to non-banks'* (FSB, 2014, p. 4). Next, the different haircut floors may lead to shifts in business and thus be less effective in reducing the overall risk in the financial system.

5. Discussion and conclusions

The current approach to regulation relies on equity buffers based on unexpected losses arising from exogenous risks. This is a reactive policy aimed at increasing the resilience of the financial system to withstand shocks. It is also a piecemeal approach, with varying requirements across the financial system. The variation gives rise to the boundary problem, which suggests that financial activities move to the segment with the lowest (or no) regulatory requirement (Goodhart, 2008). This in turn reinforces the regulatory dialectic between regulators and industry.

This paper proposes to restrict the role of debt financing as an amplifier within the financial system. This is a proactive policy aimed at dampening the financial cycle by preventing the endogenous building up of financial imbalances. Unsustainable financial imbalances are the heart of most financial crises, including the recent Global Financial Crisis (Reinhart and Rogoff, 2009). The debt restriction (or minimum equity requirement) would not only apply to banking, but across the financial system. It would address the substitution effects and shifts in risk due to the higher Basel III capital requirements. Its application is subject to a trade-off between lower static limits on leverage and a stronger countercyclical response.

We recognise that the implications of a system-wide minimum leverage ratio requirement would be far reaching. The macro requirement would call for higher leverage ratios (i.e. lower leverage) than currently observed. It could in principle be supported by a time-varying use, beyond the modest countercyclical capital buffer of up to 2.5 per cent of risk-weighted assets under Basel III. Calibrations are needed to determine the exact level of the minimum leverage requirement versus the optimal range of cyclicality.

In the broader policy framework, corporate tax codes favour debt over equity, giving an incentive to debt financing. A more equal tax treatment regarding debt and equity would also help to reduce the level of leverage.

There is no silver bullet to making the financial system failure proof. Our integrated approach is a contribution to the evolving thinking on the appropriate design of financial regulation. Nevertheless, we fear that current attempts of expanding regulation beyond the core banking system may lead to a patchwork of regulations, which may overregulate the financial system with limited effectiveness.

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Data appendix

Table A.1 shows an overview of typical leverage ratios and sizes of various financial entities and activities. The leverage ratio (defined as equity divided by total assets) is calculated for the total segment; a range for the leverage ratio is provided where possible. The data is compiled from various publicly available sources, including ECB, BIS, FSB, ICMA, ISDA, ISLA and TheCityUK. The figures on balance sheet and market sizes correspond to the latest available data points, typically at the mid or end of 2014. When available, we present the data at the level of Eurozone. In other cases, we present the values at the global level (e.g. derivatives, private equity and leveraged loans).

Table A.1 Leverage ratios across the financial system.

Entities *Leveraged balance sheets*			**Activities** *Leveraged vehicles and transactions*		
Type of entity	**Range LR**	**Balance Sheet Size**	**Type of vehicle or transaction**	**Range LR**	**Market Size (Securities Outstanding)**
Private equity (note: often through institutional investors)	100% for PE itself (note: the significant amounts of debt for the LBO come from third sources)	246 billion USD invested globally (as of 2011) Source: TheCityUK PE 2012 Survey.	**Equity and debt securities**	Not applicable	22.6 trillion EUR (Eurozone) Source: ECB SDW 2015
Investment funds / asset managers	Not applicable (note: paid-in fund shares represent 80%-95% of IVs' balance sheet size.) Source: ECB SDW 2015	9.4 trillion EUR (Eurozone) Source: ECB SDW 2015	**Securities financing**	0%-35% during upswing of financial cycle; 1% to 100% during financial crisis; (note: ranges depend on the quality of collateral.) Source: Gorton and Metrick (JFE 2012)	5.5 trillion EUR (Eurozone), Source: ICMA Repo Market Survey 2013
Money market funds	Around 50% Source: ECB SDW 2015	942 billion EUR (Eurozone) Source: ECB SDW 2015	**Derivatives**	About 15% (estimate based on the amount of collateral in circulation (3.6 trillion USD globally) in the uncleared OTC derivatives as a fraction of the total market value of uncleared OTC derivatives. Source: ISDA Margin Survey 2012	OTC Derivatives: 24 trillion USD in market value (Global coverage) Source: BIS OTC Market Survey
Insurance companies	Around 7% (note: liabilities do not represent debt-based financing) Source: ECB SDW 2015	6.8 trillion EUR (Eurozone) Source: ECB SDW 2015	**Mortgage loans (to households)**	0% to 45% (Eurozone country averages in 2013) Source: ESRB RRE Report (*forthcoming*)	3.9 trillion EUR (Eurozone) Source: ECB SDW 2015
Pension funds	Around 7% (note: liabilities do not represent debt-based financing) Source: ECB SDW 2015	2.2 trillion EUR (Eurozone) Source: ECB SDW 2015	**Commercial real estate loans**	0% to 20% (note: data available for a few countries only) Source: ESRB CRE Report (*forthcoming*).	1 trillion EUR (Eurozone) Source: ESRB 2015 CRE Report, Table 2
Hedge funds	2% to 20% (note: LR measured as net-asset-value scaled by gross notional exposure.) Source: FCA 2014	258 billion EUR (Eurozone) Source: ECB SDW 2015	**Financial Vehicles (including SPVs/SPEs)**	1.2% (Euro area, 2014) (note: around 0% in most countries, and resp. 8% and 27% in two countries) Source: ECB SDW 2015	1.8 trillion EUR (Eurozone) Source: ECB SDW 2015
Commercial / universal / investment banks	2% to 8% Source: BCBS 2015	30.2 trillion EUR (Eurozone) Source: ECB SDW 2015	**Leveraged loans (to corporates) / Leveraged buy-outs**	10%-40% Source: Kaplan and Stromberg (Journal of Economic Perspectives 2008)	248 billion USD (global value of transactions in 2012) Source: TheCityUK PE 2012 Survey.