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## Cambridge Working Papers in Economics

Cambridge Working Papers in Economics: 1824

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# A Decade After Lehman: Taking Stock of Quantitative Easing and Regulation

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April 2018\*

Abstract

*The Lehman failure precipitated the Great Recession and forced economic policy into uncharted terrain. This paper provides a retrospective on the policy response and links to the underwhelming economic recovery. The exposition is kept non-technical to facilitate wider access. Contrary to perceptions that banks remain vulnerable, this paper argues that regulation strengthened U.S. banks across a variety of dimensions. The deleveraging involved in the transition to stronger banks tightened financial conditions and offset the significant monetary stimulus. The failure to fully capture these offsetting policy forces explains the systematic forecasting errors—both markets and the Fed have consistently overestimated the strength of the economic cycle. Quantitative Easing resulted in a ballooning of excess reserves in the banking system, but payment of interest on excess reserves helped bank recapitalisation. The combination of stronger banks and excess reserves has the potential, unlike in previous cycles, to drive a late cycle surge in growth.*

Keywords: Quantitative Easing, financial regulation, deleveraging.

JEL Codes: E4, E5, G1, G2.

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## Part I: The Policy Response

As we approach a decade following the tumultuous events unleashed by the failure of Lehman, it makes sense to take stock analytically. The fallout from the Lehman failure has been traumatic and long lasting. It precipitated the

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\* The author is grateful to Chris Rokos for discussions on this topic over an extended period of time. I would also like to thank Charles Brendon, John Eatwell, Murray Milgate, Srichander Ramaswamy and Bob Rowthorn for discussions on the subject. The views expressed are solely the author's.

Great Recession, tripped economic policy into uncharted waters and spilled over into the politics of the West.

Much has been written about the bank failure both in the popular media and in the sophisticated financial press. The popular rendition links the crisis to the wilful greed of bankers. The more sophisticated narrative acknowledged human failure and malfeasance, but drew attention to deeper forces. The drive to broaden home ownership in the United States; the capacity of the banks to leverage it in their own interests; and the failure of policy to grasp the destructive force of highly interconnected banks with thin capital cushions.

Surprisingly, for an event that had a systemic impact on the economy, policy and the markets, the analytical stock taking of the crisis and its aftermath has been somewhat thin. This paper delves deeper into the policy response following the systemic bank failure to provide insights into why growth and inflation have been muted following the Great Recession when compared to past recoveries. It also examines the implications of Quantitative Easing (QE) for the banking system's excess reserves and what that portends for future economic performance.

Making these assessments requires a deeper understanding of the interactions among monetary, fiscal and financial policies. The metrics used to capture fiscal and monetary policies are transparent; we look at the cyclically adjusted budget balance for fiscal policy and interest rates and central bank asset purchases for monetary policy. The metrics to capture financial conditions/policy—i.e. the capacity of the banking system to intermediate maturity and liquidity transformations—are much less transparent. Hence, macroeconomists often ignore the impact of financial policy on growth and inflation and focus instead on the impact of monetary and fiscal policies.

The focus of the first part is to correct this bias by looking more deeply into financial policy. It offers metrics to capture how financial conditions have evolved and interacted with monetary and fiscal policies. The focus is primarily on the United States to keep the discussion tractable.

The main conclusions are that the regulatory changes instituted in the post-Lehman period broadly tightened financial conditions till recently; together with the tighter fiscal policy since 2011, it is shown to have offset the

substantial monetary easing since 2008. The offsetting effects of monetary and financial policies appear largely to explain the underwhelming economic recovery following the Great Recession. The regulatory tightening of financial conditions after the Lehman failure is, however, shown to have gradually strengthened the banking system over time. The resulting enhanced capacity of the banks to intermediate in the future has the potential to extend the recovery.

In other words, while the effect of bank regulation dampened growth and inflation until recently, it could amplify them in the future. These effects of regulation—both actual and expected—have been unintended; regulatory policy did not consciously seek these effects. It has rather been a bi-product of attempts to strengthen the banking system. Should fiscal policy turn expansionary, as appears likely now, the financial accelerator will amplify the fiscal stimulus. The banking system has the space to increase lending late into the cycle—a starkly different dynamic from most previous cycles. The second section shows how excess reserves have been built up in the banking system as a consequence of QE. The policy adopted by the Fed to pay interest on excess reserves after the Lehman event is shown to have aided the recapitalisation of the banking system. The combination of stronger banks and excess reserves could have the potential to strengthen and extend the late cycle recovery. That has important implications for monetary policy and the markets as it indicates that the impact of QE could transition from largely influencing assets prices (as it has so far) to impacting the real economy through credit creation.

## **I.2. Perspectives on Post-Lehman Policies**

A retrospective on post-Lehman policies should be useful to understand how financial conditions have evolved. The first order policy response to the stresses associated with the failure of Lehman was to ease monetary and financial conditions. Fed funds were eased from 5.25% to essentially zero between August 2007 and December 2008. This was followed by large scale asset purchases – QE1 in March 2009, QE2 in November 2010, operation twist in September 2011 and QE3 in September 2012. While asset purchases began to be tapered in December 2013 and ended in October 2014, monetary policy continued to be expansionary throughout this period as the stock of assets held by the Fed grew, reaching around \$4.5 trillion – a massive increase. The totality of the monetary stimulus through cuts in the Fed Funds rate and large

scale asset purchases between 2007 and 2014 was unprecedented. The gradual hikes in the Fed funds rate since December 2015 has perhaps made only a small dent on the easy monetary conditions.

As the financial system seized up, financial policy complemented monetary policy during 2008-09 to keep the system operational. The Term Securities Lending Facility (TSLF), the Primary Dealer Credit Facility (PDCF), the Troubled Asset Relief Program (TARP), the Capital Purchase Program (CPP) to inject capital into the banking system, the Commercial Paper Funding Facility (CPFF), the Term Asset-Backed Securities Loan Facility (TALF) and the FDIC's guarantees of all checking deposits and the insurance of new senior debt kept the financial system whole and constituted an easing of credit conditions<sup>1</sup>.

Fiscal policy also complemented monetary and financial policies in providing support for the economy after the Lehman failure. The American Recovery and Reinvestment Act passed in February 2009 provided a fiscal stimulus of \$787 billion. The cyclically adjusted general government deficit as a percentage of potential output (a good proxy for the fiscal impulse) rose from about 4% in 2007 to about 9.5% in 2010 – a significant fiscal expansion.

That is, the cumulative support from monetary, fiscal and financial policies was significant in the couple of years following Lehman's collapse. It needed to be given the massive contractionary forces on the economy. This policy response explains the rapid stabilisation of financial and economic conditions during 2009-10.

### **I.3. Bank Regulation and its Implications**

The first order objective following the failure of Lehman was to prevent a re-run of the Great Depression. There is always an intrinsic conflict between the lender of last resort function of the central bank and moral hazard. During a financial implosion it is catastrophic to get obsessed with moral hazard. However, once the financial system had stabilized, as in 2010, it does make

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<sup>1</sup> Bernanke (2015) provides an extensive documentation of these initiatives.

sense to deal with moral hazard<sup>2</sup>. Fiscal policy was also tightened after 2010. This was a reflection of the political perception that a lack of fiscal discipline was a factor leading to the crisis. The cyclically adjusted general government deficit as a percentage of potential GDP contracted from about 9.5% in 2010 to 4% in 2016—a gradual but significant fiscal tightening.

On financial policy, a swath of regulations was initiated both in the United States and globally to curb excessive risk taking by banks. There were three main aspects to the regulatory initiatives. The first was to make sure that the egregious practices that led to the crisis were punished. The second was to make sure that the gaps in regulation were tightened so that the banking system could not arbitrage the regulatory system. The third was to ensure that the banking system had significant capital and liquidity cushions—both in quantity and quality—to withstand the next crisis.

The costs to the banks from fines to clean up past violations were substantial. The IMF's Global Financial Stability Report estimates that for the Global systemically important banks (GSIB) the cumulative litigation expenses constituted 27% of the underlying net income for the European banks and 19% for the U.S. banks. Regulation also forced a clean-up of the legacy assets. Non-core assets of the GSIB came down from 12% of all assets to 5%; for U.S. banks it came down from 12 to 3%. The fines and the clean-up weighed on bank profitability and lending, though much of that now appears to be behind.

There has been a strong sense among policymakers that the regulatory changes entailed by the move from Basel I to Basel II in 2004 incentivised banks to arbitrage the regulatory framework with unintended macro consequences that culminated in the financial crisis<sup>3</sup>. The Basel I framework associated the riskiness of bank assets by whether it was public or private. The key innovation in Basel II was to delink risk-weights from the public-private mix and link it instead to the external credit rating of the asset. So, a corporate bond that was rated AAA had a risk weight of 20% under Basel II as opposed to 100% under Basel I—a material difference for bank lending. Another important

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<sup>2</sup> A detailed discussion of the issues connected with moral hazard can be found in King (2016).

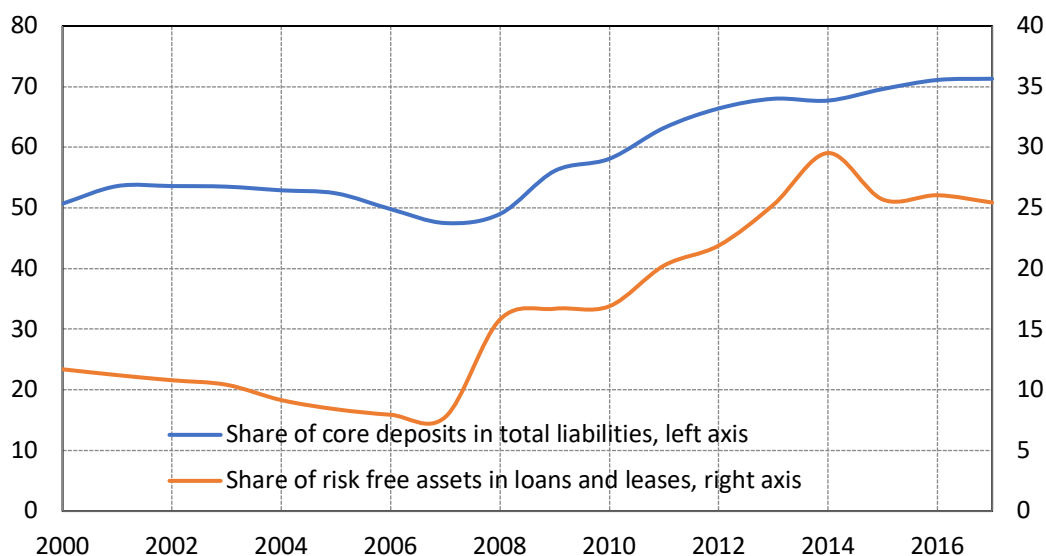
<sup>3</sup> See BIS (2017). Also see Ramaswamy (2017) and Bayoumi (2017) for a detailed discussion of the regulatory issues connected with Basel Standards.

change under Basel II was a reduction of risk-weights for collateralised residential mortgages from 50 to 35%.

The rules for holding securitized assets and the capital treatment of off-balance sheet exposures under Basel II were eased substantially. Banks could securitize their assets and hold them in off-balance sheet vehicles with literally no capital commitments. This was the crux of the structure that blind-sided regulators and blew up the banking system in 2008—essentially, banks could create sub-prime mortgages with little capital commitment.

Basel III consequently adopted a heavy hand in cleaning up the aberrations of Basel II. The experience of Northern Rock, showed that financial stress could also emanate from the liability side of the banks—i.e. how a bank funded itself. The exclusive focus of both Basel I and Basel II were on risk managing the asset side of the banks' balance sheet. Basel III regulated liability management by introducing new standards for liquidity management. Banks are now expected to hold adequate stocks of high quality liquid assets to manage the cash outflows associated with short-term financial stress. Chart 1 shows the dramatic impact of this regulation on bank balance sheets. Core deposits which were just under 50% of total liabilities of US banks in 2008 have now increased to over 70%. On the asset side, the share of risk-free assets (essentially cash and treasuries) in total loans and leases, which was as low as 7% in 2007 rose to as high as 30% in 2014 and is now at just over 25%. These constitute fundamental changes in U.S. bank balance sheets in the post-Lehman period.

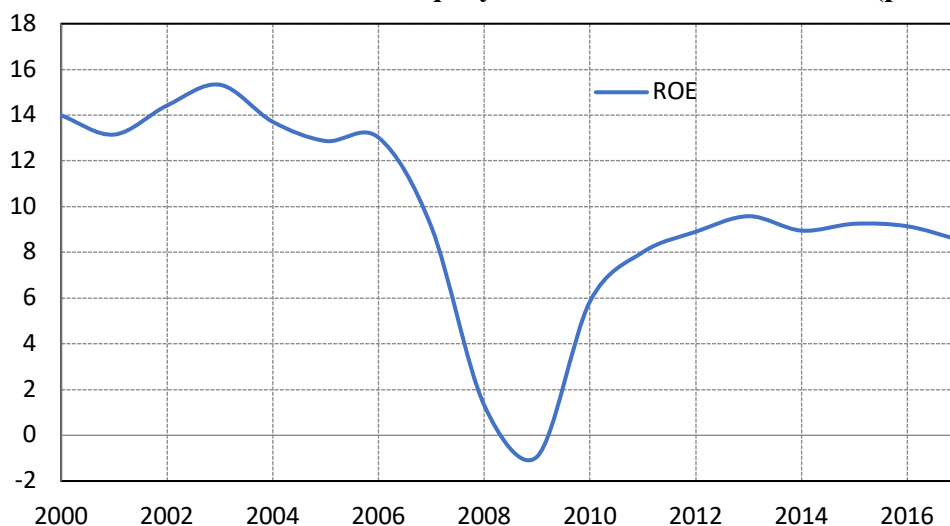
**Chart 1. Changes in U.S. Bank Balance Sheets (percent)**



Source: FDIC

The combination of fines, restructuring charges, the reduction in market related functions and the growing share of risk-free assets on the balance sheet all added up to reducing bank profitability. Chart 2 shows that the return on equity of the U.S. banks which was between 12-14% prior to the crisis has come down to around 8-10% in recent years, just about meeting the cost of equity, and constituted a tightening of financial conditions.

**Chart 2: Return on Equity of U.S. Commercial Banks (percent)**



Source: FDIC

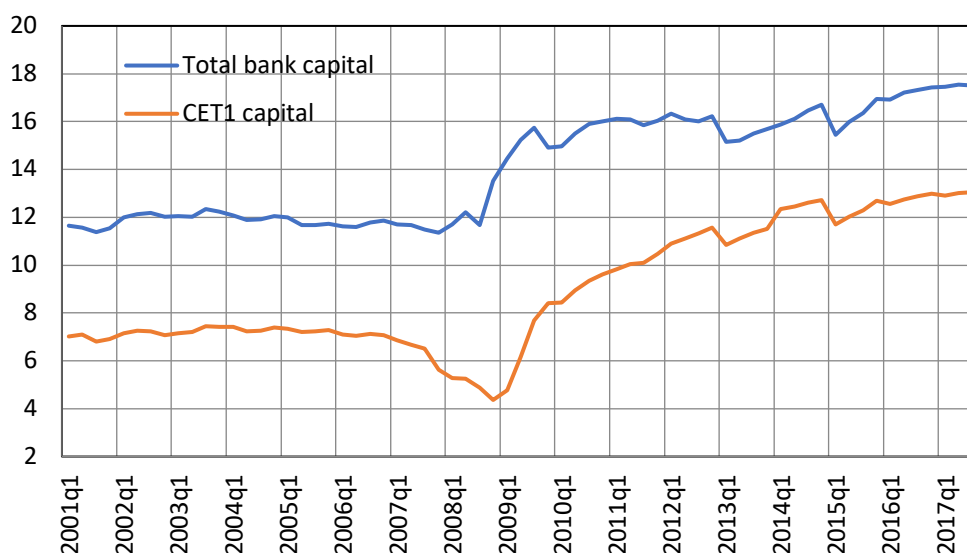
Basel III also made significant changes to the extent of regulatory capital that banks required. Superficially, Basel III set the minimum total capital



requirement as a share of risk-weighted assets to be the same as under Basel II, i.e. at 8%. However, regulatory capital is now defined stringently, forcing banks to raise the share of higher quality capital. Tier 1 capital ratio has to be at least 6%; moreover, Common Equity Tier 1 (CET1) capital—essentially common shares and retained earnings—has to constitute 4.5% of risk-weighted assets. Beyond the minimum capital requirements, additional capital requirements are imposed under macro-prudential regulatory rules. Banks are now expected to build a capital conservation buffer comprising CET1 instruments of up to 2.5% of risk-weighted assets during normal times. A counter-cyclical CET1 buffer of up to 2.5% of risk-weighted assets can be imposed. An additional capital buffer of up to 5% of risk-weighted assets has been proposed for systemically large financial institutions under Basel III. All these capital buffers are expected to be operational by January 2019.

Chart 3 shows the increase in total bank capital over risk-weighted assets for major U.S. banks following these regulatory initiatives.

**Chart 3. Evolution of Bank Capital Ratios for Major U.S. Banks (percent)**



*Source: FRB, New York*

The capital ratio was around 12% before 2008, rose to about 16% by 2011 and is about 17% currently. This broad ratio, however, masks the extent to which “effective” bank capital has been strengthened by post-Lehman regulatory requirements for high quality capital. Under Basel II, goodwill, other intangible assets and tax-deferred assets were included under Tier 1 capital, but are

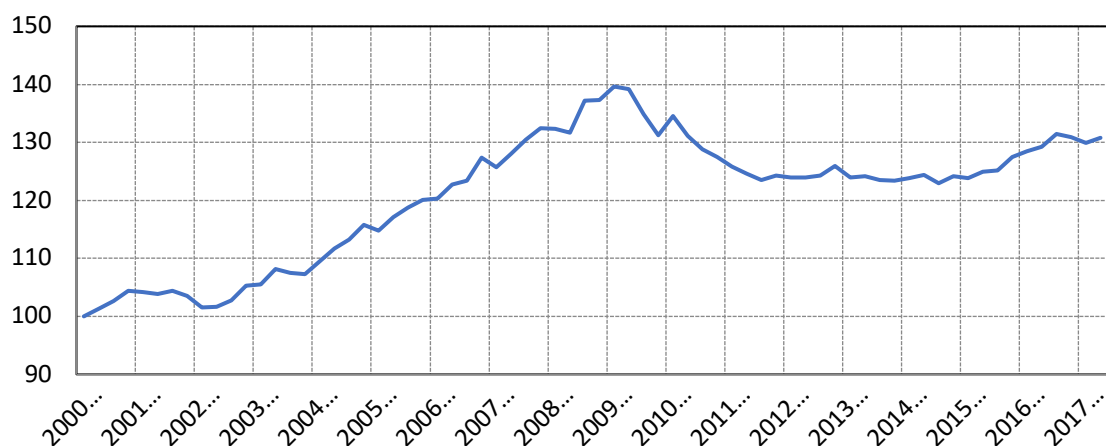
excluded under Basel III, making historical comparisons of total capital ratios an underestimation of the underlying strength of bank capital. The New York Fed now provides a backdated time series of CET1 capital for the major banks in the United States and Chart 3 shows that it increased from just over 4% at the end of 2008 to about 13% currently.

That is, the regulatory initiatives have almost tripled the high quality capital of the major banks—an increase of material significance. Even these numbers underestimate the evolving underlying strength of the banks as there are more stringent risk-weights, especially for mortgages and contingent liabilities. Viewed from this perspective, there has been an enormous strengthening of bank capital for the systemically large financial institutions in the United States, driven by the relatively close focus of regulation on the large banks. The high quality capital has been raised through deleveraging and by issuing costly common equity, which tightened financial conditions in the transition phase, but will provide the capacity for future credit expansion.

The impact of these regulation-driven changes in bank balance sheets, profitability and capital levels on the broader economy is multifaceted. The large increase in the share of core deposits in bank liabilities will provide a cheaper and more stable funding for bank intermediation in the future. This structural change in bank liability can be perceived as a prospective easing of financial conditions over the longer-run. However, financial conditions were tightened in the transition process—i.e., in the short-to-medium run—as the more stable liability structure was achieved through a truncation of wholesale funding.

The changes in the asset side of bank balance sheets tightened financial conditions unambiguously. The large increase in the share of treasuries in bank balance sheets reduced the funds available to the private sector. Banks are a critical conduit for facilitating liquidity and maturity transformation in a market economy and regulation transformed them into passive buyers of government bonds. As discussed, regulation also forced banks to raise high quality capital by deleveraging in the first instance. While normative factors (the failure of the banks to manage their risk) justify the regulatory drive, its unintended effect was to slow down credit growth to the private sector and dampen the robustness of the post-Lehman recovery (Chart 4).

**Chart 4: Ratio of Total Bank Loan Index to Nominal GDP Index (percent)**



*Source: FRB New York and FRB St. Louis*

Chart 4, which captures how credit is behaving in relation to nominal GDP, reveals interesting trends. The ratio of total bank loan index to nominal GDP index exploded between 2000-08, reflecting the booming economy, regulatory forbearance and regulatory arbitrage by the banks. The sharp decline in this ratio in the immediate aftermath of Lehman is consistent with deleveraging for survival by the banks. The regulatory drive to strengthen banks from 2011 drove this ratio further down and kept it at the lower level well into the end of 2015. The Chart is interesting because looking at the credit/GDP ratio implicitly endogenizes the identification problem—i.e. we can side-step, in the first instance, the issue of whether changes in loan growth are demand constrained or supply driven. The identification problem, of course, has to be settled econometrically ultimately. There has been a paucity of academic econometric studies on the relationship between regulation, bank capital and credit availability, but this will be a fertile area of research going forward<sup>4</sup>.

There is a gradual pick up in the ratio of total bank loan index to the nominal GDP index since 2016, with banks at the cusp of meeting regulatory targets. As banks approach regulatory targets on capital and liquidity (they

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<sup>4</sup> The topic appears at this stage to be of more interest in policy circles than in academia. A Bank of England Study (Aiyar, Calomiris and Wieldak, 2014) finds a strong negative statistical link between higher regulatory capital requirements and bank lending—in fact the effect seems almost as powerful as the monetary channel in the U.K. An IMF study by Ben Naceur and Roulet (2017) also finds a negative statistical relationship between higher regulatory capital requirement and lending in both the Eurozone and the U.S.

have passed stringent Fed stress tests in recent months), their capacity to intermediate strengthens. At the cusp of reaching regulatory targets financial conditions morph from being tight to becoming loose. The transition process from tight to loose is likely to be non-linear, because even if banks are just meeting new regulatory targets (Basel III), their underlying position is so much stronger than when they were at prior regulatory targets (Basel I and II). Consequently, easier financial conditions should accelerate into the future as banks build regulatory buffers and the economy strengthens.

#### **I.4. Summarising the Regulatory Implications**

The above analysis captures a strong and consistent theme of deleveraging by the banks and the meaningful strengthening of the quantity and quality of bank capital through regulation. This has not got the attention that it deserves either from policy circles, the sophisticated financial press, or the academic literature. If anything, the popular perception seems to veer the other way around; banks still tend to be perceived as the cause of the crisis, the driver of the muted economic performance and as a risk to future growth, despite the significant transformations we have seen in the banking sector over the last decade.

The analysis and conclusions of this part of the paper go against this conventional wisdom. A closer look at how bank regulation has evolved and played out reveals the complexity with which financial policy has interacted with monetary policy. The conundrum of low inflation amidst substantial monetary easing becomes much less of a puzzle once the headwinds from financial tightening arising from deleveraging and raising high quality capital are brought into the picture<sup>5</sup>. The analysis has no normative agenda—i.e. there is no value judgement placed on whether the regulation should have happened or been done differently. If anything, the paper is sympathetic to the need for regulatory changes given the traumatic events associated with the failure of Lehman. The analysis has been entirely positivist in attempting to capture the evolving dynamics of financial regulation and its implications for the broader economy. The stronger capital base for the banks as a consequence of regulation will aid

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<sup>5</sup> The concept of deleveraging used here refers to banks reducing the level or speed of credit creation. It is somewhat different from the way deleveraging is used in Eggertsson and Krugman (2012) to describe the reduction of debt by households and firms in response to shocks. Ultimately, it brings us back to the empirical identification problem, and this is likely to be a fertile area of research in evaluating the post-Lehman period.

future expansion; the banks now have the intrinsic capacity to accelerate loan growth into the late stage of the cycle—something that seldom happens at the mature phase of the upswing. This theme is developed in greater detail below.

## **Part II. QE, Excess Reserves and Its Economic Impact**

As discussed in Part I, the implosion of Lehman led in the first instance to significant monetary easing in the form of QE to support the economy, followed by regulation to prevent a repeat of the financial excesses. While the focus of the previous section was on the economic implications of regulation, this part delves into the financial and economic implications of QE.

The impact of QE on the economy has been relatively well documented by now. We have a good understanding of what the objectives of QE are and how bond purchases impact asset prices across the risk-spectrum<sup>6</sup>. The Fed, for instance, has carried out detailed studies of the impact of QE, estimating that it has lowered 10-year bond yields by around 100 bps (Fischer, 2015). The impact of QE on yields down the risk spectrum has no doubt been larger. There are, of course, still open questions about the impact of QE—for instance, about how the relative impact of stocks versus flows influences asset prices and the economy. That is, we still do not have a good handle on how much of the QE effects will continue to flow through from the expanded balance sheet of the central bank after asset purchases have been stopped; or, even as the stock of assets are gradually reduced, as is the case in the U.S currently. After all, based on the Fed’s forward guidance for asset disposals, it would take roughly 4 more years for its balance sheet just to halve. That could be a continuing source of monetary stimulus if the QE impact works as much through stocks of assets as it does through flows.

A critical consequence of the QE programme has been the build-up of excess reserves in the banking system. It has a significant impact on both the balance sheet and profitability of banks, and through that, on the broader economy. This channel has received much less analytical focus because macro models tend to underplay the role of the banking channel. While the focus of the analysis largely pertains to the U.S. economy, the analysis of excess reserves is also extended to the Eurozone. Contrasting the excess reserves issue

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<sup>6</sup> Yellen (2013) provides a good summary of how QE is supposed to operate.

in the U.S. with that of the Eurozone provides a deeper understanding of the impact of QE in the U.S.

## **II.2 Excess Reserves in the U.S.**

Reserve requirements are a critical ingredient of fractional banking—which essentially encompasses most of the banking system in the world. In the case of the U.S., the Fed requires all deposit taking institutions to hold 3% of any net transaction accounts between \$15m and \$104m and 10% of the accounts above \$104m in reserves. Before the financial crisis in 2007, total reserve balances in the U.S. banking system hovered around \$15b, with excess reserves making less than \$2b of this total. These were held in the form of either vault cash or reserve balances with the Fed.

As the Fed embarked on QE post the Lehman crisis, the purchases of treasuries and agency backed mortgage securities swelled the asset side of its balance sheet. From a total asset base of about \$869b in August 2007, the Fed's assets expanded to \$4.5t by December 2014, by the time asset purchases ended. As a consequence of the asset purchases reserve balances became the Fed's single largest liability, at \$2.6t by end 2014. It has declined since then to \$2.2t as of December 2017; excess reserves make up all but \$0.1t of this total<sup>7</sup>.

Since October 2008 the Fed has paid interest on the banks reserve balances. For convenience we will call it interest on excess reserves (IOER)—essentially almost all of the reserve balances are basically excess reserves at this juncture. The Fed funds rate has generally been below the IOER. The Fed currently has a range for the Fed funds rate of 25 bps, with the upper band being capped by IOER and the lower band bounded by the Fed's Reverse Repurchase Agreement (RRP).

The net income generated by U.S. banks from IOER is not straightforward to calculate, but we can make a rough estimate. With IOER being 1.75% currently, the banking system reserves of around \$2.1t should be able to generate an income of close to \$35b annually—a significant contribution to bank net income and profitability. With deposits paying little or no interest

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<sup>7</sup> A thorough analysis of the excess reserves issue is provided in Ihrig, Meade and Weinbach 2015.

income, the IOER is a good approximation of net income generated by U.S. banks on reserve balances. That constitutes just over 20% of the net income of U.S. banks, which were approximately \$150b on average during the last three years. That is a significant contribution made by earnings on excess reserves to bank profitability and has potentially aided bank recapitalisation in the U.S.

QE tends to be perceived as being detrimental to bank profitability as it lowers term premiums and thereby net interest income that banks can earn on riding the yield curve<sup>8</sup>. This presumably happened to some extent, though the optics of the low long dated yields masks how much the banks could still eke out of the yield curve (net interest income is one of the largest contributors to bank profitability). At the same time, banks benefitted greatly from IOER. QE therefore indirectly helped to recapitalise the banks through the excess reserves channel, a factor that tends to be under-emphasized in discussions, and therefore prevented the harsh deleveraging that took place in the Eurozone. The differing impact from the excess reserve channels on credit growth and bank strength in the U.S. and the Eurozone is discussed in greater detail below.

### **II.3 Excess Reserves in the Eurozone**

QE, in the form of public sector asset purchases, was announced in January 2015 by the ECB. The initial phase involved the purchase of €60b per month of sovereign bonds, which was increased to €80b in March 2016. This was later pruned back to €60b in December 2016 and then to €30b per month in October 2017. The QE programme is thus still ongoing, though with a lower velocity, and the ECB's balance sheet is still expanding.

As in the U.S., QE has been associated with growing excess reserves in the Eurozone. At the end of 2014, before the official announcement of QE, excess reserves in the Eurozone was about €80b. At the end of 2017, total reserves had risen to about €1.2t, with excess reserves constituting about €1.1t.

Unlike in the U.S. where interest is paid on excess reserves, the negative deposit rate is applied to excess reserves in the Eurozone. At today's deposit rate of -40 bps, Eurozone banks will have to pay about €4.5b a year to the euro system central banks for holding excess reserves.

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<sup>8</sup> A good discussion of this issue is provided in the collection of articles in Den Haan (2016).

This is indeed a stark difference between the United States and the Eurozone. While QE helped indirectly to increase profits and capitalise the banking system in the U.S., QE has imposed a cost on the Eurozone banks by reducing profitability and perhaps even depleting bank capital. These effects have not necessarily been intentional. The fear of deflation and the danger of replicating the Japanese experience in Europe forced the ECB into an aggressive form of monetary easing without paying sufficient heed to the collateral damage on banks and the second order effects on the economy.

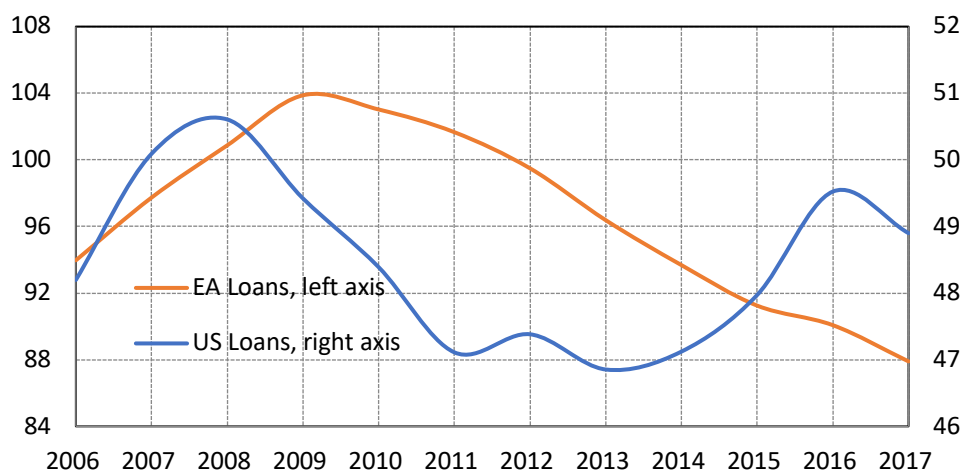
If excess reserves impose such a cost on the banking system in the Eurozone, why don't the banks lend the money out rather than pay the ECB? There are two reasons. First, demand constraints could be binding, and with the pervasive malaise in Europe, the lack of demand for loans has no doubt been a factor. But even where demand constraints do not bite it is not costless for the banks to convert excess reserves into loans. There are no capital charges on holding excess reserves and it helps the banks to meet the new statutory liquidity requirements. Using excess reserves for making commercial loans would reduce liquidity buffers and incur capital charges and Eurozone banks have not only been short of capital but have had to meet the increasingly stringent capital requirements of Basel III. That is, the Eurozone banks presumably found that paying up for excess reserves was less costly than making loans.

#### **II.4. QE, Asset Prices, Real Economy Lending**

The data appear consistent with the above discussion of how QE has interacted with excess reserves in the U.S. and the Eurozone. Chart 5 shows that loan/GDP has fallen consistently in the Eurozone from the peak of 104% to about 88% recently; in contrast, following a period of significant deleveraging, the loan/GDP ratio stabilized in the U.S. by 2014 and started picking up thereafter. That is, the deleveraging by Eurozone banks continued long after it had stopped in the U.S.



**Chart 5: Loans to GDP (percent)**



*Source: FRB New York; ECB; IMF; Eurostat.*

The essential point is that QE in both the U.S and the Eurozone has had much more of an impact on asset prices than on the real economy, but for different reasons. In the United States, QE combined with IOER contributed to raising bank profitability and aiding bank recapitalisation. The issue really is at what stage do the excess reserves get deployed for lending to the real economy, which is ultimately the purpose of non-standard monetary policy. The constraints, as always, are demand for loans and capital constraints for increasing banks' loan portfolios. With IOER paid by the Fed, we have the additional complication that an improvement in the economy that results in higher interest rates will generate more income for the banks without them having to commit capital—close to free money, as it were. That is, for excess reserves to be productively deployed in the real economy we need the configuration of an increase in the demand for loans, banks exceeding their regulatory capital requirements and a return on lending to the real economy for the banks which exceeds IOER. As the economy seems to be picking up speed and the Fed gradually reducing its balance sheet, there is a rising probability that this configuration materialises, but challenges persist.

The Fed can incentivise lending to the real economy by stopping paying IOER; however, for that to happen the balance sheet of the Fed has to be reduced significantly. Otherwise, the Fed is likely to lose control of the Fed Funds rate—that in fact is the key reason for IOER; bank recapitalisation has been a second-order effect. Stopping payment of IOER is therefore likely to take time—banks will have to transition to a more balanced reserves position.

However, despite this constraint, with the banking system close to meeting regulatory capital requirements and the economy picking up steam, the banking system has the ammunition over the next few years to increase intermediation significantly as and when lucrative lending opportunities arise (i.e., returns from lending > IOER). If those conditions were to materialise, there can be a significant acceleration in late cycle growth as banks begin to build up their loan leverage. That is, rather than the usual pattern of higher than potential growth in the early part of the cycle, we could have the unusual occurrence of higher than potential growth in the late part of the cycle. That is something that conventional macro analysis does not capture and could have significant implications for asset prices—both equity and fixed income markets. This inference is also something that is not embedded in yield curve, given its extreme flatness. However, as can be implicitly inferred from the discussion so far, it is extremely difficult to extract signals from the yield curve given the scale of the QE.

### **III. Conclusion**

This paper has provided a retrospective on the policy response to the Lehman crisis. The massive monetary, credit and fiscal easing in the immediate aftermath of the Lehman failure is confirmed to have been the appropriate policy response that offset the significant contractionary impulses on the economy. The regulatory drive after the system stabilized had three elements. First, viability for the political class demanded swift and strong retribution against banks. Second, regulators faced pressure to make sure it never happened again and revamped the rules to reduce the capacity of the banking system to engage in regulatory arbitrage. Finally, regulation forced a strengthening of bank capital. Basel III tightened the screws and forced an increase in high quality capital—the ultimate metric of bank strength, as it determines how big a hit a bank can take when things go wrong and still be viable.

While regulatory pressure has ultimately resulted in stronger banks, the transition process led to tight financial conditions over a period of close to 5 years. Regulation forced banks to raise high quality capital and deleverage. The demand for more liquidity in bank assets and greater stability in liabilities in this transition period accentuated the tightness in credit. That is, financial

policy offset some of the extraordinary monetary easing enacted through zero interest rates and large scale asset prices by the Fed.

These offsetting forces from monetary and financial policies offer a key explanation for the conundrum of why growth has been muted following the Great Recession compared to past recoveries and why inflation has been low despite the unprecedented monetary easing, rising asset prices and strong labour market. While this conundrum has lasted long—markets have consistently overestimated interest rate forwards and monetary policy has systematically undershot the Fed’s “dot plots”—the current stronger position of the banks implies that the financial headwinds are likely to abate going forward. A late cycle surge in above potential growth—something that rarely happens in an economic cycle—is entirely possible if the banks can now kick in with credit. Depending on how the inflationary dynamics plays out, that could lead to a tighter monetary policy going forward than is currently priced in.

This paper has also documented how the large scale asset purchases arising from QE has increased the excess reserves in the banking system. In fact, excess reserves increased from pre-crisis levels by a much larger multiple than the Fed’s balance sheet. While excess reserves indicates the unutilised potential for credit intermediation by the banking system, the payment of interest on excess reserves by the Fed led to an increase in bank profitability and aided bank recapitalisation. This is in stark contrast to the Eurozone where the negative deposit rate on excess reserves acts as a tax on the banking system. As capital constraints on lending become less binding and the economy picks up momentum, the excess reserves could provide the fuel for banks to extend credit going forward. This could reinforce potential for late cycle acceleration of growth noted above.

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