

## Financial Regulations and Macroeconomic Stability<sup>1</sup>

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It is now about ten years since the beginning of the financial crisis, when the financial system began to unravel as subprime mortgage lenders failed and investors ran on asset-backed commercial paper programs in the summer of 2007. As a result of the crisis, major regulatory reforms were introduced in the U.S., with the Dodd-Frank Act in July 2010, and recommendations for implementing global banking regulations, known as Basel III, in June 2011. Now that the US financial system is considerably stronger, many are reviewing the effects of the regulations, to assess what has been working and what has not.

Some in the US have proposed to scale back some regulations. They argue that the pendulum has swung too far and regulations have become oppressive and too intrusive. At the same time, research on the effects of regulations has surged, and can provide some new insights to the debate. The link between financial regulations, both micro- and macro-prudential, and macroeconomic stability is the topic of many papers at this conference.

Today I will focus on one piece of the current debate, bank capital and credit to borrowers, and its links to macroeconomic growth and stability. It will be in the context of whether we are on track to achieve the financial stability goals of regulations, whether there are unanticipated costs, and whether changes should be made.

I will make three points: First, current bank capital requirements yield net benefits and there is little to no evidence that credit availability is constrained. Second, given the severe economic costs of credit busts, it is important to continue to build out countercyclical policy options, such as the countercyclical capital buffer and stress tests. Third, some current proposals to reduce

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regulatory burden have merit, but some proposals to scale back capital requirements and stress tests would risk long-run macroeconomic stability.

### **I. Optimal bank capital ratios**

By the fall of 2008, it was evident that investors had lost confidence that banks had enough capital to absorb losses on credit they had extended even though regulatory capital ratios remained above minimum requirements. Moreover, some U.S. banks continued to face intense scrutiny even after the government injected \$125 billion into the eight largest and most complex firms, including the two still-standing investment banks that had converted to bank holding companies in order to avoid failure. Clearly, something was wrong with the regulatory capital regime.

Stress tests were an important step, taken in early 2009, to restore confidence in the largest banks. They evaluated credit losses under a hypothetical severe economic recession, for both on-balance and off-balance sheet assets, and led the way to substantial infusions of private capital where needed, with a public capital backstop.

What did we learn from this experience about how much capital is needed to promote economic stability? First, bank capital regulations are needed not only to mitigate moral hazard from limited liability, deposit insurance, and Fed liquidity provision. They also are needed because individual banks do not internalize costly spillovers that could harm the broader financial system and economy.

New bank capital requirements now include a higher quantity and better quality of capital to reduce the probability of failure, a capital surcharge for those banks whose failure would impose significant costs on other firms and the economy, and a countercyclical capital buffer (CCyB) to build capital in good times that can be released safely when the cycle turns.<sup>2</sup> These

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<sup>2</sup> The G20 summit in November 2008 agreed to stronger capital standards, both to prevent bank failures and to reduce the procyclicality of bank capital regulations. Basel III reforms, introduced in June 2011, target bank-level, microprudential regulation to build resilience to periods of stress, and “macroprudential system-wide risks that can build up across the banking sector as well as the procyclical amplification of these risks over time.” Furthermore, they view that “these two approaches to supervision are complementary as greater resilience at the individual

actions would enable banks to continue to lend even in downturns, reducing the risk that a downturn would worsen because banks stop lending.

In a static framework, optimal capital requirements are set where costs, as measured by the higher cost of borrowing, equal the benefits, specifically a lower expected cost of a severe recession or financial crisis. The Basel Committee on Banking Supervision (BCBS) estimated costs and benefit estimates based on a review of then-existing studies in 2010.<sup>3</sup> There have been some updates since then from researchers at the Federal Reserve Board and Bank of England based on new data and research which highlight the sensitivity of bank capital requirements to various assumptions, and importantly how capital might interact with other regulatory reforms.<sup>4,5</sup> The framework is conceptually straight-forward, but calibration depends on many important parameter estimates. The table below summarizes the estimated costs and benefits to calibrate optimal capital requirements from the three papers.

#### **A. Costs of bank capital requirements**

The cost of higher bank capital requirements is a higher cost of funds for banks, since equity is more expensive than debt, unless Modigliani-Miller (M-M) holds fully. In the case of full M-M, debt costs would decline as equity increases. But there are a number of reasons why M-M may not apply for banks, including that banks offer deposit services in addition to loans, bank balance sheets and risks are fairly opaque, and interest payments are tax-deductible.

As shown by the first column in Table 1, Fed researchers estimate that a percentage point increase in capital would increase bank funding costs by 3 to 7 basis points higher, and BoE researchers estimate that costs would be 5 to 10 basis points higher. The range of estimates

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bank level reduces the risk of system wide shocks.” These proposed reforms were implemented in the U.S. with Dodd-Frank rulemakings.

<sup>3</sup>Basel Committee on Banking Supervision (2010). “Assessing the Macroeconomic Impact of the Transition to Stronger Capital and Liquidity Requirements,” final report of the Macroeconomic Assessment Group.

<sup>4</sup> Simon Firestone, Amy Lorenc and Ben Ranish (2017). “An Empirical Economic Assessment of the Costs and Benefits of Bank Capital in the US,” Finance and Economics Discussion Series 2017-034. Washington: Board of Governors of the Federal Reserve System, <https://doi.org/10.17016/FEDS.2017.034>.

<sup>5</sup>Martin Brooke, et al. (2015). “Measuring the Macroeconomic Costs and Benefits of Higher UK Bank Capital Requirements,” Bank of England Financial Stability Paper No. 35.

reflect differences about what is assumed for the required return on equity and for the size of the M-M offset. Note that the BCBS paper had higher estimates of 13 basis points, which assumed a required return on equity of 15 percent and no M-M offset.

**Table 1: Costs and Benefits of Bank Capital Requirements and Optimal Bank Capital Ratios**

	<i>Costs:</i>		<i>Benefits:</i>	<b>Optimal bank capital ratio</b> (percent)
	<b>Effect on loan rates</b>	<b>Reduction in GDP</b>	<b>Reduction in pr(crisis) * cost of crisis</b>	
	(basis points)	(basis points)	(basis points)	
FRB - Firestone, et al. (2017)	3 to 7	4 to 7	8 to 27	13 to 25
BoE - Brooke et al. (2015)	5 to 10	1 to 5	2 to 10	10 to 14
BCBS (2010)	7 to 13	9	3 to 24	9 to 15

To translate the higher costs to loss of GDP, the costs are run through existing econometric macro models, such as FRB-US for the U.S. Such models incorporate lending rates, and higher lending rates would reduce borrowing and investment. These models, however, do not have a financial sector, and any benefits to the economy of a more stable banking sector would not be incorporated. Estimates of the loss on the level of GDP *in the long run* from FRB and BoE, shown in the second column of Table 1, range from 1 to 7 basis points, and are modest, for a percentage point of additional common equity. This is an estimate for the long-run because monetary policy is expected to be able to respond to the effects of higher borrowing costs.

However, at the time when Basel III began to roll out, many economies were operating with monetary policy at or near the zero-lower-bound so monetary policy was not able to offer additional cushion to the economy from higher borrowing costs. Thus, Basel III was phased into ease in the costs. Initially, it was to be phased in during 2013 to 2015, though that was extended to 2019 as economic growth remained lackluster. Note that monetary policy cannot fully offset the higher borrowing costs in these models even in the long run, in part because there is some lost investment and productivity.

## **B. Benefits of bank capital requirements and optimal capital ratios**

The expected benefits of bank capital requirements are equal to the reduced probability of a crisis and the severity of the crisis. Since the recent crisis, there has been a lot of new research that indicates that recessions associated with banking crises are more severe. Notably these findings are in Schularick and Taylor (2012) for 14 advanced economies, with data going back for some as early as 1870s (see also Bordo et al, 2001).<sup>6</sup> In particular, Schularick and Taylor (2012) show that real GDP per capita many years after the cyclical peak is considerably lower after a financial recession than in a normal recession. (Financial recessions are defined as those in which banks required an infusion of capital.)

Following up on that work, Jordà, Schularick and Taylor (2013), and others such as Claessens et al. (2012), show that higher excess credit growth leads to worse economic performance.<sup>7</sup> Excess credit growth is defined by Jordà et al as credit growth in the upturn of a current cycle above credit growth in the upturn of the previous cycle. The negative effect of excess credit growth is greater in financial recessions than in normal recessions.

Another determinant of the expected costs is whether severe recessions have a permanent or temporary depressing effect on output. Furceri and Mourougane (2012) suggests that crises have permanent effects on potential, with estimates of permanently lower output of 1.5 to 2.4 percent.<sup>8</sup> In contrast, Romer and Romer (2015) argue that the effects are temporary, and generally last as long as disruptions in the financial sector persist.<sup>9</sup>

The benefits of higher capital are shown in the third column in Table 1, expressed here as estimates when capital is increased by one percentage point from 12.5 to 13.5 percent (based

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<sup>6</sup> Moritz Schularick and Alan Taylor (2012). "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crisis, 1870-2008," *American Economic Review* 102(2), 1029-1061. Michael Bordo, Barry Eichengren, D. Klingebiel, and M.S. Martinez-Peria (2001). "Is the Crisis Problem Becoming More Severe?" *Economic Policy*, April.

<sup>7</sup> Oscar Jordà, Moritz Schularick, and Alan M. Taylor (2013). "When Credit Bites Back," *Journal of Money, Credit and Banking* 45(2), 3-28. See also Stijn Claessens, M. Ayhan Kose, and Marco Terrones (2012). "How do Business and Financial Cycles Interact?" *Journal of International Economics* 87, 178-190.

<sup>8</sup> Davide Furceri and Annabelle Murougane (2012). "The Effect of Financial Crises on Potential Output: New Empirical Evidence from OECD countries," *Journal of Macroeconomics*, Vol. 34, issue 3, Sep.

<sup>9</sup> Christina Romer and David Romer (2015). "New Evidence on the Aftermath of financial Crises in Advanced Countries," NBER Working Paper No. 21021.

on Firestone et al, 2017), since the benefit function is nonlinear, with decreasing benefits at higher levels. Benefits range from 2 to 27 basis points in terms of reduced costs of a crisis.

The fourth column shows the optimal capital ratios provided by these papers, which range from 9 percent to as high as 25 percent. Not surprisingly, given the range of estimates for the inputs, the papers offer a wide range for optimal bank capital requirements. Some key assumptions are: (i) the benefits of new liquidity requirements for reducing the probability of failure, and (ii) the benefits of TLAC and orderly liquidation authorities (OLA), which can reduce the probability of failure, the severity of crises, and whether the crisis would have permanent or transitory effects on GDP. At the high end, the 25 percent estimate assumes a recession leads to permanent losses in output and there are no benefits from OLA. The lower capital ratios from the BoE paper assume substantial benefits from OLA. In particular, OLA is assumed to reduce the probability of a crisis by reducing risk-taking incentives and it would lead to a less severe crisis.

While the range of optimal capital ratios is wide, the analysis supports much higher bank capital requirements than before the crisis. Moreover, the lower end of the ranges of the studies are largely consistent with current requirements for the largest institutions.

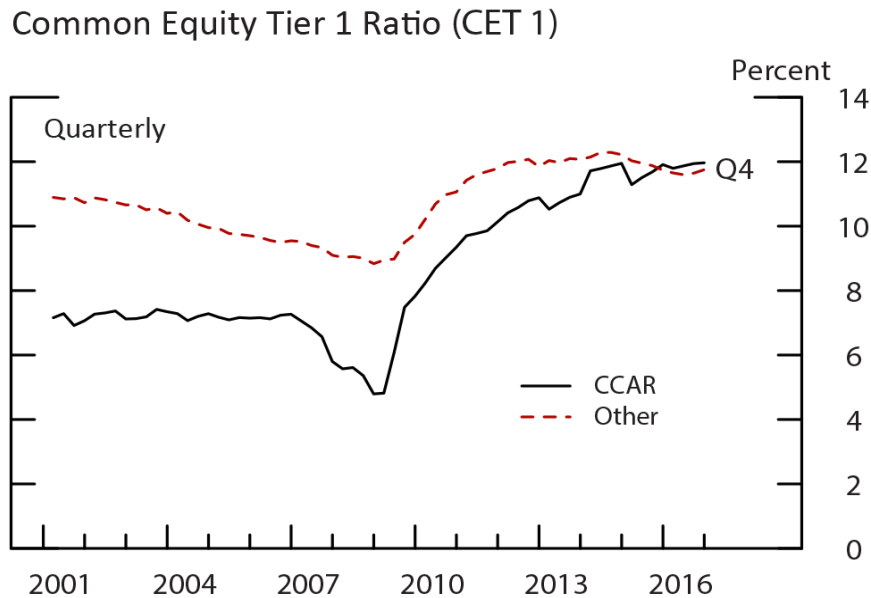
While this framework offers discipline and is helpful, the importance of the various assumptions and model dependence suggest looking elsewhere also for evidence of the costs of higher capital regulations. In that regard, evidence on bank loans, lending standards, and borrower demand is important. Evidence on whether credit provision is shifting to alternative sources is also important.

### **C. Is credit constrained?**

In the US, banks have substantially increased their capital. The largest now all meet fully phased-in capital ratios. As shown in Figure 1, Tier 1 common equity capital to assets for banks

was 12 percent at the end of 2016.<sup>10</sup> For the banks subject to the Dodd-Frank stress tests and CCAR, the Tier 1 common equity capital ratio more than doubled from early 2009.

**Figure 1: Common Equity Tier 1 Ratio**



Source. Vojtech (2017).

Are there signs that credit is constrained because of the higher capital requirements? In my view, no, not in the US. To be sure, credit is probably more expensive compared to risk-free rates -- a healthy development considering how overstretched the pre-crisis financial system was —but the effects on flows appear to have been small. Starting with loans made by commercial banks, growth has been strong outside of residential mortgages. From 2012-16, C&I loans grew at an average rate of 9.2 percent each year, and commercial real estate loans grew at a 5.9 percent rate. Residential mortgages barely grew, but much of the sluggish growth is likely due to the lack of clarity on the future of the structure of mortgage finance, mortgage putback risks, and the number of households who remained underwater on their mortgages. Consumer credit grew at a moderate rate, a bit above 4 percent per year.

<sup>10</sup> Cindy Vojtech (2017). "Post-Crisis Lending by Large Bank Holding Companies," FEDS Notes. Washington: Board of Governors of the Federal Reserve System, July 6, 2017, <https://doi.org/10.17016/2380-7172.1985>.

The next charts show broader measures of credit to businesses and households, including borrowing from banks, other lenders, and bond markets. While it is not clear how much credit is necessary to support economic growth, it is clear, however, that it was too high before the crisis, so growth rates at that time are not the right benchmark. Often, credit is assessed against GDP, since credit that rises significantly faster than GDP (adjusted for long-run trends) could be an early warning of future problems, especially if it is associated with loose financial conditions (see Borio and Lowe, 2002).<sup>11</sup> Ultimately, the credit must be serviced out of income flows embodied in GDP.

As shown in Figures 2 and 3, total private nonfinancial credit rose rapidly before the crisis, and has come off of its peaks. Figure 3 disaggregates household and business borrowing. The credit-to-GDP ratio for households, the red line, more than fully accounts for the total decline since 2009, and has only recently flattened out. For businesses, the credit-to-GDP ratios have been rising.<sup>12</sup> For corporates, the dark blue line, growth has been fairly strong (2.2 percent annual rate since 2012), especially from bond issuance, and current levels match record highs since 1990. For non-corporates, the light blue line, often used as a proxy for small business, credit has been rising slightly faster than GDP, at 1.7 percent at an annual rate. But the main form of that borrowing by non-corporate business borrowers is through mortgages; roughly 70 percent of its loans are mortgages, and it is not surprising that this collateral was less valued after the crisis, limiting these businesses' borrowing capacity.

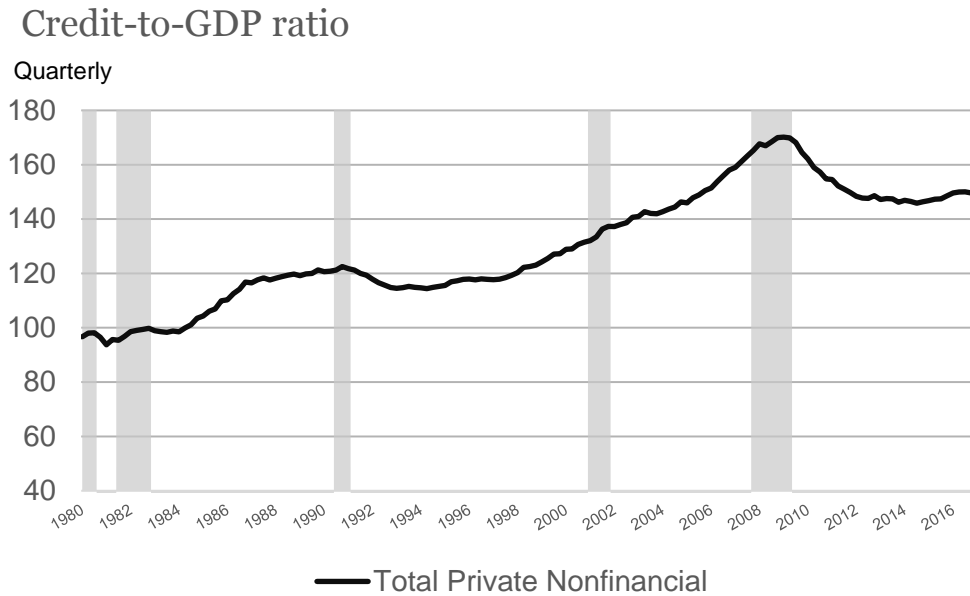
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<sup>11</sup> Claudio Borio and Philip Lowe (2002). "Asset Prices, Financial and Monetary Policy: Exploring the Nexus," BIS Working Papers 114, July.

<sup>12</sup> Total household credit grew only at 2.0 percent per year from 2012 to 2017:Q1, as residential mortgages grew only very slowly. Not shown, household consumer credit (credit cards, auto loans, student loans) grew rapidly at 6.3 percent per year over this period. In the nonfinancial corporate business sector, credit grew more rapidly at 5.6 percent, more than twice the rate of households. For non-corporate businesses, which is often associated with small businesses, and is about one-third of the debt of the business sector, growth has been a bit slower, at 5.3 percent.

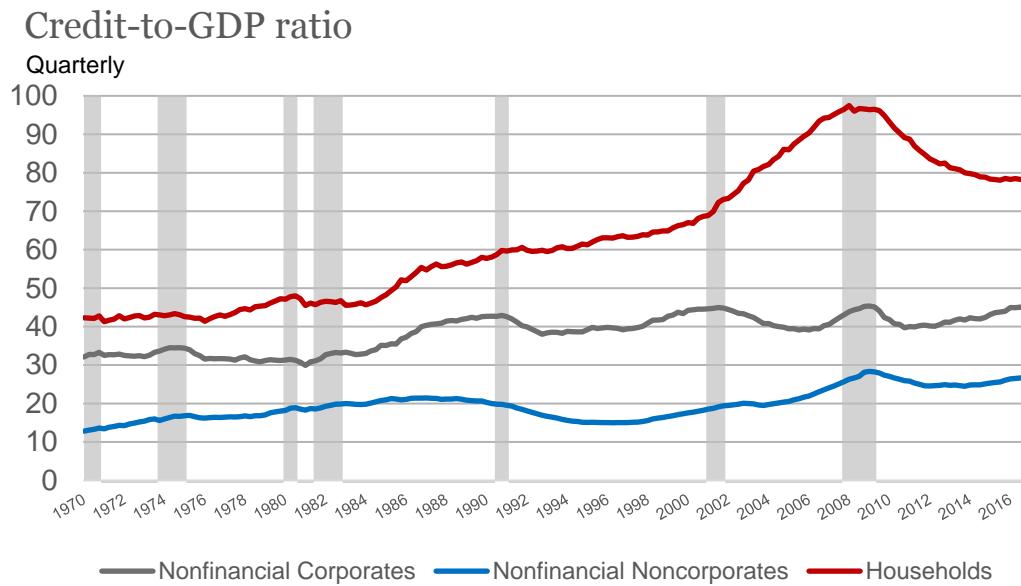


**Figure 2: Credit to private nonfinancial sector**



Source: Financial Accounts of the United States

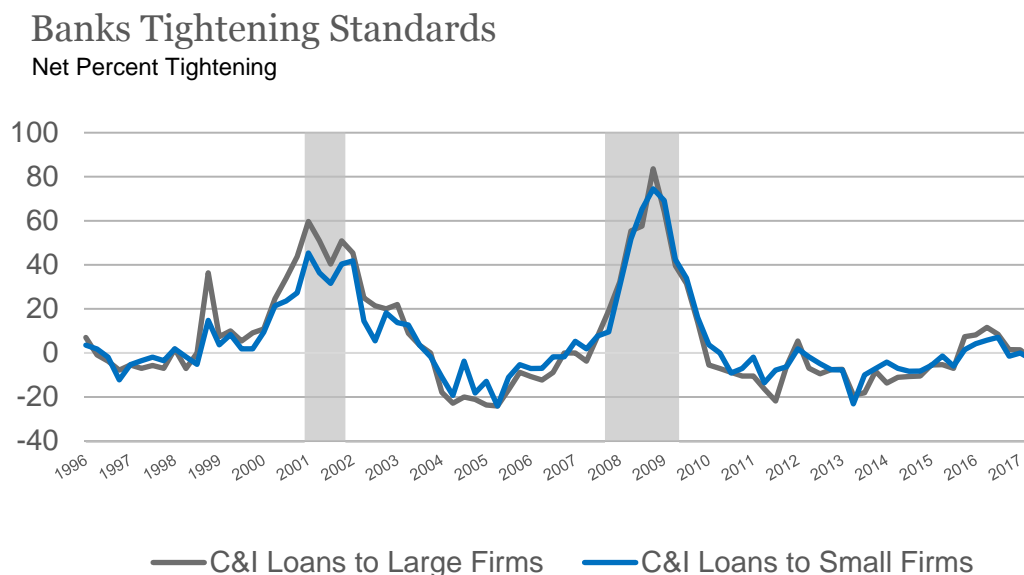
**Figure 3: Credit to households and nonfinancial businesses**



Source: Financial Accounts of the United States

Survey evidence helps distinguish between supply and demand factors determining the amount of credit for small businesses. As shown in Figure 4, banks' responses to the Fed's Senior Loan Officer Opinion Surveys show that after having tightened substantially in the crisis, and easing substantially after, lending standards have bounced around zero in recent years, suggesting neither substantial net tightening or loosening. Moreover, they do not report that lending standards for C&I loans to small firms have tightened or eased on net more than for large firms. When asking small businesses themselves, the NFIB survey of its members finds that among the roughly 30 percent of small businesses in their survey that borrow about once every three months, loan availability has improved considerably since the depths of the crisis, and is about the levels of the mid-2000s.

**Figure 4: Bank Lending Standards for C&I Loans**



Source: Senior Loan Officer Opinion Survey

Finally, following the release of the Fed's stress tests / CCAR results in late June, many banks have announced large increases in shareholder payouts.<sup>13</sup> Some firms announced dividends and share repurchases that totaled close to 100 percent of expected income. Four large firms

<sup>13</sup> Yalman Onaran, et al. "Banks Unleash Surprisingly Big Payouts After the Stress Tests." *Bloomberg Markets*, June 29, 2017. <https://www.bloomberg.com/news/articles/2017-06-28/capital-one-must-resubmit-plan-as-33-banks-ace-fed-stress-tests>

announced sizable increases in share repurchases, from less than \$40 billion to about \$60 billion. To the extent the CCAR results were interpreted as lower capital requirements, these actions do not suggest that banks would greatly expand lending if only capital requirements were loosened.<sup>14</sup>

In summary, I do not see much evidence that credit is restrained (aside from residential mortgages which are part of a larger mortgage finance system that has still not been reformed). The implications from some research being presented at this conference, that links higher bank-specific capital to more loan growth, not less loan growth, also reinforces this information available based on credit aggregates. Stronger banks and stronger economies are supportive of stronger loan growth.

## **II. Cyclical factors for bank capital and macroeconomic stability**

Those who propose scaling back bank capital requirements argue that cutting capital requirements would boost lending, and thereby boost growth and jobs. Credit-to-GDP measures are not definitive about credit restraints, since it could be that GDP growth itself has been held down by restrictive credit. However, a key question is whether such credit growth, if any, would be sustainable growth. That is, is there an intertemporal tradeoff between current financial conditions and risks to future growth?

For this question, I will add a cyclical, time-varying dimension to the discussion of capital requirements. Both the G-20 and Basel III recommendations featured a recognition that financial vulnerabilities can build during stable growth periods, and can increase risks in the future to financial and macroeconomic stability.

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<sup>14</sup> Alternatively, if banks do not view the CCAR results as a reduction in capital requirements that reduces their regulatory-induced cost of capital, increased distributions to shareholders rather than more lending may reflect their view that returning funds to shareholders is a better use of capital.

### A. Improving capital requirements by reducing procyclicality

Many things are procyclical. Risk-taking by investors and borrowers responds to current conditions, not just long-run average conditions. Such behavior can lead to Minsky-type boom-bust cycles.<sup>15</sup>

Capital regulations themselves can be procyclical. Repullo and Suarez (2013) illustrate how capital requirements that depend on default rates can be procyclical, and therefore amplify the effect of an increase in borrower defaults on the economy.<sup>16</sup> In their model, bank capital helps to prevent failure but also affects credit rationing of businesses, especially those that rely on banks for financing. For a given average level of capital over a business cycle, a constant requirement such as Basel I would lead to a higher failure rate, but less credit rationing. A time-varying requirement, such as in Basel II, would lead to a lower failure rate, but more procyclicality. This is because Basel II capital requirements would rise when realized default rates rise.

Their model offers a way to interpret Basel III, which it supports. Both higher structural capital levels and a countercyclical buffer would lead to higher social welfare when the social costs of bank failure are high.<sup>17</sup> This combination would reduce the probability of failure in good times (expansions) and preserve the capacity to lend in bad times (recessions) when borrower default rates are high.

In Basel III, the new countercyclical capital buffer is the primary feature to offset procyclicality to which countries have agreed. In the U.S., the new capital buffer would be applied equally to the domestic exposures of banks which are covered (generally SIFIs and those with global businesses), and could range from 0 percent to 2.5 percent. Generally, banks would be given a year or more to raise capital if authorities were to increase the CCyB, but banks could release it

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<sup>15</sup>Hyman Minsky (1974). "The Modeling of Financial Instability: An Introduction," *Modeling and Simulation*. Proceedings of the Fifth Annual Pittsburgh Conference, 5; and John Cassidy (2008). "The Minsky Moment: Subprime Mortgage Crisis and Possible Recession," *New Yorker*, February 4, 2008.

<sup>16</sup> Rafael Repullo and Javier Suarez (2013). "The Procyclical Effects of Bank Capital Regulation," *Review of Financial Studies* 26 (2), 452-490.

<sup>17</sup> Social welfare costs of bank failure reflect costs to borrowers and government, and could include disruptions in the payment systems, loss of confidence in similar banks, deterioration in the fiscal position.

immediately if authorities were to decrease the CCyB. This would free capital to be available to lend. Countries could choose to set it higher than 2.5 percent, although bank regulators from foreign countries may not agree to accept the additional charge above 2.5 percent for its assets.

In practice, policymakers are establishing and publishing frameworks about how they would use the CCyB. BCBS recommended that authorities should look at credit-to-GDP gaps, among other measures, as a guide for implementation, based on the empirical relationship found between credit-to-GDP gaps and recessions.<sup>18</sup> If the gap is high or predicted to be high, expected losses to banks are expected to increase in the future. By raising the CCyB before the losses are realized would mean that banks would be raising capital when it is less expensive. Once the credit cycle turns, authorities would release the CCyB, to offset natural tendencies by banks to tighten credit standards when defaults are high.

Most policymakers appear to believe the CCyB will work mostly to increase the resilience of banks to future losses rather than to slow down a building credit boom, that is to “lean against the wind.” While 2.5 percent of additional capital is significant, its effects on lending costs is not especially large and credit could be available from other lenders, especially when asset prices are rising.

The new CCyB has been adopted by many countries. In a study of macroprudential authorities (Edge and Liang, prelim 2017), 53 of 58 countries in our sample had established an authority to set the CCyB.<sup>19</sup> This authority resides mostly with central banks (many of which also are prudential regulators) and independent prudential regulators; in only two countries, the U.K. and France, does the financial stability committee have the authority on its own to implement the CCyB.

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<sup>18</sup> Claudio Borio, Mathias Drehmann, and Kostas Tsatsaronis (2011). “Anchoring Countercyclical Capital Buffers: The Role of Credit Aggregates,” *International Journal of Central Banking* 7(4), 189-240.

<sup>19</sup> Rochelle Edge and Nellie Liang (2017). “New Financial Stability Governance Structures and Central Banks,” working paper.

To date, eight countries have raised the CCyB above zero at least once, largely in response to rapidly rising house prices and high mortgage debt in their countries.<sup>20</sup>

In the US, regulators also are reducing procyclicality through the bank stress tests. In particular, regulators specify the stress scenario to include a severe recession, defined typically as an increase in the unemployment rate of 4 percentage points. However, when the economy has been growing and unemployment is low, they impose a floor of 10 percent for the unemployment rate to help offset procyclicality—that is, the rise in the unemployment rate will be larger in good times than in bad. In practice, we have seen that even with these countercyclical scenarios, loss rates exhibit procyclicality as the economy improves and balance sheets improve – basically because the starting positions of the banks and the economy are stronger.

## **B. Research on credit and macroeconomic stability**

How does research on credit, as a financial vulnerability, and macroeconomic stability help to evaluate the use of countercyclical tools? There has been progress on a number of fronts, starting from the financial accelerator model (Bernanke and Gertler, 1989), which incorporated asymmetric information between the lender and the borrower.<sup>21</sup> When borrowers net worth falls as asset prices fall, lending spreads would increase proportionately more because of the asymmetric information, leading to an amplification of the initial fall in asset prices.

Models that incorporate the net worth of lenders also can lead to a reduction in the supply of credit (Gertler and Kiyotaki, 2010).<sup>22</sup> In general, however, the mechanisms in these models are not viewed as sufficiently large to on their own to generate a financial crisis. There is more recent work to these types of models to add bank runs that could lead to a non-linear, crisis-like outcome (Gertler, Kiyotaki, Prespino, prelim 2017).

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<sup>20</sup> These countries are Czech Republic, Hong Kong, Iceland, Norway, Slovakia, Sweden, Switzerland, and United Kingdom. See Table 6 in Edge and Liang (2017).

<sup>21</sup> Ben Bernanke and Mark Gertler (1989). “Agency Costs, Net Worth, and Business Fluctuations,” *American Economic Review* 79(1), 14-31.

<sup>22</sup> Gertler, Mark, and Nobuhiro Kiyotaki (2010). “Financial Intermediation and Credit Policy in Business Cycle Analysis,” *Handbook of Monetary Economics* 3(11), 547-599.

Endogenous risk-taking also can lead to discontinuous, crisis-like outcomes. A lower price of risk as reflected in higher asset prices can lead intermediaries and borrowers to increase leverage or increase maturity mismatch. For example, the supply of credit responds endogenously to low volatility given risk management practices which increase leverage and short-term funding, which will generate greater amplification of shocks (Adrian and Shin, 2008, 2014; Gorton and Ordonez, 2014).<sup>23</sup> In addition, the net worth of financial intermediaries could affect the risk-bearing capacity of the marginal investor and hence the risk premia for asset prices (He and Krishnamurthy, 2013).<sup>24</sup>

Note that this research focuses on behavior, build-ups of vulnerabilities like credit and leverage, and their effects on the economy, but not on the role of capital regulations. In part, this is because capital regulations have not been designed or implemented in the past to address risks of the financial system as a whole, as they are now being considered.

### **C. Empirical model of financial conditions, credit, and growth in the US**

I will use ongoing empirical work from Aikman, Lehnert, Liang, Modugno (2016) to illustrate the transmission of financial conditions through nonfinancial credit on economic stability in the U.S.<sup>25</sup> Specifically, we look at financial conditions and nonfinancial credit in a vector-autoregressive (VAR) model which allows for nonlinearities. Financial conditions are measured by asset prices and underwriting standards for household and business credit. Nonfinancial credit is the potential vulnerability, measured by the credit-to-GDP gap or by credit-to-GDP growth.

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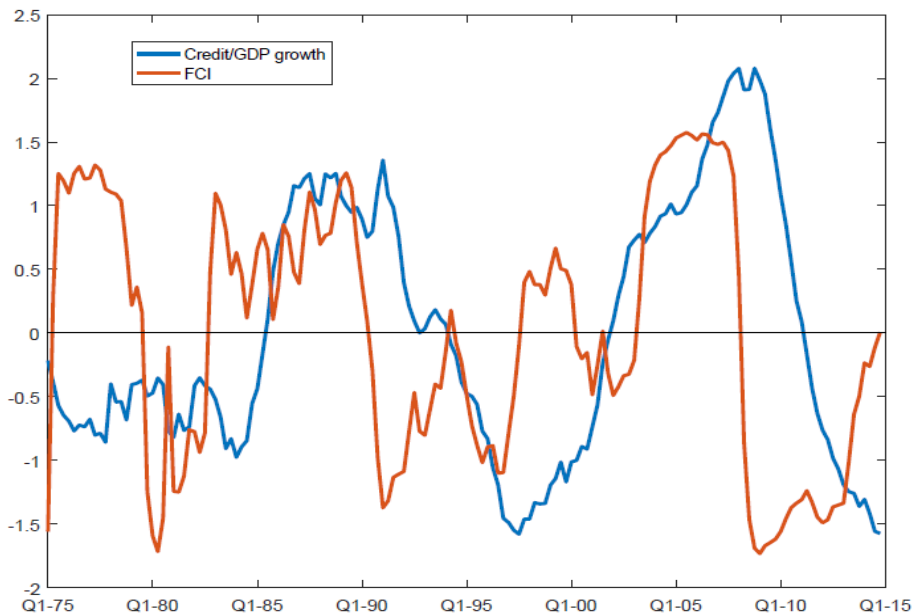
<sup>23</sup> Adrian, Tobias and Hyun Song Shin (2008). "Financial Intermediaries, Financial Stability, and Monetary Policy," *Federal Reserve Bank of Kansas City Jackson Hole Economic Symposium Proceedings*, 287-334; and Adrian, Tobias, and Hyun Song Shin (2014). "Procyclical Leverage and Value-at-Risk," *Review of Financial Studies* 27(2), 373-403. Gary Gorton and Guillermo Ordoñez (2014). "Collateral Crises." *American Economic Review* 104(2), 343-378.

<sup>24</sup> Zhiguo He and Arvind Krishnamurthy (2013). "Intermediary Asset Pricing," *American Economic Review* 103(2), 732-770.

<sup>25</sup> David Aikman, Andreas Lehnert, Nellie Liang, and Michele Modugno (2016). "Credit, Risk Appetite, and Monetary Policy," Working paper, December, revised draft of "Financial Vulnerabilities, Macroeconomic Dynamics, and Monetary Policy," Finance and Economics Discussion Series 2016-055. Washington: Board of Governors of the Federal Reserve System, <http://dx.doi.org/10.17016/FEDS.2016.055>.

Figure 5 shows financial conditions and credit growth from 1975 to 2014 in the US. Credit-to-GDP growth estimated with long lags shows two distinct boom-bust cycles. Financial conditions are more volatile. Also, financial conditions also tend to lead credit-to-GDP growth, and the highest correlation is at seven and eight quarters. At the end of the sample period 2014, credit-to-GDP growth (on a moving average basis) was still quite low, though financial conditions had moved back up to averages. Since then, credit-to-GDP growth has been rising, but it is not yet above its long-run average.

**Figure 5: Financial conditions (FCI) and credit-to-GDP growth**



Source: Aikman, Lehnert, Liang, Modugno (2016)

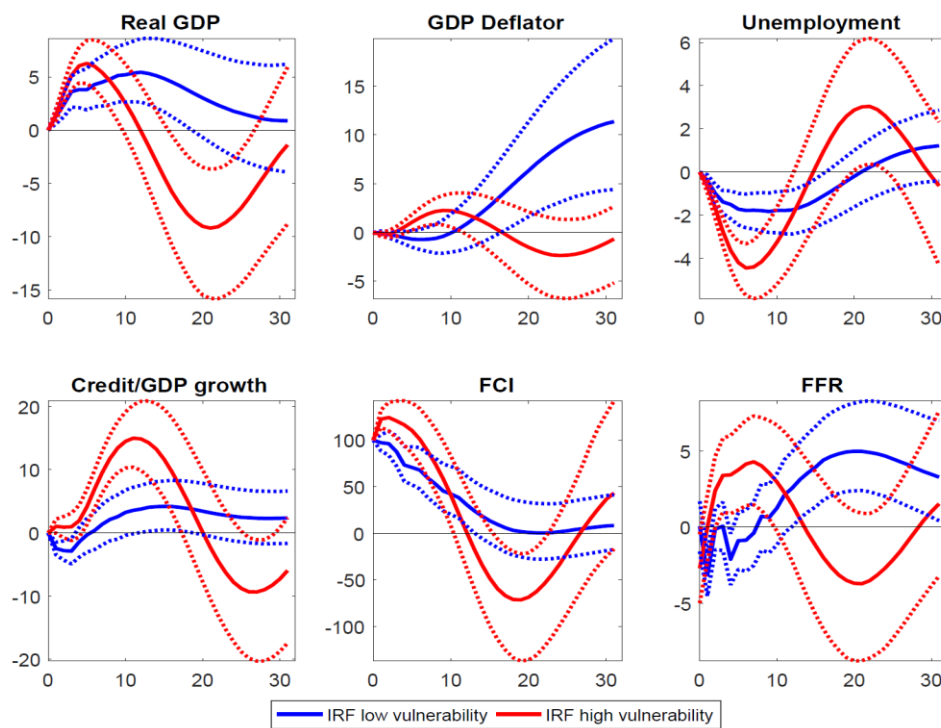
We allow for nonlinear effects in our VAR by defining a threshold based on credit, by whether it is above or below zero. Given the fairly long credit cycles, the economy is not crossing back and forth across the threshold in the estimations.

We use a fairly standard VAR, with GDP, prices, unemployment rate, and the federal funds rate. We add a financial conditions index and credit-to-GDP gap (or growth). We look at impulse responses to shocks to financial conditions and to monetary policy.



The effects of shocks to financial conditions are shown in Figure 6. The blue lines show the results for estimations when the credit-to-GDP gap is low, and the red lines show the results for when the credit-to-GDP gap is high. A shock to financial conditions would be expected to lead to an expansion. We find that in a low credit state, a positive shock is expansionary – GDP rises, price deflator rises, unemployment falls. But in a high credit gap economy, shown by the red lines, the shock initially is expansionary as well, but also leads to higher credit growth. This growth appears to be followed by a sharp reversal in financial conditions and a recession, which we interpret as sustained high credit leaves the economy more vulnerable in the future to a shock.

**Figure 6: Shocks to financial conditions in a threshold-VAR, by credit-to-GDP growth**



Source: Aikman, Lehnert, Liang, Modugno (2016)

Overall, these empirical results based on a nonlinear specification indicate that financial conditions can affect the sustainability of economic performance. When vulnerabilities as measured by nonfinancial credit are high, the economy is more prone to a future recession.

I would note that while credit since 2014 does not appear constrained, and credit-to-GDP has been growing, the gap relative to a long-run trend remains negative.

This paper is part of a growing body of research of financial conditions and macroeconomic stability. The research cannot directly evaluate macroprudential tools because they have not been used in that way in the past. But empirical work along these lines may be able to provide estimates for structural models, which can be used to evaluate dynamic macroprudential tools. Importantly, such models also could help to evaluate how macroprudential policies might interact with monetary policy. Both types of policies can work to offset natural tendencies for borrowers and lenders to increase debt, and could help to avoid high costs from future recessions.

### **III. Implications for some proposed reforms**

I will conclude with comments on some important proposed changes to US bank capital regulations.

The Treasury recently issued a report with recommended changes to bank capital regulations.<sup>26</sup> Its aim is to reduce unnecessary regulatory burden, which it says would unleash new lending and create new jobs.

Some of the proposals are easy to support.<sup>27</sup> In particular, the Treasury recommends that community banks get significant capital regulatory relief, such as from mandatory stress tests and parts of Basel III. Such proposals would significantly reduce burden without increasing risks of another financial crisis. Some can be implemented directly by the regulators. For example, the Fed can scale back the qualitative assessments of CCAR for many BHCs, as it already did this year. But it cannot eliminate the mandatory stress test requirements in the Dodd-Frank Act for

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<sup>26</sup> Steven Mnuchin and Craig Phillips, "A Financial System that Creates Economic Opportunities: Banks and Credit Unions." U.S. Department of the Treasury Report to President Donald J. Trump, June 2017. <https://www.treasury.gov/press-center/press-releases/Documents/A%20Financial%20System.pdf>

<sup>27</sup> See Nellie Liang, "What Treasury's Financial Regulation Gets Right and Where It Goes Too Far," June 13, 2017. <https://www.brookings.edu/blog/up-front/2017/06/13/what-treasurys-financial-regulation-report-gets-right-and-where-it-goes-too-far/>

banks and BHCs of between \$10 billion and \$50 billion. That action would require an amendment to Dodd-Frank.

The Treasury also proposes changes that would effectively reduce capital requirements and supervision of the largest, most complex firms. In my view, these changes would increase risks to financial stability, and go too far. As discussed earlier, current bank capital requirements are near the low end of the range of estimates for optimal bank capital ratios.

One proposal is to reduce the frequency of supervisory-run stress tests, from once a year to once every two years. But stress tests provide many benefits than just a measure of capital.<sup>28</sup> In particular, they require firms to invest in serious risk management analytics and to make forward-looking assessments of risks. Risk management for macro stress tests need to be done fairly frequently, as risks can change rapidly. Moreover, stress tests should be done no less frequently than decisions for dividends and share repurchases, which they do each year.

A second proposal is to require the Federal Reserve to put out its models, economic scenarios, and other material methodologies for public notice and comment. I think such a change would make stress tests much less effective. Regulators would become reluctant to make changes and models would become rigid. Banks would adjust their balance sheets to reduce capital requirements for a specific scenario, and then re-adjust once the starting balance sheet values used for the stress tests were determined. The process would make the stress tests essentially a take-home exam for the banks. While the Federal Reserve does need to continue to improve the transparency of the stress tests, this proposal goes too far.

A third proposal is to alter the calculation of the leverage ratio. It would deduct certain assets—reserves at the central bank, Treasury securities, and initial margin held at clearing houses— from the denominator of the leverage ratio. But the main point of a leverage ratio is that it should serve as a simple, transparent, backstop capital ratio that does not distinguish among

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<sup>28</sup> See Nellie Liang, “Higher Capital is Not a Substitute for Stress Tests,” Brookings, April 24, 2017. <https://www.brookings.edu/research/higher-capital-is-not-a-substitute-for-stress-tests/>

assets based on risk. These types of changes would undermine the whole point of a leverage ratio.

Another proposal is an off-ramp from significant regulation and supervision for institutions that maintain a 10 percent leverage ratio. While a tradeoff of higher capital and less regulation is very compelling, the proposal changes would significantly increase risks to financial stability. While an off-ramp based on a 10 percent leverage ratio might lead initially to higher capital, and thus less risk, this proposal would lead to more risk over time. Banks would have incentives to increase their risk exposures since they would not be penalized for higher risks. And banks not required to do stress tests would have less incentive to maintain strong risk management practices.

A fifth proposal is to consider not implementing the CCyB, but to add countercyclical elements only through the stress tests. As discussed earlier, there are important procyclical elements in capital requirements and in market participants' behaviors. The macroeconomic scenarios for the stress tests are designed in the U.S. to help offset some of the procyclicality. But they provide only a modest counterbalance, in that stress losses depend importantly on the starting positions for the economy and bank balance sheets. The CCyB would be calibrated based on expected financial and credit market developments, and would be a more effective way to build a buffer when future risks are not easily captured by current conditions.

An important proposal in the House Financial CHOICE legislation is to repeal the Orderly Liquidation Authority (OLA) in Title II of the Dodd-Frank Act.<sup>29</sup> The Treasury has not yet addressed this issue. The OLA is a mechanism to resolve a large, complex institution outside of bankruptcy, in order to reduce the systemic fallout from a failure. It is not a taxpayer bailout – indeed, it reduces the likelihood of that outcome since without OLA, policymakers may see no better alternative because of the potential systemic consequences of bankruptcy.

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<sup>29</sup> See discussions of OLA Ben Bernanke, "Why Dodd-Frank's Orderly Liquidation Authority Should Be Preserved," Brookings, February 28, 2017. <https://www.brookings.edu/blog/ben-bernanke/2017/02/28/why-dodd-franks-orderly-liquidation-authority-should-be-preserved/>, and Aaron Klein, "A Primer on Dodd-Frank's Orderly Liquidation Authority," Brookings, June 5, 2017. <https://www.brookings.edu/blog/up-front/2017/06/05/a-primer-on-dodd-franks-orderly-liquidation-authority/>

In the framework for capital requirement discussed earlier, if OLA were eliminated, it would increase the expected costs of failure, by increasing both the probability of failure and increasing the severity of a crisis. The higher expected costs of failure would then indicate that optimal capital requirements should be raised. For example, in the BoE paper, they assumed that TLAC and orderly resolution would reduce the expected severity of a crisis by about 60 percent, so the effect on optimal capital requirements would be significant.

Finally, in terms of research, it is important to continue to fill the gap on the effects of the financial sector and the macroeconomy, to evaluate the effectiveness of macroprudential policies and its interactions with monetary policy. Also, I have talked today mostly about capital, but new liquidity requirements are an important regulatory change, and it will be important to evaluate its effects and its interaction with capital.

There is more to be done, and many papers at this conference are tackling these important issues.