Following the Great Financial Crisis, central banks in the major economies have adopted a whole range of new measures to influence monetary and financial conditions—more popularly known as unconventional monetary policies. In this paper, the authors try to answer two broad questions regarding such policies: how effective they have been and what broader issues do they raise.

Post-crisis, the central banks under consideration have actively engaged in (a variety of) credit policies, quasi debt management policy and forward guidance. During the crisis management phase, central banks relied heavily on balance sheet policies to stabilise the financial system. As emphasis shifted to more traditional macroeconomic objectives, central banks increasingly relied on forward guidance. The adoption of negative policy rates is of more recent vintage, has sometimes sought to reinforce the impact of balance sheet policies and has coincided with a typically more nuanced use of forward guidance.

These measures have changed the size and structure of central bank balance sheets beyond recognition, and have had a profound influence on the day-to-day operations designed to set policy rates. Central banks went from setting policy rates by fine-tuning the amount of reserves in the system as dictated by reserve requirements to doing so through the rate paid on excess reserves. They also greatly broadened the range of eligible collateral and maturity of operations and, in some cases, widened that of counterparties. In the process, the distinction between normal lending operations and those that would have taken place only when markets and institutions are under market stress has become blurred.

On the effect of unconventional monetary policies on balance sheet policies of central banks, the authors accumulate formal econometric evidence and less formal ones when the former are not available. The former is concerned with the impact of large scale asset purchases, regardless of whether they involve private sector or government assets, whereas the number of studies assessing the effects of credit policies pursued through central bank lending facilities is much smaller. A look at the studies points to a number of findings. First, there is general agreement that large-scale asset purchases did have sizeable effects on financial conditions, regardless of the assets purchased. Second, most of the impact appears to take place on announcement. Third, the studies have a hard time distinguishing between the impact on the risk premium and on the expected path of future policy rates.

On the issue of forward guidance, the authors state that pre-crisis this was done indirectly, by explaining the central bank’s strategy. In a few cases, the central bank was much more specific, announcing the policy rate’s expected path, possibly embellished with estimates of the surrounding uncertainty. In these cases, the central bank took pains to indicate that these forecasts depended on the information available at the time. Things changed when policy rates hit the perceived lower bound. At that point, if central banks wished to ease financial conditions further they either had to engage in balance sheet policies or they had to
steer expectations more actively.

Forward guidance can be distinguished along two dimensions; one, it may relate to a certain period of time, or may be conditional on economic conditions. Depending on the complexity of the statement, combinations are also possible. One view, advocated by some economists, is that for forward guidance to be effective, it must involve a form of pre-commitment. Central banks, however, have generally been reluctant to portray their policies this way. They do not regard announcements as sufficiently strong pre-commitment mechanisms. Rather, central banks have stressed forward guidance as a means of clarifying their intentions and, when state contingent, to underline their determination to pursue specific objectives. The formal evidence suggests that forward guidance can generally succeed in influencing bond yields in the right direction, but with some qualifications.

Two factors may explain why forward guidance may not be as effective as originally hoped. The guidance may not be fully understood, in particular, if it is too complex or state-contingent, as the conditions envisaged may not be expressed very clearly. Second, the central bank may not be able to guarantee the consistency of future decisions beyond short horizons. Also, the market may not share the central bank's view about the outlook or the workings of the economy. Therefore, over time, central banks appear to have downplayed forward guidance somewhat. There has been a certain shift from the quantitative and state-contingent type to the qualitative variety. And when quantitative elements have been retained, they have tended to refer directly to the ultimate goals, such as inflation, rather than to intermediate variables.

Negative policy rates are the latest addition to the arsenal of unconventional monetary policy measures. The experience so far suggests that modestly negative policy rates transmit to the rest of money market and capital market rates for the most part much like positive rates do. Their transmission to bank rates, by contrast, has proved more problematic. In particular, such rates have only been partially transmitted to wholesale deposit rates and so far not at all to retail deposits. Ostensibly, banks are reluctant to do so, presumably out of concerns with the reaction of depositors. This points to the limits of the strategy as a means of boosting financial conditions through the banking system. If policy rates do not transmit to lending rates, they cannot boost the demand for loans. If they do transmit to lower lending rates but not to deposit rates, they squeeze banks' profits, over time possibly undermining their willingness and ability to lend. Additionally, if they transmit to both lending and deposit rates, they risk unsettling the deposit base, making it harder for banks to attract funds. This leaves exchange rate depreciation and, possibly, direct borrowing from capital markets as the main channels through which negative rates can ease financial conditions. The impact on bank profitability arises not so much from the direct tax on bank reserves but from the compression of the yield curve.

While the literature on the impact of unconventional monetary policies on financial conditions is vast, that on their effect on output and inflation is much more limited. One can seek to measure directly the effects of the variables of interest on output and inflation. A specific problem with such studies is that the relationship between the variables of interest is bound to be highly unstable and to exhibit breaks. Any patterns
observed in the period preceding the adoption of balance sheet policies are highly suspect and bound to change following their implementation. Thus, it is not clear what these studies really capture.

At the other end, one can follow a theory-based approach. The corresponding models, however, are not taken to the data directly, and rely on other information to set the size of the key parameters. The results, therefore, are primarily intended to shed light on the transmission mechanisms involved and are less useful as a guide to the actual size of the effects. An approximate middle approach is to follow a two-step procedure - it first maps the specific measures into more traditional variables or “shocks” normally included in models and econometric work; then, based on this mapping, traces the effect on output and inflation. Problems may arise if the decoupling principle undermines attempts to derive the shadow rate from the size and structure of the central bank’s balance sheet, and is more reliable if the mapping is simpler.

Views differ widely concerning the measures' effectiveness in steering output and inflation beyond the crisis management phase. A common impression is that despite central banks having deployed the tools vigorously and beyond what was imaginable pre-crisis, output growth has remained disappointing and inflation stubbornly below objectives. The authors reason that the financial crisis is less amenable to traditional monetary policy measures because of the legacy of the previous financial boom, as an impaired banking system obstructs the transmission of policy and misallocates credit, while also failing to stimulate an overly indebted private sector, focused on repairing balance sheets rather than spending. The measure-specific characteristics on the other hand, suggest that the tools may be subject to diminishing returns; balance sheet measures are likely to be most effective when financial markets are segmented and dislocated, so that the authorities' intervention can help alleviate the corresponding distortions. According to the authors, there is clearly a limit to how far risk premia can be compressed, expectations guided and interest rates pushed into negative territory. As those physiological limits are approached, policy loses effectiveness and trade-offs worsen.

The combination of context and measure-specific characteristics raises serious exit issues. On the one hand, it is compelling for central banks to press further on the accelerator in order to achieve their objectives. On the other hand, unless the measures do prove sufficient or other factors come to the rescue, sooner or later their limitations would become fully apparent.

Moving on, the authors point out that unconventional monetary policy measures also raise delicate political economy issues viz. the policies’ perceived impact on inequality and the complications linked to balance sheet measures. The authors claim that the financial crisis has put the spotlight on the growing inequality that had been developing for decades, and the extreme monetary policy settings have focused attention on central banks' role, not least given their greater and explicit reliance on boosting asset prices and given the impact of persistent exceptionally low interstates on savers. They however mention that formal evidence on the impact of monetary policy on inequality is limited. On the balance sheet policies, they point out that almost any balance sheet policy can, or could be, replicated by the government; conversely, any balance sheet policy has an impact on the consolidated government sector balance sheet; and hence balance sheet policy needs to be viewed as part of this larger balance
This is also why, according to the authors, balance sheet policies have a quasi-fiscal character and blur the line between the government and the central bank. If the central bank engages actively in credit policies, it may be criticised for favouring one set of borrowers over another, and if it purchases government paper on a large scale it may be criticised for financing the government. All this puts a premium on co-ordination and raises deeper questions about central bank independence. However, according to the authors, operational independence has a habit of coming under threat when it is most valuable, and loss of independence may also go hand-in-hand with a loss of legitimacy and credibility of the institution.

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Quantitative easing (QE) programme generally varies in design across countries, but in recent years four major banks: the Bank of England, the Bank of Japan, the European Central Bank and the Federal Reserve have involved the secondary market purchase of government bonds and the associated creation of bank reserves. Intuitively, the QE has two main objectives - first is to put downward pressure on longer-term interest rates by reducing the average maturity of government debt, and the second is to increase bank reserves and to make the domestic banking system more liquid. Literatures suggest that QE had a large measure of success in meeting these objectives. But central focus of this paper is to investigate whether round-tripping practice of purchasing of bonds via the markets in the secondary market is cheaper than directly purchase by the government or not. Simple macroeconomic theory suggests both approaches are identical except involvement of transaction costs in the market operations. It is simply a matter of intra-public sector accounting with no direct economic effects - unless the behavior of the government or of the central bank is altered (or perceived to be altered) by this transaction.

Analyzing the impact of recent QE on consolidated balance sheet of the monetary authorities (the government and the central bank combined), the paper found that QE has changed their liabilities from long-term government bonds to very short-term bank reserves (i.e. banks' deposits with the central bank). The QE has also changed the central bank's holdings of government bonds. Considering the two key objectives of lowering the long term interest rate and expanding bank reserves, the paper observes that central bank purchases of longer-dated government paper can drive down the term premium (given expected future short-term rates) through portfolio balance effects. But buying long-term government debt may lead to risk of provoking excessive currency depreciation. For the second objective of expanding bank reserves, the purchasing of government bonds in the secondary market generates government deposits, but only if the government draws down such deposits to finance its domestic spending that there would be monetary implications.

Fiscal discipline could be eroded if the government was able to force the central bank to directly finance government spending at interest rates dictated by it (“direct finance”) and hence monetary policy independence would be undermined. But in case of purchasing of government debt in the secondary market, it would be relatively easy to find willing buyers for that debt in the primary market who could then quickly sell to the central bank. Other financing arrangements could equally undermine fiscal discipline - such as forcing commercial banks to finance the government (financial repression). However, the monetary financing of government deficits (defined as currency, Federal Reserve liabilities plus US Treasuries with a maturity of less than one year) can take place without any direct finance. Indeed the standard measure of monetary financing does not depend on the intensions of either government or the central bank. Contrarily, it depends on the short-term liabilities (currency, other central bank liabilities, short-term government debt) on the consolidated balance sheet of the central bank and the government. But treasury issuance of short-term debt was monetary finance, and therefore subject to limits. According to Tobin (1963), the monetary impact of
government debt depends on the consumption of the public holdings of government debt (i.e. net of central bank holdings).

For estimation of transaction costs, the paper analyses the movements in bond yields around each type of operation (debt deals and debt purchases) to measure short-term underpricing of sales and overpricing of purchases (termed as concession) - over the period when quantitative easing was in operation. The primarily analysis suggests that the round-trip approach was not required due to lack of government primary issuance during the QE period. Another possible explanation for a round-trip approach to QE transactions was objective to alter the average duration of existing debt, akin to 'operation twist', where purchases of longer duration debt are funded by sales of short duration with the express intention of shortening the average duration of outstanding debt (and potentially lowering long term yields).

The paper found a significantly higher transaction cost involved in purchasing bonds in QE operations relative to the average cost of sales. Purchases are intrinsically more expensive to undertake than sales since they require existing holders to offer their bonds for sale. Poor operational design associated with QE operations was also responsible for their cost in case of debt purchases. Two potential design problems with QE operations are potential interaction between bidder behavior and final allocation, and use of indicative secondary market yields. In the first problem, bidder may act to influence the secondary market yields used to allocate bonds, while secondary market indicative yields are not based on firm offers to buy. The auction pattern shows that competition between market makers (participants) is unlikely to eliminate this effect - especially for the less frequently traded bonds. Over 86% of bond purchases were allocated at a single yield (indicating that there was probably only one successful bidder) suggests that competition in individual bonds was limited. Literature also suggests that smaller and more frequent issuance could reduce costs.

Conclusively, the paper states that monetary and real effects of QE (e.g. reduced holdings of long-term government bonds by the market and increased bank reserves) depend on the changes in the consolidated balance sheet of the monetary authorities. The paper found that QE mechanism involves significant market transaction costs. Although it is hard to identify the recipients of these transaction costs, it is unlikely to be entities that the government would wish to subsidize. With the central objective of investigation of a round-trip approach in QE, the paper found that central bank reinvestment of maturing government bonds is relevant in case of central banks willingness to sell bond and hence any bilateral central bank/treasury operation would have to be designed to avoid any compromise on central bank autonomy.

A deliberate price manipulation in auction processing, especially in less liquid bonds may generate price imperfection. This can also cause market distortion and may generate unusual price movements during the day. Thus the timing of shrinking - which would have effects on financial markets and the macroeconomy - would depend only on the pattern of past purchases and be quite independent of future economic conditions. The same macroeconomic effects of central bank sales of bonds in the market could also be achieved by some combination of a bilateral central bank/treasury transaction (e.g. the treasury could swap long-dated fixed-rate government bonds on
the central bank's balance sheet for floating-rate debt) and a change in the government's debt management strategy. There should be wider range of exit options than only having option of central bank selling the government bonds (it holds) in the open market. The treasury could design “more efficient and less costly” exit by a single financing strategy for the consolidated public balance sheet (i.e. central bank and treasury combined). The central bank could be given the opportunity to swap the government bonds it holds for short-term government bills.

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The major takeaway from this paper is that monetary policy, through the financial cycle, has a long-lasting impact on output and, by implication, on real interest rates. Therefore, a narrative that attributes the decline in real rates primarily to an exogenous fall in the natural rate is deceptive. The prevailing view is that the secular decline and exceptionally low level of inflation adjusted (real) interest rates largely reflect a fall in natural rates, driven by paradigm shift in saving and investment fundamentals. Views about the natural rate are necessarily model-dependent. At the heart of the prevailing interpretation are two key features. First, the natural rate is defined as that which would prevail when actual output equals potential output. Second, inflation is the key signal that output is not at its potential, sustainable level. All else equal, if output is above potential, inflation will tend to rise; if it is below, inflation will tend to fall. This conventional view is seen through a narrow prism and generally belies data prior to crisis.

The twofold objective of this paper is to revise the measurement of the natural interest rate, and more ambitiously, propose a monetary policy rule that systematically takes into account the state of the financial cycle. By establishing a link between monetary policy and long-run output trajectories, the framework also provides a richer perspective on the secular decline in real interest rates. The framework is applied on US data over a 30-year period, 1985-2015. The paper reaches to two major conclusions. First, on taking financial factors into account, the natural interest rate turns out to be higher and falls by less than prevailing empirical approaches would suggest, at least since 2000. Second, monetary policy has a first-order impact on financial factors and hence on output fluctuations. The subsequent booms and busts leave behind grave repercussions, at least on the level of output. The amalgamation of these two conclusions suggest that a narrative that attributes the decline in real interest rates and their persistently ultra-low post-crisis levels primarily to an exogenous fall in the natural rate is incomplete.

An effective “lean-against-the-wind” approach requires policy to take financial developments into account systematically. Responding to financial stability risks only when they become evident would inevitably lead to doing too little too late, as it would ignore the cumulative impact of policy over the whole financial cycle. Rather, policy interest rates should beset so that the economy is never too far away from “financial equilibrium”. Using an illustrative policy rule that embodies such features, analysis done in this paper suggests that it would have been possible to mitigate financial imbalances, leading to significant output gains.

The authors decompose traditional measures of the financial cycle- typically captured by the behaviour of (private sector) credit and asset prices, notably property prices - into two key variables that jointly pin down sustainable levels of the credit-to-GDP ratio. The first is a long-run equilibrium (“co-integrating”) relationship between the credit-to-GDP ratio and asset prices, a rough measure of leverage; the second is a relationship between the credit-to-GDP ratio and asset prices, a rough measure of leverage; the second is a relationship between the credit-to-GDP ratio and asset prices, a rough measure of leverage; the second is a relationship between the credit-to-GDP ratio and the average lending rate on debt outstanding, in effect a measure of the debt service burden. By embedding the deviations of these relationships (“gaps”) in a vector autoregressive (VAR) system, the authors find that
they are a major driver of output fluctuations.

The dynamics of the results reveal that financial factors can have a very persistent impact on output. Specifically, the interaction of the leverage and debt service gaps gives rise to endogenous economic cycles that can have perpetual output effects. They reveal a prominent role for monetary policy. Policy does not just affect credit and asset prices but, more directly through interest payments, has a major influence on the debt service gap - a key variable driving long run output dynamics.

The debt service gap was large and positive before and during the three recessions in the sample considered by the authors, in particular for the most recent one. By contrast, the leverage gap was very low during the commercial real estate and leveraged buy-out (LBO) boom in the late 1980s and the housing boom in the mid-2000s. This simply reflects the fact that asset prices tend to run ahead of the credit-to-GDP ratio during booms, even as this ratio increases beyond historical trends. In other words, while the credit-to-GDP ratio soars during a credit boom, the leverage gap, as measured here, actually declines, because asset prices increase even more. This also makes borrowers look deceptively solid in the boom phase. The permanent impact on output is sizeable. The impulse responses suggest that private sector expenditure drops by around 3 percentage points in the long run after a -10% leverage gap. Now, at the height of the credit boom in the mid-2000s the leverage gap was as low as -20%. This would explain around half of estimated post-crisis output losses.

When estimated over the full sample, from the mid-1990s the two gaps move together. Recognising the financial tailwinds, output gap measure clearly indicates that the economy was running above sustainable levels in the years leading up to the financial crisis. Conversely, output was below potential in the aftermath of the crisis on account of the substantial financial headwinds. The fact that output moved above potential towards the end of the sample reflects the significant support that financial factors provided to the US economy during that phase, with leverage and debt service below their long-run levels.

Following a “business as usual” policy most of the time, combined with occasional leaning only once the signs of financial imbalances become obvious, would result in doing too little too late. At worst, it could mean that the central bank is seen as simply precipitating the very recession it wishes to prevent. Selective attention is not the answer. A “through-the-cycle” policy is called for. The right policy would need to take financial considerations systematically into account, never straying too far away for too long from some notion of “financial equilibrium”. Merits of such a policy more generally, will withstand further scrutiny.

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