

A liquidity-based approach to macroprudential policy¹

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Introduction

It is widely recognised that an excess of credit caused the financial crisis. In the future, one objective of macroprudential policy will be to regulate the financial cycle in order to prevent the disruptions associated with booms and busts. Tools have been available for a long time to regulate credit in specific sectors or categories, such as loan-to-value or loan-to-income ratios, as well as margin requirements. New instruments are now being developed at the aggregate level, first of all the countercyclical capital buffer. All share a common feature: they rely exclusively on the direct control of leverage.

This paper argues for a different approach, based on liquidity and maturity transformation inside and by the financial sector. Basel III has introduced liquidity ratios that will play an important role alongside capital requirements. But there is an asymmetry. Whereas capital ratios have a cyclical component (through the countercyclical buffer), this is not the case for liquidity requirements, that are fixed and unchanged over the cycle.

This may be a source of inefficiency. Financial cycles are created by the interaction between leverage on the one hand and maturity transformation on the other. In this process, maturity transformation is often the main driver. Without maturity transformation, leverage would not be profitable, and often not possible.

Macroprudential measures that would act directly on liquidity and maturity transformation would therefore be more effective. Since maturity transformation by banks involves money creation, they would also make interaction with monetary policy more palatable and, ultimately, easier to manage. The framework and tools for cyclically regulating liquidity inside the financial system are currently available. They may prove especially appropriate over the next period when the balance sheets of Central Banks are expected to stay large in proportion of their GDP.

Regulation through leverage: an imperfect cyclical tool

The cyclical component in the behaviour of leverage is well documented. It is associated with the measure and perception of risk (Adrian and Shin (2008)). It seems, therefore, natural to counteract this natural procyclicality by moving capital

¹ I am deeply indebted to Philip Turner for numerous suggestions, advice and guidance in preparing this paper. He suggested many new ideas and improvements. All errors are mine only.

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requirements over time. This is the rationale for the countercyclical capital buffer created by Basel III.

If successful, the benefits of this approach would be significant for financial stability, but also, for monetary policy. As noted by Philip Turner in this volume, acting independently on the credit channel would give monetary policy an additional degree of freedom – and efficiency. It would enable authorities to target domestic demand more directly, thus avoiding unwanted side-effects that monetary policy triggers through exchange rate appreciation or depreciation.

Practically, however, it is doubtful that aggregate leverage control can be efficiently used to smooth out the credit cycle. There may be three difficulties.

First, coordination problems will arise. Cecchetti and Kohler (2012) show that capital requirements and interest rates are perfect substitutes as monetary tools. There is a distinct possibility that monetary and macroprudential policies pull in opposite directions, thereby nullifying each other and creating unwanted side-effects in the financial system.

Second, there is considerable uncertainty about leads and lags. Under Basel III, banks will have up to 12 months to comply with a countercyclical buffer. How much longer will it take to effectively act on credit distribution? We don't really know. There is not enough experience to assess the elasticity of credit aggregates to changing capital requirements. Recent attempts to act more directly on the marginal capital ratio through "funding for lending" schemes (that carried zero capital requirements for new credits) have not been considered as fully successful.

Finally, there is a calibration issue. The denominator of capital ratios is composed of long-term (slow rotation) assets. Cyclical changes in the overall capital requirements will therefore imply brutal adjustments in new credit flows. This may inhibit authorities in effectively implementing the necessary measures. It could be argued that countercyclical capital requirements are rule-based; and therefore, banks will anticipate their evolution and adjust *ex ante* their credit behaviour. However, rules will necessarily refer to aggregate (credit) quantities. To determine its lending capacity, each bank will have to assess the behaviour of all other intermediaries. In a competitive environment, this will open the way to many strategic interactions and multiple equilibria.

Taking into account those difficulties, it may be more efficient to affect the cyclical component of leverage at the levels of sectors and credit instruments – through haircuts, loan-to-value ratios and minimum margins. Geneakoplos (2010) lists several advantages of such an approach. Different securities include different amounts of "embedded leverage". The leverage of an investor is often a meaningless number, for instance, when losses reduce equity and arithmetically increase leverage (additional prudential action may, in this case, aggravate the situation). A focus on securities leverage would lead to better control of derivatives. More generally, it is harder to hide securities leverage than investor leverage.

Aggregate capital ratios should best be used to fulfil their essential function, that is, as buffers against unexpected losses. And cyclical regulation of credit may be better achieved by other tools.

The next section will make the case that liquidity – and maturity transformation – dynamics are an important – maybe dominant – driver of the credit cycle. Therefore, if authorities were able to cyclically "regulate" liquidity, they may have a powerful tool to prevent the build-up of financial imbalances.

Maturity transformation³, liquidity creation and the financial cycle

Maturity transformation is a permanent fixture of modern financial systems. Without maturity transformation, it would be impossible to reconcile the preferences of savers and investors. Capital allocation in the economy would be extremely inefficient. Maturity transformation also carries specific risks and is the source of major fragilities and negative externalities (runs on short-term liabilities possibly leading to fire sales of illiquid assets). Whatever their underlying causes, all crises develop, start and amplify through a breakdown in intermediation and maturity transformation. The last one was no exception.

There are good reasons, therefore, to regulate maturity transformation. Basel III has marked major steps forward with the creation of the Liquidity Coverage Ratio (LCR) and the Net Stable Funding Ratio (NSFR). Both ratios, in effect, put quantitative limits on maturity transformation performed by a specific bank. They do not, however, allow for cyclically adjusted constraints or requirements. While they permanently strengthen the resilience of individual institutions, it is not their objective, nor their effect, to prevent the build-up of excessive maturity transformation across the system. Nor do they provide an effective protection against aggregate liquidity shocks, affecting a large set of financial intermediaries.

From a cyclical perspective, it is useful to think of maturity transformation as a service provided by the financial sector. For that service, there is a demand, a supply and a price. The question then becomes: where to apply regulation. As mentioned, Basel III ratios act by quantitatively controlling the supply of maturity transformation by the banking sector, therefore potentially repressing demand. Such interventions may lead to unintended consequences. Maturity transformation may migrate to other, less secure, parts of the financial system. Or the equilibrium could be reached at a distorted price. Since that price can be measured as the spread between safe/liquid and risky/illiquid assets, mispricing appears under different guises. For instance, safe assets can be overpriced and yield returns that would be abnormally low. Alternatively, the spread required to perform maturity and risk transformation could be very high, so that only those long-term (risky) investments with very high expected returns would be undertaken. Excess demand for maturity transformation would ultimately show up as insufficient physical investment. These are all symptoms currently observed in advanced economies. Indeed, one possible interpretation of the so-called disconnect between economic and financial risk taking, could be an insufficient supply of maturity (and risk) transformation. Reaching a proper equilibrium, therefore, is a matter of great importance for policy makers aiming at the best possible trade-off between efficiency and stability in the financial system.

A comprehensive analysis of the demand for – and supply of – maturity transformation is beyond the scope of this paper. We are interested here in the cyclical variations in maturity transformation that may fuel the dynamics of leverage and, more generally, the financial cycles. From that perspective, an essential component is the capacity of financial intermediaries to create "inside" liquidity by

³ Here, the words "maturity transformation" are used in a very loose sense, to designate three possible transformations: from short-term to long-term; from safe to risky; and from liquid to illiquid assets.

engaging into money creation or reciprocal transactions, and, in the process, expand or contract their balance sheets.

Modalities depend on the specific features of financial intermediation. Banks create deposit money. They also issue short-term instruments that are accepted by other financial intermediaries or non-financial entities. The process is commonly known as "funding". In economies where "shadow banks" and securitisation play an important role, financial intermediaries permanently both issue and trade very short-term debt instruments especially through repo markets operations. Intermediation is organised through a "long chain" of financial institutions, with new liquidity created at each and every step, together with progressive maturity transformation. That mechanism allows maturity transformation and, at the same time, fuels leverage. As a result, "an important fraction of private money creation now takes place entirely outside of the formal banking sector, via the large volumes of short-term collateralised claims created in the "shadow banking" sector" (Gorton and Metrick (2010)).

This process drives the endogenous expansion of balance sheets. If funding is easy, maturity transformation is inexpensive and can seem riskless. As a consequence, leverage grows. It is therefore no exaggeration to say that liquidity drives leverage.⁴

Inside liquidity itself moves endogenously with risk appetite. This is well documented in recent research. To quote Brunnermeier (2014): "funding is not an input". It results from a dynamic process depending on the (time-varying) propensity of intermediaries to take counterparty risk on each other. When inside liquidity dried up during the crisis, credit stopped. Because it depends on risk perception and appetite, there is also a strong "cyclical" component in inside liquidity and this cyclical component is subsequently reflected in the evolution of leverage.

As a result, the consolidated balance sheet of the financial sector can expand or contract for a given level of the policy interest rate. In turn, it can be shown the size of the financial system's balance sheet determines credit, risk premia, asset prices and overall financial conditions (Adrian and Shin (2010)).

From a monetary policy point of view, money (and credit) multipliers may be highly unstable as leveraging and de-leveraging take place independently of policy rates. Money creation and interest rates can be disconnected and "In this richer environment, monetary policy as it is conventionally practised is generally not sufficient to rein in excessive money creation" (Stein (2011)). From a macroprudential perspective, the main takeaway is that the dynamics of inside liquidity and maturity transformation ultimately drive leverage and the financial cycle. It is therefore natural to look at the possibility and modalities of regulating liquidity and maturity transformation in a countercyclical fashion.

An elastic supply of maturity transformation

Borrowing from monetary theory literature, it may be said that the supply of maturity transformation must be elastic enough, but not too much. It has to be elastic because

⁴ One would conjecture further that *expectations* on the availability of future funding liquidity drive decisions on leverage.

the demand itself is time-varying. But excesses should be avoided, because they can lead to dangerous financial fragility.

An elastic supply of maturity transformation would perform a double function. One is monetary stability. Maturity transformation, when done by banks, frequently involves money creation. Too low maturity transformation may therefore lead to insufficient supply of money and deflation (Brunnermeier and Sannikov (2014)).⁵ The other is financial stability. An excess supply of maturity transformation may create financial fragility.

In theory, there should be, at any point in time, an optimal level of maturity transformation that would balance the benefits in efficiency against the costs in terms of financial fragility. In practice, the optimum has to be found by trial and error. For that reason, it is important for the authorities to have the tools to regulate permanently the amount of maturity transformation in the economy.

Two sets of such tools are potentially available that will be discussed in the following sections.

First, Central Banks can step in and use their balance sheets to undertake maturity transformation on their own. They have done so extensively during the crisis. An important question is whether, with very large balance sheets, this may become a more permanent feature for managing the interactions between price and financial stability.

Second, Central Banks may influence the price of maturity transformation by creating a "tax" through an appropriate system of reserve requirements and liquidity provision.

The Central Bank's balance sheet as a financial stability tool

By nature, all Central Banks are engaged into maturity transformation. This role has traditionally been marginal in the economy, as their balance sheets – and the volume of reserves kept by banks – were small in proportion of the overall size of the financial sector. In many countries, the access of financial intermediaries to the central bank balance sheet is restricted. Open market operations have generally been very short-term.

Following the crisis, those balance sheets have considerably expanded and are now commensurate with the size of annual GDP. In addition to traditional refinancing operations through repos, Central Banks have purchased long-term (and sometimes risky) assets in implementing unconventional monetary policies. Through various new facilities, they gained direct access to (until then) remote parts of the financial system. In that new environment, the role of Central Banks in financial intermediation and maturity transformation can hardly be ignored.

From a monetary policy perspective, the consequences are significant. Through the asset side of their balance sheets, Central Banks have triggered portfolio rebalancing in the private sector and exerted significant influence on term premia,

⁵ Well-capitalised banks are therefore a necessary – maybe not sufficient – condition for an elastic supply of maturity transformation

long-term rates and overall financial conditions. Although the precise quantitative impact remains a matter for discussion and debate, the existence and direction of such effects are widely recognised.

The financial stability impact is as important, if less advertised. Central Banks are the ultimate issuers of safe and liquid assets. For many decades, before the crisis, this liquidity provision function had been "passive" as Central Banks accommodated the demand for reserves at the policy interest rate. But, during and post-crisis period, the Central Banks' balance sheets have taken up an active role and carried out an intermediation function that the private sector was (temporarily) no longer capable of providing (Papadia (2014)). By actively providing outside liquidity, Central Banks have reduced the risk of market disruption, eliminated any uncertainty on funding and, ultimately, encouraged maturity transformation and risk taking by all financial intermediaries (both banks and non-banks).

That approach has worked well during the crisis. Will it continue to do so when the times come to exit unconventional policies? Exit can be done in a number of different sequences, starting either by raising policy interest rates or reducing the size of central bank balance sheets, or both. But exit to where? As noted by Turner (2015), there is no consensus on the "new normal" for the balance sheets of Central Banks. Broadly speaking, there are two sets of (intertwined) arguments. One is on the size of balance sheets: should Central Banks try to come back to pre-crisis levels? Or will they accept as permanent the situation created by the legacy of the crisis and expanded assets and liabilities. The other argument is about instruments: will, in the future, Central Banks keep a diverse set of (conventional and unconventional) tools, therefore acting on different parts of the financial system (including long-term bonds rates)? Or will they rely only on the short-term policy rate, coming back to the "benign neglect of the long-term rate" (Turner (2013)) that has prevailed until the crisis?

Those fundamental policy choices matter enormously, of course, for the implementation of monetary policy. They also matter for financial stability. The idea of using the Central Bank's balance sheet as a financial stability tool is not universally accepted. Many policymakers still consider Central Banks' expanded role in financial intermediation as a necessary, but temporary, evil. They long for a situation where interbank markets would return to their pre-crisis level of activity and functions. Other policymakers see merits for Central Banks in keeping expanded balance sheets for some time. From this perspective, an ample balance sheet is one way for the Central Bank to provide an elastic supply of safe asset (Bernanke (2015)) or, equivalently, an elastic supply of maturity transformation.

The possibility only exists, however, in (current) circumstances when there is an excess supply of reserves by the Central Bank. When reserves are in short supply, the Central Bank cannot easily control their amount (and the subsequent level of maturity transformation it provides) independently of monetary policy. It has to satisfy the demand for reserves at the prevailing policy rates if it wants to keep the interbank rate close to its objective. Therefore, banks are assured to get any reserve they need to compensate for shortfalls in funding. There is no effective brake on maturity transformation.⁶

Some freedom may be gained by implementing a "floor system" (Keister et al (2008)) whereby the policy rate is, in effect, the deposit rate. Provided reserves are

⁶ Other than the restriction on demand that may come from higher policy rates.

quantitatively sufficient to bring down the interbank rate to the floor, they can be increased or reduced without impacting the interbank rate. Liquidity provision is "divorced" from monetary policy. The same result can be achieved by remunerating reserves at the policy rate, in which case the remuneration of reserves serves as an effective floor to money market equilibrium.

However, from a point of view of financial stability, the freedom given by those schemes remains limited. These are still situations where the Central Bank is committed to meet any demand for reserves unless it is prepared to let a bank fail. In effect, the amount of Central Bank liquidity is endogenous to commercial banks' behaviour. This is the fundamental moral hazard issue raised by liquidity provision. If, at the prevailing policy rate, the amount of maturity transformation provided by banks is excessive from the point of view of financial stability, there is nothing the Central Bank can do *ex post* to correct this situation. The demand for reserves materialises after decisions on credit and funding have been made – and it has to be met. In effect, when bidding for liquidity against collateral, banks transfer part of their maturity transformation to the Central Bank. For individual banks, liquidity provision acts as an insurance against any difficulty they may encounter as a result of excessive maturity mismatch between their assets and liabilities. In such a situation, additional tools are necessary to regulate *ex ante* maturity transformation.

Reserve requirements and liquidity regulation

As underlined above, what is needed is a regime of liquidity regulation that allows for cyclical action on inside liquidity and maturity transformation. It turns out that basis for such a regime exists in the literature and that instruments are potentially available. It rests upon three pillars: first, the ability to impose reserve requirements on a broad range of short-term financial liabilities; second, the use of interest on reserves as a separate and independent tool; and, third, the ability of the central bank to set the monetary policy rate separately from the remuneration of reserves.⁷ The analytical foundations have been extensively developed in Stein (2012) and Kashyap and Stein (2012).

Reserve requirements (RR) introduce a wedge between market rates and funding costs. An intermediary that issues a short-term liability subject to RR would, in effect, pay an additional charge (a "tax"). The effective weight of the tax would depend on the reserve requirement ratio and the interest rate paid on reserves (that has to be lower than the policy rate).

In such a framework, the Central Bank would have three instruments available to pursue price and financial stability: two interest rates (the policy rate and the interest on reserves) and one ratio (on reserve requirements). Depending on the structure of the financial system, for a given (monetary) policy rate, the authorities could choose to move one or the other two instruments to counter unwanted cyclical movements in maturity transformation. By doing so, the Central Bank can *ex ante* make maturity transformation more or less expensive, with a very quick effect as, by assumption,

⁷ Most EMEs actually operate under such a kind of framework except for, in most cases, paying interest on reserves.

those liabilities are very short-term and would have to be rolled over at high frequency.

Further considerations on reserve requirements

Prior to the crisis, compulsory reserve requirements had basically been abandoned by Central Banks in most advanced economies. They continued to exist at low rates in some jurisdictions – in the euro area, in particular – as an accessory tool of short-term liquidity management, helping the Central Bank to create a permanent excess demand for reserves.

The demise of compulsory reserves can be attributed to several causes. They are seen as a distortionary tax on bank intermediation, thus pushing maturity transformation into other, less secure, parts of the financial system. They seemed to relate to an outdated intellectual framework: the simplistic "money multiplier approach" where controlling banks' reserves would also ensure control of the money supply and (with constant velocity) help achieve price stability. Finally, of course, in an era of (very ample) excess reserves, compulsory requirements may seem redundant and superfluous.

The approach developed here takes a totally different tack. First, compulsory reserves are used as a financial stability – not a monetary policy – tool. Second, there is no presumption of any stability of the money multiplier. On the contrary, as mentioned above, endogenous fluctuations in the multiplier are taken as a defining feature of contemporary financial systems. Influencing those fluctuations is therefore a major intermediary objective for macroprudential policy. Finally, interest is paid on reserves, but the rate of interest may differ from the policy rate that the Central Bank wants to target for monetary policy purposes.

Obviously there would be numerous technical, practical and legal difficulties in implementing such a system, especially in deciding on the perimeter of liabilities subject to reserve requirements.⁸ Also, regulators would give themselves the right to influence the relative costs of different sources of funding, and this may be seen as excessively intrusive. Yet, this is exactly what regulators have been doing recently with the creation of the LCR and NSFR. These new ratios have the same "taxing" and distortionary effect as compulsory reserves – with less transparency. And they will probably lead to a lasting increase in the demand for reserves as Gagnon and Sacks (2014) argue. But, how far the demand for reserves will rise when these new instruments come into force is unknown? This instrument uncertainty itself creates a case for considering more direct measures such as varying required reserves. As compared to quantitative ratios, reserve requirements can be introduced and changed flexibly. They can be made to vary according to risk (for instance, with higher reserve requirement ratios for short-term or foreign-currency deposits). Maturity transformation is now severely constrained by "quantitative" tools. Using compulsory

⁸ Maturity transformation may migrate outside the perimeter of reserves implementation. This is already happening as an increased share of maturity transformation is directly taking place on securities markets where there are doubts concerning market liquidity. This new kind of maturity transformation, however, is dissociated from leverage and raises different issues that relate to the overall fragility of the financial system rather than to its cyclical behaviour.

reserves in a flexible way would introduce a “price” component in liquidity regulation that would increase the overall efficiency of macroprudential policy.

Conclusion

Considerable progress has been made since the global financial crisis in strengthening the resilience of financial systems. New regulations have created or increased capital and liquidity buffers, in effect quantitatively constraining leverage and maturity transformation especially in “systemic” institutions.

This paper argues that those efforts could usefully be complemented by an additional “pillar” for macroprudential policy, with the objective of regulating the financial cycle, preventing the build-up of imbalances and reducing the risk of financial fragility. The best approach is to cyclically regulate liquidity creation and maturity transformation inside the financial system as, ultimately, they drive the dynamics of leverage and credit supply. Central banks have the necessary tools. They can use their expanded balance sheets to bring some elasticity in the supply of maturity transformation in the economy. They can also put a price on maturity transformation by financial intermediaries through a flexible use of reserve requirements and interest paid on reserves.

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