Discussion of "An Integrated Framework for Analyzing Multiple Financial Regulations"*

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1. Introduction

The global financial crisis of 2007–09 has spurred a renewed interest in the use of macroprudential policy tools. Indeed, the Basel III regulatory framework developed in the aftermath of the crisis features several such tools, including a macroprudential capital surcharge, a countercyclical capital buffer, and a liquidity requirement.[1] Following the impetus provided by the G20's November 2008 communiqué, international bodies including the International Monetary Fund, the Financial Stability Board, and the Committee for Global Financial Stability issued a series of studies developing macroprudential policy frameworks.[2]

In addition, legislative developments in response to the financial crisis have led to the establishment of institutional changes that allow for some degree of macroprudential policies. In the United Kingdom, the Bank of England's Monetary Policy Committee has been complemented by the Financial Policy Committee, which has

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[1] See www.bis.org/publ/bcbs187.htm and www.bis.org/publ/bcbs189.htm for a presentation of Basel III.

[2] See www.g20.utoronto.ca/2008/2008declaration1115.html for the G20's statements and www.imf.org/external/pubs/ft/sdn/2012/sdn1205.pdf, www.bis.org/publ/cgfs38.htm, and www.financialstabilityboard.org/publications/r_1103.pdf for some of the resulting papers.

an explicit mandate to develop and use macroprudential tools. Within the European Union, the European Systemic Risk Board has a mandate to make recommendations for macroprudential policies. In the United States, the Financial Stability Oversight Council, created by the Dodd-Frank Act, has the mandate to ensure the stability of the U.S. financial system. In addition, Dodd-Frank requires U.S. financial regulators to take a "macroprudential approach" to supervision and regulation.

These institutional and regulatory efforts to create institutional frameworks for macroprudential policy have been paralleled by academics' intense efforts to construct a conceptual framework for it. While dynamic stochastic general equilibrium (DSGE) models are the workhorse for monetary policy analysis, these models have traditionally focused exclusively on questions relating to the trade-off between inflation and real activity, abstracting from the role of financial intermediaries and the presence of systemic risks. However, macroprudential policy consists of the application of prudential policies with the macroeconomic objective of minimizing systemic risk, so it seems natural to develop DSGE models with systemic risk as the conceptual framework.

While an exceedingly high level of capital requirements might minimize systemic risk in the financial sector entirely, this would come at a high welfare cost: The level of credit intermediation and maturity transformation available would be sub-optimal, thus impeding economic growth. Consequently, there is a trade-off between the level of systemic risk and the amount of growth and consumption smoothing. Optimal macroprudential policies can thus be viewed as trading off the cost of financial intermediation with the likelihood and severity of systemic risk.

Goodhardt et al. (2012a, 2012b, henceforth GKTV) propose a dynamic, general equilibrium framework that provides a conceptual, and to some extent quantitative, framework for the analysis of macroprudential policies. The paper by GKTV is part of a wave of recent research that proposes conceptual frameworks. Angelini, Neri, and Panetta (2011), Angeloni and Faia (2012), Bianchi and Mendoza (2011), Christensen, Meh, and Moran (2011), and Kiley and Sim (2011) have proposed such alternative theories. However, while those papers model macroprudential policy, they do not include deep mechanisms that generate systemic risk. These papers complement

earlier literature on the topic that was largely qualitative (see Borio 2003) by providing a rigorous analytical framework based on equilibrium theory.

A closely related strand of literature develops dynamic macroeconomic models with a financial sector. Brunnermeier and Sannikov (2012), Gertler, Kiyotaki, and Queralto (2011), and He and Krishnamurthy (2012a, 2012b) propose theories of amplification due to financial sector frictions, but they do not incorporate notions of systemic risk and do not model macroprudential policy explicitly. Adrian and Boyarchenko (2012) do use a dynamic general equilibrium model with financial sector amplification and endogenous systemic risk, but they analyze only a limited set of policy tools. Therefore, what distinguishes GKTV from all of the existing literature is that they propose a framework for analyzing multiple tools in a setting with systemic risk.

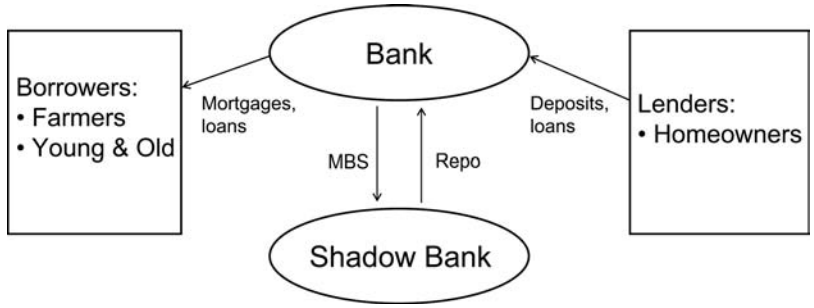
The distinguishing feature of GKTV relative to any other paper in the area to date is the study of a setting with multiple financial frictions that permits the analysis of multiple macroprudential policy tools at the same time. This very ambitious approach is designed to capture the complexities of the decision process of macroprudential policymakers and the multiple trade-offs that have to be considered in conducting such policies. In comparison to monetary policy analysis, GKTV's analysis is more highly dimensional, given the presence of many different policy trade-offs.

Because theirs is a dynamic model, it also incorporates the expectations channels that are at the heart of DSGE models used for monetary policy analysis. The GKTV model features several leakages in the transmission of these policies, which most of the existing papers on macroprudential policies do not incorporate in any way. In particular, capital regulation is arbitraged owing to the existence of shadow banks. None of the alternative papers in this literature incorporate such aspects, even though they are likely to be very important in practice. In fact, how large regulatory arbitrage leakages are will likely determine whether macroprudential policies work or not.

2. Overview of the Model and the Policy Tools

GKTV consider an economy with five economic actors, as illustrated in figure 1: three types of households (homeowners, the young and

Figure 1. Economic Structure



old, and farmers) and two types of financial institutions (banks and shadow banks). Homeowners either sell homes or rent out homes, and invest their savings as deposits in the bank. The bank in turn provides mortgages and loans to the borrowing households. The mortgages can be securitized via mortgage-backed securities (MBS), which are funded in a shadow bank through the repo market. Besides the houses, traded goods are potatoes that are produced by farmers.

The model is calibrated so that a systemic event occurs on average every fifty years. Thus, when conducting their analyses, the authors have assumed the potential for a severe financial crisis. The aim of their model is to analyze the impact of systemic crises on real consumption and hence the welfare of various economic actors.

The model features a variety of frictions that justify the use of policy to enhance welfare. The incompleteness of asset markets, coupled with the heterogeneity of agents' preferences and endowments, implies that the market equilibrium is generically Pareto inefficient. These inefficiencies give rise to the potential for economic policies designed to improve welfare. More specifically, three frictions are built into the model that motivates various macroprudential policy tools:

(i) The setting of incomplete markets with heterogeneous agents follows Dubey, Geanakoplos, and Shubik (2005), who show that collateralization arises endogenously. The market-based level of collateral that is determined endogenously does not maximize welfare in such economies due to the markets'

incompleteness, which motivates policies that aim at welfare-improving collateral levels. Capital requirements, loan-to-value (LTV) ratios, and margins are all policies that directly change the collateral requirements among economic agents, creating the potential to move the equilibrium toward a more efficient allocation.

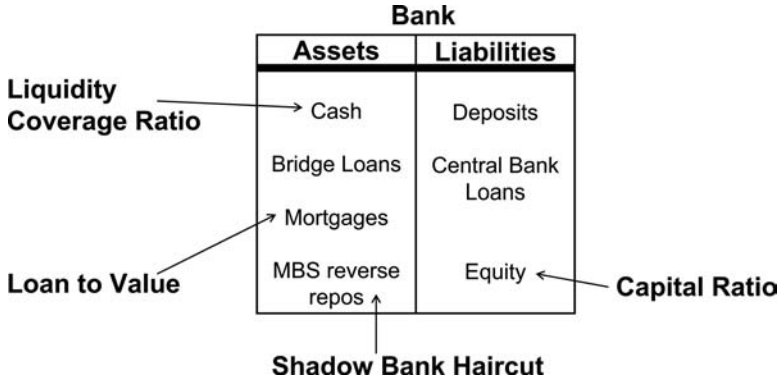
(ii) The setup incorporates fire sales as a further amplification mechanism. Arguably, fire sales contributed to the spillovers from the financial sector to the real economy during the financial crisis of 2007–09 (see Shleifer and Vishny 2011 for an overview of the literature on fire sales). The fire-sale mechanism in the model closely follows the logic of Allen and Gale (1994). Banks face cash-in-advance constraints for MBS, which induces liquidation below fundamental value in times of crisis. The cash-in-advance constraint motivates time-varying liquidity and capital requirements for banks.

(iii) Fire sales are further exacerbated by the margin spiral described by Brunnermeier and Pedersen (2009). When asset values of MBS fall and their mark-to-market volatility rises, repo haircuts increase, exacerbating the fire-sale externality of (ii) above. The margin spiral motivates haircut policies for the shadow banking system and provides additional justification for cyclical capital and liquidity policies.

Figure 2 summarizes the four types of policies justified by the three financial frictions relative to the balance sheet of the banking sector. On the liability side of the balance sheet, capital requirements limit the amount of leverage (relative to risk-weighted assets) that the bank can take on. On the asset side of the balance sheet, the liquidity coverage ratio constrains the bank to hold a minimum amount of cash. The LTV ratio effectively regulates the underwriting standards of the bank, thus determining asset quality. Shadow banks' haircut policy indirectly determines the riskiness of the reverse repo positions on banks' balance sheets.

In addition to the four policies in figure 2, GKTV also consider central bank policies as well as dynamic provisioning. I will abstract from these additional policies in my discussion. Additional policies that the authors could have considered are taxes and levies on bank

Figure 2. Macroprudential Policy Tools



size or particular activities such as wholesale funding, sectoral capital buffers, and other forms of liquidity regulation. Furthermore, some argue that stress tests can be used to achieve macroprudential objectives.

3. Cyclical Macroprudential Policies

The policy tools discussed by GKTV are not inherently cyclical tools and could be used for either cyclical or structural macroprudential policy aims. However, the focus of their paper is on cyclical macroprudential policy, so I will address its distinguishing features.

Traditionally, of the four policy tools in figure 2, only capital requirements and maximum LTV ratios have been used actively, and their primary usage has been for microprudential purposes. In particular, capital requirements constitute the foundation of the Basel Committee's regulatory approach, under Basel I and II, where the objectives are almost exclusively microprudential. Maximum LTV ratios have been used in many countries to ensure minimal underwriting standards. For example, in the United States, so-called conforming mortgages that are securitized by the government-sponsored institutions have a maximum LTV ratio, whereas sub-prime mortgages do not. While margin policies are applied by exchanges, those margins are again set purely with respect to the safety and soundness objectives of the exchanges. Haircuts in repo markets, and implicit

or explicit collateralization requirements in securitized markets, usually do not have any regulatory requirements, and those that do are, again, set for microprudential purposes. Liquidity requirements have generally not been applied to banks.

The main difference between the microprudential and the macroprudential approaches to regulation is that macroprudential policy takes general equilibrium effects into account, whereas microprudential policy is focused on the safety and soundness of individual institutions while taking equilibrium prices and quantities as given. If financial markets were frictionless and markets worked perfectly, no distinction between micro- and macroprudential policies would be necessary. However, as mentioned earlier, GKTV take the view that financial markets are incomplete and that various frictions give rise to costly endogenous default, fire-sale externalities, and margin spirals. As a result, externalities across agents and across markets are pervasive in the authors' setup, which justifies macroprudential policies. In fact, a purely microprudential approach in GKTV's setup is clearly sub-optimal from a welfare point of view.[3]

A further distinction can be drawn between cyclical and structural macroprudential policies. Cyclical macroprudential policy aims to

- lean against the buildup of risks over time, and
- create buffers and resilience against a potential future crisis.

In contrast, structural macroprudential policies aim at fixing market failures relating to infrastructures, moral hazard, and externalities across institutions. Clearly, the setup of GKTV is designed to address cyclical, not structural, macroprudential policies.

GKTV's ability to conduct welfare analysis relative to cyclical macroprudential policies is an important contribution to the existing literature. Their setup is ideally suited to study the optimal time pattern of capital, liquidity, haircut, and LTV requirements. The authors are able to analyze which types of policies are best

[3]It should be pointed out that GKTV focus exclusively on macroprudential policies and do not discuss the microprudential approach. This does raise the question of the extent to which micro- and macroprudential policies might conflict, a question of practical importance, especially since the two approaches are most likely to conflict at or around a crisis.

suited for various shocks at different horizons and how they interact with the multiple frictions over time.

4. Cyclical Capital Requirements

The policy motivation for (counter-) cyclical capital requirements is twofold. First, higher-capitalized banks can better withstand spillover effects from repo defaults and are thus able to insulate borrowers and savers from the haircut spiral in the repo market. Second, raising capital requirements preemptively raises the cost of credit intermediation during booms, thus mitigating the potential for a disorderly financial crisis.

In GKTV's model, countercyclical increases in capital requirements reduce mortgage issuance due to the increase in the cost of credit intermediation, thus leading to an increase in the mortgage rate for borrowers. Banks respond by increasing securitization activity, which is a capital arbitrage in the model.

As a result of these endogenous responses of banks to the tighter capital standards, households consume fewer housing services and banks face less risk. Consequently, deposits are less risky, thus achieving a countercyclical behavior. However, the practical usefulness of countercyclical capital is ultimately quite limited, given that capital tends to be inflated during booms. Accordingly, the increase in capital requirements that is needed to potentially deflate asset bubbles is quantitatively very large.

GKTV's finding that capital requirements are a poor preemptive tool is an important one and requires further investigation. To what extent it translates into fully dynamic economies, and whether the calibrated values used by GKTV turn out to be realistic, remains to be seen. If the findings are robust, that would indicate an important limitation of one of the most developed macroprudential tools. However, further research and perhaps more data are required to draw such a conclusion. Countercyclical capital requirements really have not been implemented in any country yet, so empirical evidence on their usefulness is lacking.

5. Cyclical Variations in Haircuts

Cyclical variation in haircuts is the natural complement to cyclical capital policies. While capital policies primarily affect banks,

haircut policies primarily affect shadow banks. The policy motivation for countercyclical increases in haircuts is to lean against a buildup of risks in funding contracts (such as repo and securities lending), futures, and derivatives. Higher through-the-cycle haircuts can reduce or potentially eliminate counterparty credit risk. Note that higher through-the-cycle haircuts could be considered structural tools, while the countercyclical increases of haircuts are cyclical. Haircut policies are directly aimed at impacting the likelihood and severity of haircut spirals. Within the framework of GKTV, the haircut/margin spiral arises as MBS are moved from the shadow banks and returned to the banks' balance sheets.

In GKTV's model, tighter haircuts reduce lending but increase stability as the haircut spiral is mitigated. The size of the repo market is reduced when haircuts increase, and consequently a relatively larger share of intermediation is done via banks, not shadow banks. Repo defaults are reduced.

According to GKTV's calibration, the impact of haircut changes on welfare is small and is heterogeneous across the various market participants. Currently, there is no empirical evidence on the effectiveness of preemptive increases in haircuts for macroprudential purposes. However, lending of last resort by the central bank in times of crisis can be viewed as a type of haircut policy. In fact, Ashcraft, Gârleanu, and Pedersen (2010) report empirical evidence that the Term Asset-Backed Securities Loan Facility, which offered ABS funding at below-market haircuts during the financial crisis, had an economically and statistically significant impact on lending rates during the financial crisis in 2009.

6. Variable LTV Ratios

Limiting LTV ratios is a classic policy aimed at regulating underwriting standards and has been used in many countries over many years. However, the primary motivation for LTV ratio policies has been to prevent banks from excessive risk taking (safety and soundness) and to protect borrowers from predatory lending behavior (consumer protection motivation). LTV caps help limit borrower and lender exposure to asset price declines. LTV caps also reduce borrower defaults and lean against price appreciation. LTV caps potentially address externalities due to borrower default costs. They might

also reduce the frequency and severity of asset bubbles, though that aspect is not discussed within the GKTV framework. In recent years, countries such as Hong Kong, Singapore, and South Korea have used LTV (as well as debt-to-income, or DTI) policies in a macroprudential fashion in an attempt to regulate the financial cycle and, in particular, house price booms from a macroeconomic perspective.

GKTV find that decreases in maximum LTV ratios reduce mortgage lending and MBS issuance, which raises mortgage rates. Lower maximum LTV ratios lead to lower lending and higher stability (less default), as well as a reduction in fire sales and enhanced shadow bank stability. However, similar to the finding for capital requirements, GKTV argue that maximum LTV ratios are not a good preemptive tool because asset prices are inflated during booms, thus requiring prohibitively high maximum LTV ratios in order to have any preemptive impact. As is the case with countercyclical capital regulation, this conclusion is noteworthy and should be verified in alternative, fully dynamic calibrated settings.

LTV ratio policy is the only one of the four cyclical macroprudential policies considered here that has empirical underpinnings. Suggestive evidence from Hong Kong, Singapore, and Korea points to the usefulness of using both maximum LTV and DTI ratios. In fact, that evidence points toward some preemptive ability of these tools to cool housing markets. Interestingly, an expectations channel seems to be at work: Evidence from South Korea suggests that tightening of maximum LTV ratios is associated with a decline in expectations of house price appreciation, even absent any effects on borrowing. The empirical evidence thus seems to be more encouraging than the theoretical findings from GKTV.

7. Liquidity Coverage Ratio

The liquidity coverage ratio (LCR) is part of the Basel III bank regulation, and its implementation is currently under consideration. The LCR requires banks to hold liquid securities on the asset side of their balance sheets to protect against run-offs of wholesale and deposit funding. Both liquid assets and funding liabilities are subject to haircuts set by the Basel Committee, which takes the liquidity of each asset class into account. While the LCR is envisioned to be static, one might consider countercyclical haircuts to be applied to

each of the asset classes. That would potentially tighten or loosen the liquidity constraints of banks and thus implement the time-varying liquidity requirements envisioned by GKTV.

The policy motivation for the LCR is to protect banks against run-offs in funding and to reduce the likelihood of a liquidity crisis. The LCR reduces the likelihood that banks will end up in a situation where they have to fire-sell assets. Within the context of GKTV's model, fire sales of MBS become less likely when the LCR is tightened. The LCR thus primarily acts on the fire-sale externality which in turn is caused by the cash in the market pricing.

GKTV find that variations in the LCR are a good preemptive tool. In contrast to countercyclical capital and LTV ratios, the LCR does not have the problem of having to act against asset price appreciation, as liquid assets are either countercyclical or acyclical, and funding tends to be less procyclical than lending. In response to an increase in the LCR, banks reduce mortgage lending and MBS securitization, raise the mortgage rate, and increase short-term lending. This results in less severe mortgage defaults and higher deposit repayment rates.

An important caveat to the effectiveness of using a time-varying LCR as a cyclical macroprudential tool is that a high but static LCR generates fire-sale incentives and increases margin spirals in a crisis. GKTV thus argue that the LCR should be time varying in a countercyclical manner. To date, there is no empirical evidence on the use of the LCR, either in a static or a dynamic fashion. The conflict between micro- and macroprudential objectives with respect to the LCR is not well understood, and the model does not resolve this tension. While a static liquidity buffer might be optimal from a microprudential objective, the results of GKTV suggest that the liquidity buffer should be released in times of financial market stress. Such a potential conflict between micro- and macroprudential objectives certainly needs further exploration.

8. Assessment

The most notable findings for GKTV can be summarized in two points. First, countercyclical capital and countercyclical maximum LTVs are not that useful as preemptive tools due to asset price inflation. However, capital and LTV policies do increase resilience to

some extent, though the resilience depends on the tail risk in asset prices relative to the size of capital or LTV buffers. Furthermore, haircuts should be viewed as a complement to capital policy.

Second, cyclical liquidity ratios are ideally suited as preemptive tools, but they have to be softened in downturns to prevent fire sales. Notably, the macroprudential view that liquidity requirements should be loosened in a crisis might very well conflict with the microprudential objective of securing sufficient liquidity buffers at all times. GKTV offer only a macroprudential viewpoint, which does not aid in resolving this conflict between micro- and macroprudential goals.

One clear omission from GKTV's model is the lack of government backstops via discount window lending or deposit insurance. Such backstops will change the optimal allocations of banks and shadow banks, thus altering the likelihood and severity of a crisis. The presence of backstops would have general equilibrium effects and might be welfare improving relative to the portfolio of policy tools currently being modeled. That said, the model is already complex and considers many different policies, so the omission of the backstops is understandable.

An appealing aspect of GKTV's setup is that it provides a link between "financial stability" and credit availability. A universally accepted definition of financial stability would also include a discussion of the frequency and depth of disruptions in financial markets beyond fire sales. For example, market infrastructures in derivatives and funding markets often break down during a financial crisis, and counterparty credit risk can spill across institutions.

The robustness of these findings has to be verified in alternative, fully dynamic settings with more detailed features. The conclusion that liquidity requirements are better preemptive tools than capital requirements or maximum LTV ratios might be specific to the setup under consideration. Furthermore, the conclusions are ultimately quantitative and thus depend on the particular calibration of the model. For example, the drawbacks of using LTV ratios as a tool may be quite different in a world with a well-functioning rental market or one with maximum loan-to-income ratios as complementary tools.

Because it covers only three periods, GKTV's paper does not offer any instruction on when the macroprudential tools should be

released. In the model, policymakers know for certain when the depth of the crisis has been reached. In practice, policymakers are never certain whether the worst has materialized or whether the crisis will continue to deepen. During the recent financial crisis, for example, should the macroprudential tools have been released in August 2007, March 2008, September 2008, or November 2008? Both solvency and liquidity kept deteriorating for many months during that crisis, and theories should ideally provide concrete guidance as to the timing of policy changes.

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