Multi-Polar Regulation

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The financial crisis has brought about a fundamental rethink of both the source and scale of systemic risk in the financial system and the regulatory framework needed to guard against them. The papers by Alter, Craig, and Raupach (this issue) and Kharroubi (this issue) speak to some of the risks and the regulatory response that might be most appropriate to mitigate them. But underlying both is a more fundamental question about the emerging framework for regulatory policy—multi-polar regulation. This commentary considers the impact and cumulative consequences of multiple regulatory constraints on banks' asset allocation. Using a simple framework, these effects are shown to be complex and interconnected. The impact of this regime shift, on analytical models and real-world behavior, remains largely uncharted territory. This defines a whole new, and exciting, research frontier.

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The financial crisis has brought about a fundamental rethink of both the source and scale of systemic risk in the financial system and the regulatory framework needed to guard against these risks. The papers by Alter, Craig, and Raupauch (this issue) and Kharroubi (this issue) speak to different types of systemic risk and the regulatory response that might be most appropriate to mitigate them.

The first paper discusses how best to calibrate the new systemic capital surcharges that will be applied to the world's largest, most complex banking organizations, using empirically calibrated network theory. The second discusses, in a theoretic setting, the externalities associated with inadequate holdings of private-sector liquid assets. Both are valuable additions to what is a burgeoning literature on the appropriate setting of, respectively, capital and liquidity regulation (for example, Admati and Hellwig 2013).

Yet underlying both is a more fundamental question about the emerging framework for regulatory policy. Post-crisis, what we have seen is much more than just a recalibration of existing regulatory tools. Rather, we have witnessed a regulatory regime shift from what might be described as *uni-polar* regulation, centered around risk-based measures of capital adequacy, to *multi-polar* regulation with multiple regulatory constraints at play.

I want to discuss the microeconomic rationale for such a multi-polar regulatory approach, before considering some of the behavioral questions it poses, both to policymakers and academics.

1. The Benefits of Multi-Polar Regulation

It is not difficult to see why regulation has moved in a multi-polar direction. The crisis brought home the real-world significance, and quantitative importance, of a number of frictions or externalities in the financial system. Many of these externalities had been identified prior to the crisis, both by academics and policymakers (for example, Brunnermeier et al. 2009). But experience during the Great Moderation, when both the economy and the financial system experienced remarkable tranquility, called into question their real-world significance. That meant these frictions, and their macroeconomic implications, did not attract widespread attention among either academics or policymakers.

It was well known pre-crisis that financial market liquidity has many of the properties of a public good: its collective benefit in ensuring the smooth functioning of financial markets outweighs the individual benefits from its provision (Cifuentes, Ferrucci, and Shin 2005, Haldane 2009). Its public-good nature gives rise to the possibility of liquidity being underprovided by the market when left to its own devices, particularly at times of crisis. There is a liquidity externality. That externality was exposed during the financial crisis, which generated an acute, widespread, and lengthy liquidity squeeze (Brunnermeier 2009).

There may also be externalities which operate on the assets side of banks' balance sheets. For example, the absence of funding due to a liquidity squeeze may prompt asset fire sales by banks and other financial institutions, exacerbating illiquidity pressures in financial markets in a procyclical loop (Brunnermeier and Pedersen 2009, Gai et al. 2013). Or it may prompt the truncation of credit provision by banks, causing a credit crunch which damages the wider economy in a procyclical loop (Aikman et al. 2014). Both of these negative externalities were in evidence during the crisis.

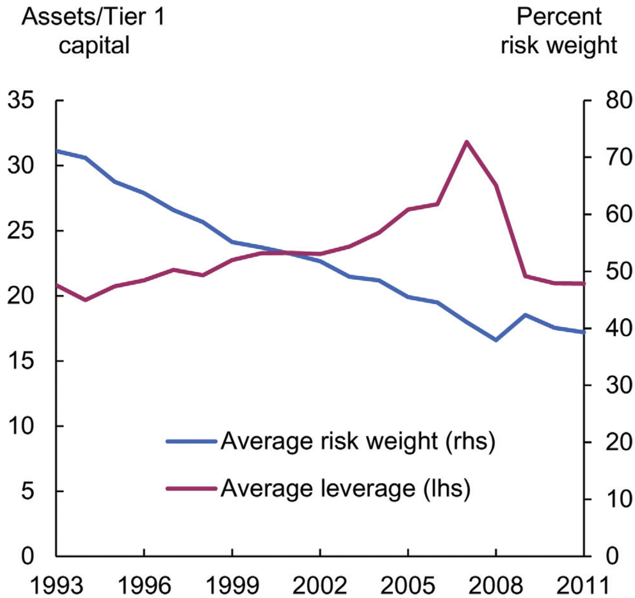
These procyclical loops, or negative externalities, in financial behavior are not confined to crises. For example, credit provision may also be procyclical during the upswing, generating a credit boom. This might arise, for example, because banks optimize over relative, rather than absolute, returns, causing herding in credit provision (Aikman et al. 2014). Or it may arise from banks suffering from collective disaster myopia (Gennaioli, Shleifer, and Vishny 2015). The pre-crisis credit boom appears to have been driven by both such financial frictions.

Highly interconnected systems are also often subject to externalities, specifically network externalities (Acemoglu, Ozdaglar, and Tahbaz-Salehi 2015). In financial networks, these might arise from default or margins cascades due to counterparty exposures (Gai, Haldane, and Kapadia 2011). These network cascades can result in even modestly sized shocks rippling through the system, in an amplifying wave thus having much larger, systemic implications (Haldane and May 2011). These network cascades, and associated tipping points in financial market dynamics, were a common feature during the financial crisis.

Finally, there are market distortions which arise as a result of policy interventions themselves. For example, intervention to support the (liquidity or capital) of a bank provides incentives to increase risk taking (Farhi and Tirole 2012). This moral hazard channel was particularly important, pre-crisis, for banks and other institutions deemed "too big to fail" (Alfonso, Santos, and Traina 2014). It generated private incentives for banks to inflate their balance sheets beyond levels that were optimal from a societal perspective (Haldane 2013).

A more subtle form of regulatory-induced market distortion arises from banks using their own internal models to generate risk weights in order to meet risk-weighted capital standards. This provides incentives to "game" these risk weights—to adjust them downwards to lower the regulatory hurdle (Haldane and Madouros 2012). For example, despite the rapid rise in pre-crisis leverage and risk

Figure 1. Average Risk Weights Since 1996



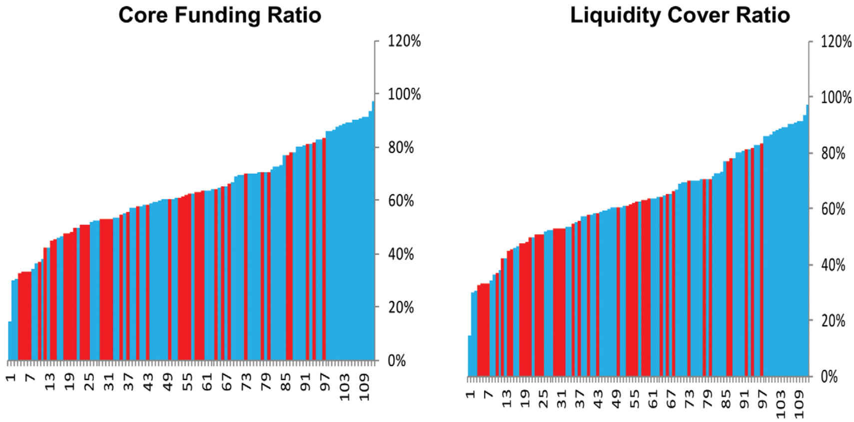
Source: *The Banker* and Bank of England calculations.

taking, measured risk weights fell secularly among the world's largest banks (figure 1).

The policy response to these various distortions within the financial system has been to apply the regulatory equivalent of the Tinbergen rule (Tinbergen 1952). This is to require that there be at least as many regulatory instruments as there are financial frictions. At least in some theoretical models, this approach is a sensible one. For example, something akin to the Tinbergen rule often emerges from modern dynamic stochastic general equilibrium models with financial frictions (for example, Smets 2014).

Prior to the financial crisis, there was no internationally agreed regime for liquidity regulation. Now there is, with a core funding ratio (the so-called net stable funding ratio) and a maturity mismatch ratio (the so-called liquidity coverage ratio) about to be implemented at an international level. This is an externality-based regulatory requirement, which recognizes both the public-good

Figure 2. Core Funding and Liquidity Cover Ratios



Source: Capital IQ, SNL Financial, published accounts, Laeven and Valencia (2010) and Bank of England calculations.
Notes: The classification of bank failure is based on Laeven and Valencia (2010), updated to reflect failure or government intervention since August 2009. Total assets have been adjusted on a best-efforts basis to achieve comparability between institutions reporting under U.S. GAAP and IFRS.

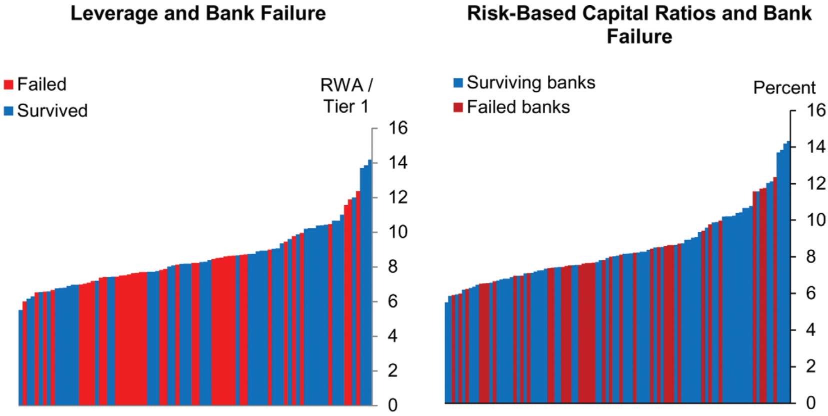
benefits of private liquid asset holdings and the moral hazard costs associated with public liquidity provision.

Figure 2 plots the core funding ratio and the liquidity mismatch ratio for a selection of the world's largest banks in the pre-crisis period. There is a strong correlation between these measures and the subsequent incidence of bank failure. In other words, had either regulatory measure been in place pre-crisis, it is plausible to think incidences of failure or stress among the world's largest financial firms would have been somewhat lower; the liquidity externality would have been to some extent internalized.

A second example of a new regulatory constraint, agreed at an international level, is the leverage ratio. Leverage ratios, too, are set to be implemented in the next few years. The motivation for introducing them was also externality based: as a safeguard against the funding liquidity risk associated with rapid balance sheet expansion, and as a bulwark against the gaming of risk weights (Haldane 2013).

Figure 3 looks at the leverage ratios of the world's largest banks in the pre-crisis period. As with liquidity ratios, there is a strong

Figure 3. Leverage and Risk-Based Capital



Source: Capital IQ, SNL Financial, published accounts, Laeven and Valencia (2010) and Bank of England calculations.
Notes: The classification of bank failure is based on Laeven and Valencia (2010), updated to reflect failure or government intervention since August 2009. Total assets have been adjusted on a best-efforts basis to achieve comparability between institutions reporting under U.S. GAAP and IFRS.

association between high leverage and subsequent bank failure (Haldane and Madouros 2012). Or, put differently, had leverage constraints been in place pre-crisis, it is plausible to think there would have been fewer failures among the world's largest financial firms during the crisis.

A third new regulatory constraint is the so-called systemic capital surcharge. In the future, this will be levied on the world's largest, most complex, most interconnected banking institutions. It has been proposed that these surcharges apply to each of the new solvency standards for banks—risk-based capital requirements (Basel Committee on Banking Supervision 2013), leverage requirements (Bank of England 2014), and total loss-absorbing capacity (TLAC) requirements (Financial Stability Board 2014a). The surcharges have been accompanied by a strengthening of resolution regimes, particularly for large, complex, cross-border institutions (Financial Stability Board 2014b).

These new requirements are intended to reduce the probability of failure among the world's largest banks and/or to reduce the systemic impact of their failure. In other words, they are intended to reduce the network externalities, such as default cascades and asset fire sales, otherwise associated with large bank failure. In that process, they should also reduce the moral hazard otherwise associated with institutions which are perceived as “too big to fail” (Haldane 2013).

A final, new set of regulatory requirements aims to lean against the externalities associated with procyclical credit booms and busts. Specifically, the capital conservation and countercyclical capital buffers have been agreed internationally as a macroprudential policy tool (Basel Committee on Banking Supervision 2009). The latter raises banks’ capital requirements in upswings to curb credit booms, and lowers them during downswings, to smooth out procyclical swings in credit.

In short, all of the elements of the new international regulatory framework can be seen as a response to a theoretically well-defined, and quantitatively important, set of financial externalities. Regulation has adhered to Tinbergen’s rule; it has become multi-polar.

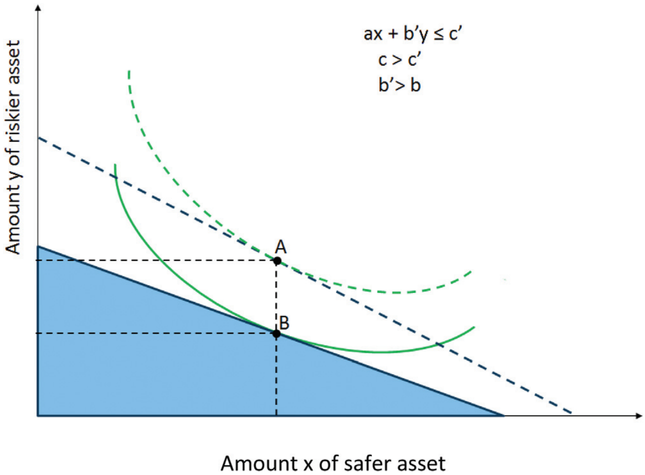
2. The Costs of Multi-Polar Regulation

Abiding by the Tinbergen rule is optimal in a world where both the financial system and the impact of regulation on it is reasonably well understood. In practice, there is considerable uncertainty, as distinct from risk, about the impact of these new regulatory constraints on banks’ behavior and business models, both individually and in combination.

It is possible to begin to explore the behavioral impact of these multiple regulatory constraints using a very simple, stylized model of banks’ decision making (adapted from Duffie 2013). In particular, imagine a bank making a portfolio decision between risky assets of amount x and safer assets of amount y (where $x + y = 1$). Risky and safe assets attract risk weights a and b to meet a risk-weighted capital requirement c (where $ax + by < c$).

For simplicity, it is assumed that a bank cannot raise extra equity capital to meet its requirements. Instead, when faced with regulatory constraints, it is required to adjust its asset portfolio, either

Figure 4. Higher Minimum Requirements



in aggregate or in the safe and risky assets mix. It is assumed that, at least in the short run, the Modigliani/Miller theorem is violated.[1]

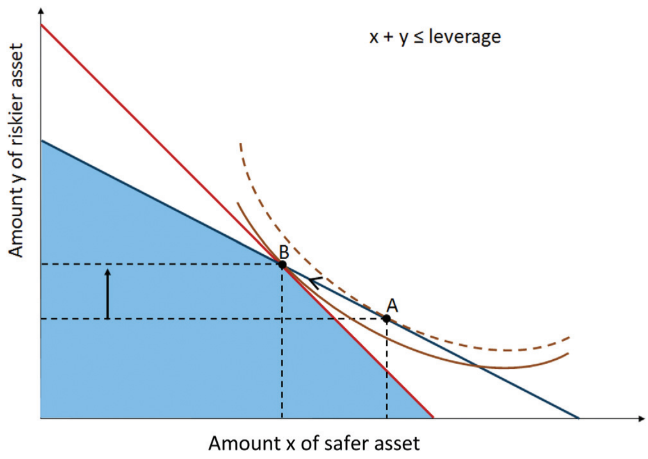
Imagine now that a new regulatory regime is introduced which both raises banks' average capital requirements ($c' > c$) and raises risk weights on banks' riskier assets ($b' > b$). This is, in effect, Basel III. The impact of this on banks' portfolio choice is shown in figure 4. Banks' asset opportunity set shifts inwards (reflecting higher capital requirements) and tilts (reflecting higher risk weights on riskier assets); it is now shown by the shaded area.

For given bank risk preferences, shown by the indifference curve in figure 4, banks' optimal portfolio allocation shifts from point A to point B. The introduction of Basel III has two effects: banks' overall asset portfolio shrinks and, within this, there is a shift in asset mix away from risky and towards safer assets.

Now imagine adding a second regulatory leverage constraint to the mix—a leverage constraint, l (where $x + y < l$). This differs from the risk-weighted capital constraint because safe and risky

[1]Clearly, if the Modigliani-Miller theorem applied, it is not clear that a bank would wish to adjust its assets rather than its liabilities (Admati and Hellwig 2013).

Figure 5. Adding Leverage Ratios



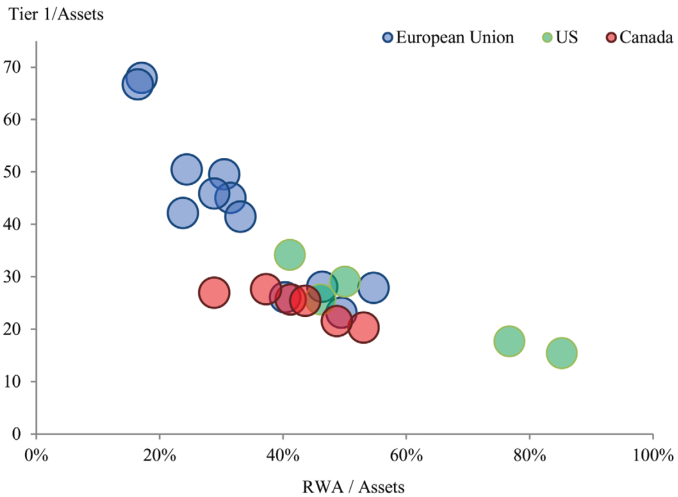
assets are now equally weighted. This leverage requirement constrains banks' asset opportunity set further, as shown by the shaded areas in figure 5.

The impact of leverage constraints on banks' portfolio behavior depends crucially on their risk preferences and, hence, business model. For banks with a high degree of risk tolerance, whose optimal portfolio allocation lies to the left of point B, the leverage constraint is slack; it has no impact on their optimal asset allocation.

For banks with a low risk tolerance, however, the impact can be more significant. For example, for a bank whose initial portfolio allocation is given by point A in figure 5, the effect of a leverage constraint is to cause them to shift to point B. This is associated not only with a smaller aggregate balance sheet but also with a shift from safe towards riskier assets—there is "risk shifting."

There is evidence, pre-crisis, of such risk shifting having been important. In particular, U.S. and Canadian banks that were subject to a leverage ratio requirement tended on average to hold assets with a higher average risk weight than European banks not subject to the leverage ratio (figure 6). More generally, the relative importance of risk-based capital and leverage requirements, and thus how it affects banks' portfolio allocation, will depend crucially on banks' risk preferences and business models.

Figure 6. Leverage Ratios and Risk Taking



Now consider adding a third regulatory restriction to the equation, a liquidity ratio, n, proportional to banks' assets $(d+e(x+y) > n)$ where d is a fixed liquid asset requirement and e defines its relationship to total balance sheet size. This further shrinks banks' opportunity set, to the shaded area shown in figure 7. Its impact on banks' portfolio behavior will again depend on their risk preferences. In the example in figure 7, the optimal portfolio allocation shifts from point A to point B.

This new equilibrium is associated not only with a smaller aggregate balance sheet but also with a portfolio switch towards safe assets—there is not "risk shifting" but instead "safety shifting." In other words, liquidity and leverage requirements may act in opposite directions in their impact on banks' risk-taking incentives, with the relative importance depending on banks' business model.

As a final example, consider the effects of dynamic, countercyclical adjustments in banks' capital requirements. In particular, imagine a credit boom which results in regulators raising banks' countercyclical capital buffers, in line with the new macroprudential framework of Basel III. Taken in isolation, this would cause banks' asset opportunity set to shift inwards and their asset allocation to move from point A to point B in figure 8.

Figure 7. Adding Liquidity Ratios

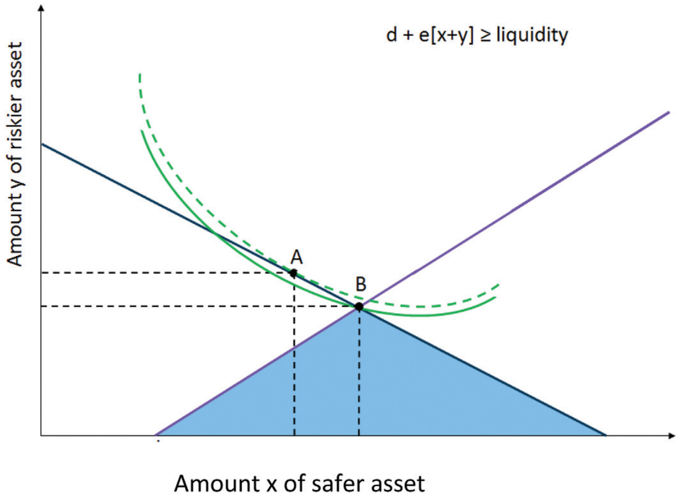
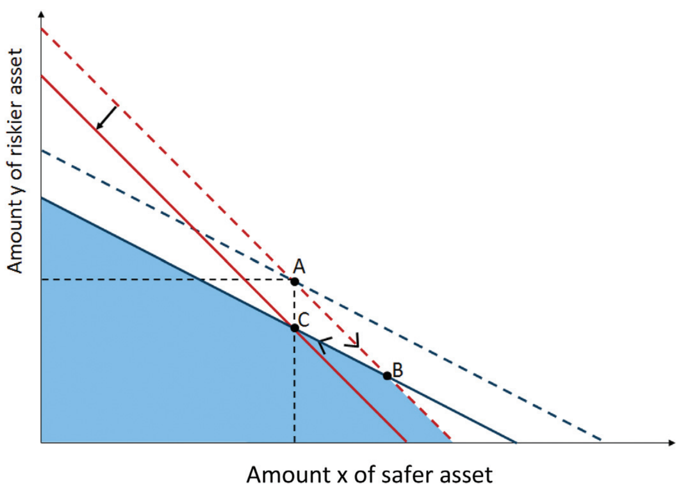


Figure 8. Dynamic Adjustment in Capital and Leverage



This is associated with a contraction in banks' balance sheets, but also a significant shift in banks' portfolio allocation towards safer assets—"safety shifting." While the former might be desirable, the latter is an unintended consequence of the interplay between risk-based capital and leverage requirements, the relative importance of which now switches.

If instead banks' capital and leverage requirements were adjusted proportionately, banks would move their asset allocation from point A to point C as countercyclical requirements are tightened. At point C, banks' balance sheets are constrained, but the mix of risky and safe assets is now broadly unchanged.

The avoidance of unintended changes in asset mix is one reason why some regulators have determined that countercyclical regulatory policy should be associated with proportionate movements in banks' leverage and risk-based requirements. For example, in 2014 the Bank of England's Financial Policy Committee (FPC) set out how it intended to make operational the Basel countercyclical capital buffer.[2] This will involve proportional movements in banks' leverage and risk-based capital requirements over the cycle.

The aim in setting out this analysis is not to provide a comprehensive account of how different regulatory constraints will affect banks' behavior, statically or dynamically. Rather, it is to show that these effects are complex and interconnected. While all of the new constraints are likely to constrain banks' asset opportunity set to some degree, their precise impact on asset allocation is likely to differ according to asset mix and risk preferences. On occasions, new regulatory constraints may have conflicting impacts on banks' portfolio choices.

3. Future Research and Policy Questions

What implications does this carry for future policy and research? On the research front, few macroeconomic models at present are well equipped to deal with the multiple financial frictions which played out during the crisis. This limits their usefulness for understanding the effects of multiple regulatory constraints on banks' behavior, much less the interconnections between these regulatory instruments.

This underscores the importance of continuing to develop coherent, optimizing models containing both banks and financial frictions.

[2]See Financial Policy Committee (2014).

These would enable the effects of multiple, interacting regulatory instruments to be evaluated. There has recently been some progress in that direction, with many of the frictions discussed earlier being examined individually. But it is early days in nesting these frictions in a common framework.

For policymakers, this analysis underlines the importance of carrying out a comprehensive, system-wide evaluation of the impact of new regulatory constraints on the topology of the financial system. For understandable reasons, reform has proceeded on a friction-by-friction, regulatory rule-by-rule basis. The system-wide impact of these multiple constraints now needs to be assessed.

Applying the Tinbergen rule has resulted in a considerably more complex regulatory architecture than any seen previously. This complexity is an understandable response to new risks. It may not, however, always be the ideal response to uncertainties resulting from the crisis and the regulatory response to it. Alternative, simpler regulatory approaches might be more robust to such uncertainty (Hansen and Sargent 2007).

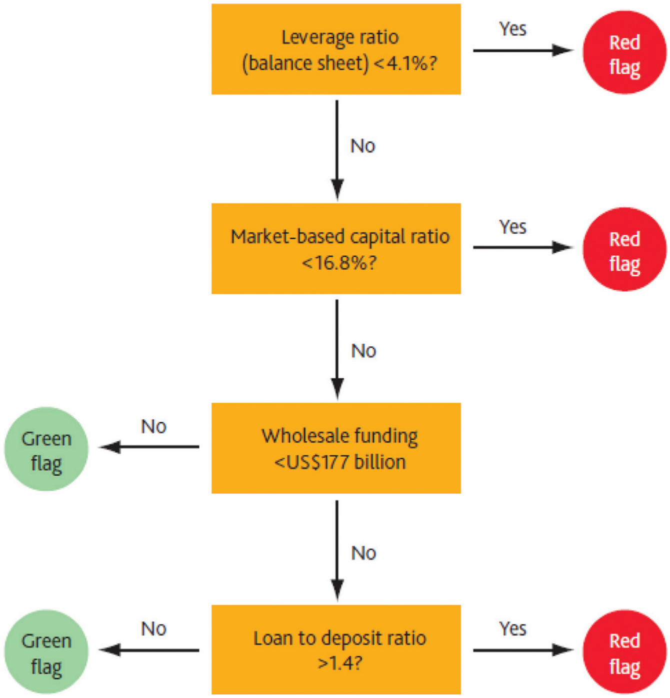
One such approach would to evaluate simple regulatory decision rules when assessing banks' vulnerability. One approach, which has been found valuable in such fields as medicine and law, is to use so-called fast-and-frugal trees (Gigerenzer, Hertwig, and Pachur 2011, Aikman et al. 2014). These are very simple decision trees for guiding regulatory intervention when there is considerable uncertainty about the true signal.

As one example, figure 9 shows a simple fast-and-frugal tree for assessing bank vulnerability. This involves a mix of solvency and liquidity metrics, calibrated to past experience. But these metrics are combined in a simple regulatory decision schema. While not fail safe, these simple heuristic approaches might be an effective regulatory cross-check on complex, discretionary approaches to evaluating bank risk.

4. Conclusion

Since the crisis, regulation has become multi-polar. But the impact of this regime shift on analytical models and real-world behavior remains largely uncharted territory. This defines a whole new, and exciting, research frontier.

Figure 9. Fast-and-Frugal Tree for Assessing Bank Vulnerability



Source: Aikman et al. (2014).

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