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Editor's Note

The articles in this issue of the *Cato Journal* stem from the Cato Institute's 36th Annual Monetary Conference—**Monetary Policy 10 Years after the Crisis**—which was held in Washington on November 15, 2018. Leading scholars and policymakers discussed changes in the Fed's operating framework, the impact of Fed policy on interest rates and asset prices, the lessons learned from unconventional monetary policy, and the case for a rules-based monetary regime.

The Fed's new operating system became fully operational in 2015. Under the new system, the Fed uses interest on excess reserves (IOER) and overnight reverse repos (ON RRPs) to administratively set a range for the fed funds rate. By doing so, it divorces the size of its balance sheet from its policy rate target. Prior to October 2008, banks had little incentive to hold excess reserves rather than lend them out. However, when the Fed began to pay IOER, which was greater than the opportunity cost of holding those reserves at the Fed, banks rapidly increased their balances at the Fed. The strong demand for reserves weakened the normal monetary transmission mechanism. Hence, the Fed's large-scale asset purchases (also known as "quantitative easing" or QE) increased the monetary base but did not lead to a corresponding expansion of monetary aggregates or runaway inflation.

Today, there is no longer any substantial interbank lending on the fed funds market and the Federal Reserve continues to hold a large portfolio of longer-term Treasuries and mortgage-backed securities. By engaging in credit policy, the Fed politicized the allocation of capital; and by engaging in QE and forward guidance (promising to hold rates "lower for longer"), the Fed encouraged excessive risk taking and helped inflate asset prices. Moreover, the Fed appears willing to relax the stance of monetary policy whenever the stock market begins to tumble.

Without any stable long-run rule to guide monetary policymakers, there is still much uncertainty about future policy. Another crisis could mean a new round of large-scale asset purchases by the Fed and thus further intervention in credit markets—and lower, even negative, interest rates. Meanwhile, the Fed's new operating system provides a backstop for the Fed to absorb government debt without any apparent short-run consequence in terms of inflation, tempting Congress to delegate fiscal authority to the Fed.

The authors in this volume present an in-depth view of the Fed's new operating system, assess global financial stability and the role of central banks, consider the lessons learned from the past decade of monetary experiments, and suggest how the monetary regime could be improved and financial systems made more stable.

I thank the authors for their assistance in bringing this special issue of the *Cato Journal* to fruition and the George Edward Durell Foundation for its continuing support of Cato's Annual Monetary Conference. An understanding of the role of trust, the rule of law, and free markets in creating sound money and credit is essential to avoid policy mistakes that favor special interests and increase uncertainty. By studying the Fed's experiment with unconventional monetary policies, lessons can be learned on how to reform the monetary regime and mitigate business fluctuations caused by the monetary mischief inherent in our current unconstrained discretionary monetary policy arrangements.

—J. A. Dorn

Monetary and Fiscal Headwinds to Sustaining the Recovery

Phil Gramm, Thomas R. Saving, and Michael Solon

A massive housing bubble—the product of a 15-year concerted federal effort to pressure banks to make subprime loans, and force Fannie Mae and Freddie Mac to buy and securitize subprime loans and incentivize banks to hold them as capital—burst in the fall of 2008. The asset base of the world's financial institutions crumbled as the value of mortgage-backed securities (MBSs) collapsed and credit markets froze. Following traditional monetary policy precedence, the Federal Reserve responded by buying government bonds, pumping liquidity into the financial market, and expanding bank reserves.

Unconventional Monetary Policy

The Fed also did something that was not widely noticed at the time and even a decade later is almost never taken into account in the analysis of Fed policy: it started to pay interest on reserves in October 2008—in essence paying banks not to lend (Board of

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Phil Gramm is former Chairman of the Senate Banking Committee, Thomas R. Saving is former Director of the Private Enterprise Research Center at Texas A&M University, and Michael Solon is a Partner at U.S. Policy Metrics. This article stems from Phil Gramm's luncheon address, "Monetary Headwinds 10 Years after the Crisis," presented at the Cato Institute's 36th Annual Monetary Conference, November 15, 2018.

Governors 2008). By paying interest on reserves, the Fed converted the reserves of the banking system into interest-bearing securities and a liability of the Fed. But in paying interest particularly on excess reserves, the Fed was able to inject massive liquidity into the financial system and expand bank reserves without significantly expanding the money supply (Gramm and Saving 2019).

Though the recession ended in the summer of 2009, six months after the Obama administration took office, the economic recovery that followed lagged further and further behind historic norms for postwar America. In an effort to stimulate the economy, the Fed used its large-scale asset purchase (LSAP) program (also known as quantitative easing or QE) to acquire federal debt and MBSs. Consequently, the Fed's asset holdings swelled to almost five times their prerecession levels. In so doing, the Fed acquired directly or offset some 45 percent of all federal debt issued during the Obama era, almost four times the share of federal debt the Fed purchased during World War II.[1] However, unlike Fed purchases during World War II—which produced an increase in bank reserves, bank lending, and the money supply—the much larger debt purchases of the Obama era did not significantly increase bank lending and the money supply. The increase in bank reserves, which grew as a mirror image of Fed asset purchases, were effectively sterilized by the payment of interest on reserves, inducing banks to hold the excess reserves as an income-yielding asset.

The need to sterilize such excess bank reserves was explained by Chris Phelan (2015) of the Minneapolis Federal Reserve:

> For every dollar in excess reserves, a bank can lend 10 dollars to businesses or households and still meet its required reserve ratio. . . . Thus, if every dollar of excess reserves were converted into new loans at a ratio of 10 to one, the $2.4 trillion in excess reserves would become $24 trillion in new loans, and M2 liquidity would rise from $12 trillion to $36 trillion, a tripling of M2.

[1]Board of Governors of the Federal Reserve System, "H.4.1 Factors Affecting Reserve Balances" (www.federalreserve.gov/releases/h41; accessed November 8, 2018).

Today's $1.75 trillion of excess reserves if fully loaned by the banking system, would by Phelan's analysis produce an inflationary 122 percent increase in the money supply.[2]

In August 2008, prior to the financial crisis, banks held $0.14 of reserves for every dollar of demand deposits outstanding, reflecting a normal reserve ratio in a fractional-reserve banking system. By 2011, with the interest rate paid on excess reserves 15 basis points above the interest rate on 1-year Treasuries, banks held some $2.90 of reserves for every dollar of demand deposits outstanding—over 20 times the precrisis level. Thus, banks were strongly incentivized to hold historic levels of excess reserves as the Fed expanded its assets by purchasing government bonds and MBSs. Even today, as the assets held by the Fed have begun to shrink and demand deposits have grown, banks still hold $1.31 of reserves for every dollar of demand deposits outstanding. As the Fed has sold assets and reduced bank reserves, it has incentivized banks to further reduce excess reserves by paying an interest rate on excess reserves 45 basis points below the interest rate on 1–year Treasuries.

Monetary Headwinds

Extraordinarily, today we do not have a fractional reserve banking system. In a term used by Irving Fisher, the 19th and 20th century economist who advocated eliminating fractional reserve banking, we have today in his words, "100% money" (Fisher 1936). The only period in American history with policies remotely similar to today's policy was during the Civil War after the passage of the National Banking Act of 1863. The National Banking Act of 1863 levied a 10 percent tax on state bank notes, driving them from circulation. It also granted national bank charters and allowed national banks to issue notes, provided they held government bonds dollar for dollar

[2]M1 consists of (1) currency outside the U.S. Treasury, Federal Reserve Banks, and the vaults of depository institutions; (2) traveler's checks of nonbank issuers; (3) demand deposits; and (4) other checkable deposits (OCDs), which consist primarily of negotiable order of withdrawal (NOW) accounts at depository institutions and credit union share draft accounts. M2 consists of M1 plus (1) savings deposits (which include money market deposit accounts, or MMDAs); (2) small-denomination time deposits (time deposits in amounts of less than $100,000); and (3) balances in retail money market mutual funds (MMMFs).

against their notes. In this way, the federal government created a massive market for its bonds, allowing the Treasury to fund part of the Civil War without driving up borrowing costs or printing additional "Greenbacks" and increasing inflation.

In the last decade, by comparison to the Civil War era, the Fed has purchased government bonds and other assets, which it has paid for by printing new money and inflating bank reserves. The Fed then paid banks interest to hold those excess reserves. Under the National Banking Act, commercial banks held the government bonds and were paid with interest on the bonds and given the ability to issue currency. Today the Fed holds the bonds and borrows from commercial banks to pay for them.

As a result of its quantitative easing programs, the Fed now holds 17 percent of the value of all publicly held federal debt and 27 percent of the value of all outstanding government-guaranteed MBSs.[3] While the initial injection of liquidity into the economy in 2008 clearly helped stabilize financial markets and was a classic central-bank response to a financial crisis, the subsequent monetary easing programs of the Obama era were unprecedented. After the recovery began, further monetary easing did little to strengthen the economy, but at least in part due to monetary easing, the Obama administration was able to double the federal debt held by the public while reducing the cost of servicing that debt below the interest costs that had been incurred when the debt was only half as large.

From 2009 to 2016, private loan demand was weak in an economy kept in a stupor by high taxes and an avalanche of regulations. In that stagnant environment, the Fed was able to manage a massive balance sheet and inflated bank reserves without either igniting inflation or causing interest rates to rise. However, the Fed's challenge is now growing enormously as the economy returns to normal growth. The strong growth of the last 18 months is driving up the demand for bank loans, increasing interest rates, and inducing banks to lend excess reserves. In addition, "Operation Twist" (by shortening the average maturity date of the debt held outside the Fed) will force the Treasury to borrow more money as the economy strengthens and interest rates rise.

[3]Board of Governors, "H.4.1 Factors Affecting Reserve Balances" (accessed November 8, 2018).

Challenges Facing the Fed

Despite repeated assurances from the Fed that it has the ability to gradually raise interest rates at a pace of its own choosing and keep inflation rates in the 2 percent range, the reality is that, with banks holding unprecedented levels of excess reserves, the money supply is now primarily market driven. A rise in loan demand and market interest rates will incentivize banks to reduce excess reserves and expand loans, causing the money supply to increase. To prevent that from happening, the Fed will have to raise the interest rate it pays on excess reserves or sell bonds to reduce bank reserves as market rates rise.

Historically, when the Fed did not pay interest on excess reserves, banks held few excess reserves. When the public's preference for holding money relative to GDP was stable, the Fed controlled the money supply by controlling the volume of coin, currency, and bank reserves. With banks now holding more than $9.15 of reserves for every dollar they are required to hold, it is the return on bank lending relative to the return the Fed pays on excess reserves that determines the volume of excess reserves banks choose to hold, the volume of loans, and the money supply.[4]

The Fed now sets not just the fed funds target range; it sets the rate of interest that it pays on all reserves at the same time. That rate has a direct effect on monetary policy. When the Fed first began to pay interest on reserves, it also began setting the Fed funds rate as an upper and lower boundary, with the interest rate on reserves set as the upper limit for the fed funds target range. However, that changed in June 2017 when the interest rate paid on reserves was set 5 basis points *below* the upper limit target for the fed funds rate (Board of Governors 2017).

The policy effect embodied in setting the interest rate paid on excess reserves is that, if the rate is set above the market alternative for banks, they will expand their holding of excess reserves and the money supply will fall. If the interest rate on excess reserves is set at the market rate, other things being the same, the money supply will remain unchanged. Finally, if market interest rates rise and the rate paid by the Fed on bank reserves stays the same or rises by less,

[4]Authors' calculations (as of November 8–9, 2018) based on Federal Reserve and Bureau of Economic Analysis (BEA) data.

banks will expand loans and the money supply will rise. Before the Fed started paying interest on reserves, the money supply changed only when the Fed acted. Now if market interest rates rise and the Fed does not raise the rate it pays on excess reserves or take other actions to reduce bank reserves, the money supply rises. As a result, to maintain any given money supply, the Fed must respond to changes in market interest rates. In doing so the Fed becomes an interest rate follower, not an interest rate leader.[5]

If the Fed could find just the right mix of selling assets and lowering the rate it pays on excess reserves, it could theoretically succeed in reducing the assets it holds and reducing bank reserves without either slowing economic growth or igniting inflation. But the danger posed by the Fed's bloated asset holdings and the resulting massive level of banks' excess reserves is that, with a full-blown recovery now underway, the demand for credit will accelerate and force the Fed to move quickly to raise interest rates on reserves or sell securities to sop up excess reserves. If the Fed moves too slowly, the money supply will expand and inflation will rise. However, if the Fed raises the interest rates on reserves too much, lending and the money supply will fall, and a spike in interest rates could choke off the recovery.

As long as banks hold massive excess reserves as interest-bearing assets, the Fed will have to react to a market interest rate change or the money supply will change. The degree to which the Fed was ever able to set interest rates independent of credit market rates has now been dramatically curtailed, and the mechanism by which it can control the money supply has become far more complex. The monetary easing of the Obama years, which did little to stimulate growth, could now be paid for with runaway inflation or a crippled recovery or both.

The Fed faces several other challenges. A rise in market interest rates will increase the velocity of money, the ratio of the value of money the public chooses to hold relative to the size of GDP. Velocity fell by 28 percent in the decade after the financial crisis as the cost of holding money fell to virtually zero, but as interest rates have started to rise velocity has risen 1.5 percent.[6] As interest rates increase in the future, velocity can be expected to rise as people

[5]Whether the Fed was ever an interest rate maker is open to question. See, for example, Fama (2013).

[6]Federal Reserve Bank of St. Louis, "Velocity of M2 Money Stock [M2V]" (https://fred.stlouisfed.org/series/M2V; accessed November 8, 2018).

economize on the holding of money, and the demand for goods and services will rise. To maintain price stability in an environment of rising interest rates, the Fed will not only have to prevent an explosion of bank lending and the money supply, it will also have to reduce bank reserves to prevent the increase in velocity from inflating demand and igniting inflation.

A second complication is that the Fed does not mark its assets to market. Every increase in market interest rates drives down the market value of its Treasury and MBS holdings and will require the Fed to sell more and more of the book value of its portfolio to lower the monetary base by a given amount. Selling assets at their lower market value would deplete both the value of the Feds asset holdings and its earnings. The Fed carries its holdings of MBSs on its books as being worth $1.68 trillion, the price at which they were purchased. But since mortgage rates have risen by an average of 40 basis points since the MBSs were purchased, those same MBSs would now sell for only some $1.52 trillion. The same principle applies to Treasury bonds and notes that were bought for $2.3 trillion but would today sell for only some $2.15 trillion. Their market devaluation will increase in proportion to rising interest rates.[7]

To avoid these losses, the Fed can hold its Treasuries and MBSs to maturity. But the long maturity of the Fed's portfolio means that as interest rates rise and the Fed is forced to pay banks higher interest rates on reserves to prevent them from expanding lending and the money supply, its earnings on the bonds it holds will not grow. As a result, Fed profits will fall as interest rates rise.

In both 2014 and 2015, the Fed earned large profits on its portfolio and transferred earnings of almost $100 billion each year to the Treasury. In both years those earnings covered an astonishing 40 percent of the total cost of servicing the entire federal debt. The transfer of earnings from the Fed to the Treasury in 2017 fell to $80 billion, which funded only 30 percent of the Treasury's debt servicing costs. In 2018 Fed earnings were sharply lower at $65.4 billion. Fed earnings continue to drop sharply.[8] The decline in the payment of Fed earnings to the Treasury will drive up the federal budget

[7]Board of Governors, "H.4.1 Factors Affecting Reserve Balances" (accessed November 8, 2018).
[8]Ibid.

deficit and Treasury borrowing and in turn put upward pressure on interest rates. Once the public understands that the Fed is paying banks not to lend during a time of rising interest rates, a political blowback seems inevitable.

The Fed can sell securities, hold securities until maturity, pay higher interest rates on excess reserves or borrow against the value of its balance sheet, but all those options force the Fed to compete directly with the private sector for credit. In a crisis the Fed might consider raising reserve requirements, but any suggestion that the Fed simply mandate higher reserve requirements on banks to eliminate excess reserves should be weighed against Richard Timberlake's analysis of the massive reserve requirement increases of 1935–38 which "turned what had been an ongoing recovery into another cyclical disaster." The "result of Fed-Treasury policies was a sharp recession that further undermined confidence in the market system" (Timberlake 1999).

Complexity of Conducting Monetary Policy

Conducting monetary policy to promote price stability and full employment has historically been a Herculean task—an art as well as a science. But the monetary easing of the Obama years, which did little to stimulate growth, has made the task even more difficult. The Fed still controls the money supply, but the fact that virtually every commercial bank in America holds massive levels of excess reserves means a small error by the Fed in setting interest rates on excess reserves could send lending and the money supply spiraling. The Fed will now have to try to anticipate market changes and constantly try to react to those changes. More than ever the Fed will have to respond to increases in market interest rates defensively. With vibrant growth the Fed will be far more likely in the future than it has been in the past to be an interest taker and not an interest maker.

Any thought that the Fed could keep rates low as credit demand rises in the current economic expansion is not only naive but dangerous. Never in its more than 100-year history has the Fed had less ability to control interest rates. The sheer level of assets in the Fed's balance sheet virtually guarantees that the Fed will feel the yoke of massive excess reserves in the banking system for at least the next five years. It is possible, in theory, that the Fed could engineer a

program to dramatically reduce the interest on reserves, quickly sell off the assets in its balance sheet, and keep the money supply relatively constant, but the risk entailed in such a program would be huge. An error could spike interest rates, derail the recovery, and ignite inflation. It seems highly improbable that any central banker, even the great Alan Greenspan in his heyday, would dare to undertake such an effort.

The safest, and most likely, policy the Fed will follow to reduce its assets, and the excess reserves of the banking system, is to let the economy grow up to the size of the Fed's asset holdings. If the Fed lets the money supply grow to meet the needs of trade, at a 2 percent inflation rate and a 3.5 percent economic growth rate, the money supply could grow around 5.5 percent a year. At that growth rate, if the currency/deposit ratio and velocity remained the same, it would take 11 years for the Fed to grow its way out of its bloated asset holdings and eliminate the excess reserves of the banking system. If the Fed continued to reduce its assets by $300 billion a year, as it did in 2017, the combination of economic growth and asset reductions would eliminate the current excess reserves within five years. Whichever path it follows, the Fed will almost certainly be required to closely monitor the difference between the interest rate it pays on reserves and market interest rates, and react to that difference for the remainder of the current recovery.

It seems reasonable to conclude that during this unwinding period interest rates and prices could be more volatile than we have seen previously in the postwar period, and the Fed will be less likely to try to hold interest rates below their natural market equilibrium levels. Economists will debate how restricted Fed action really is, but no one will argue that the Fed has more flexibility in setting policy than it did before it bought a significant share of the public debt and MBSs.

Fiscal Headwinds

As the current strong recovery continues and interest rates rise, the Treasury will be forced to borrow at a level never equaled during a strong recovery in the postwar period, and in the process it will begin to preempt private-sector borrowing (Gramm and Solon 2018). The debt-based entitlement programs of the 1930s and 1960s have always represented a ticking time bomb set to explode as the

population aged.[9] With a trillion dollar stimulus package, an increase in general appropriated accounts, Obamacare and Medicaid, food stamp and Social Security Disability eligibility increases, nondefense federal spending in the eight years of the Obama era swelled to record levels.[10] As the rising tax and regulatory burden weighed down the economy and delivered the weakest recovery in the postwar era, federal tax collections fell despite the large increase in tax rates in 2013. From September 2010 through January 2017, the Congressional Budget Office (CBO) sliced 10-year revenue projections by a whopping $4.1 trillion due to lagging growth through the end of Obama's term.[11] With spending surging but revenues stunted from a weak economy, the national debt held by the public doubled in eight years.

The projected cost of the Trump Tax Cut at an assumed 1.9 percent GDP growth rate was $1.2 trillion over 10 years (Joint Committee on Taxation 2017). At the current 3 percent GDP growth rate, the cost of the Trump Tax Cut in lost revenues from lower tax rates is already being largely recovered by new projected revenues from stronger economic growth. In the CBO's April 2018 report, the adjustment for higher growth alone generated a revenue surge totaling $1.1 trillion, the single largest growth-driven revenue gain ever reported (CBO 2018: 94). If the economy continues to grow at the normal postwar rate, growth driven federal revenues will overwhelm the cost of the tax cut, paying for virtually all of its originally projected 10-year revenue losses in just five years.

[9]In 1983, President Reagan's reforms extended Social Security's cash flow for 51 years, but Medicare and Social Security will be broke and absorbing general revenue by 2026 and 2034, respectively.

[10]Federal spending spiked in late 2008 with the passage of the Troubled Asset Relief Program (TARP), which added some $189 billion to the deficit in 2008–10. Most of TARP funds were paid back by 2010 and banks and other financial firms such as AIG paid the government back in full plus interest. Only bailouts to nonfinancial firms, principally General Motors and mortgage assistance bailouts, failed to repay TARP funds. On net, therefore, TARP did not contribute to the long-term national debt.

[11]See Congressional Budget Office, *The Budget and Economic Outlook* and the *Budget and Economic Outlook Update*, January 2011 through January 2017 (Washington: Government Printing Office). Available at www.cbo.gov/publication/52370.

But growth driven revenues cannot outpace politically driven spending. As the CBO (2018: 94) reports, raising the budget caps for 2018 and 2019 in the 2011 Budget Control Act will cost $670 billion over 10 years. If the spending caps are busted permanently in 2020, the additional spending increase over the next decade would equal $1.7 trillion—more than the original projected cost of the tax cut (CBO 2018: 61).

Although the publicly held national debt roughly doubled as a share of GDP, the cost of servicing the debt dropped to 1.3 percent of GDP in 2016 from 1.7 percent in 2008 (CBO 2018: 149). But while the cost of servicing the doubled federal debt has been masked by historically low interest rates, the building recovery will continue to put upward pressure on interest rates. If the current recovery is sustained and blossoms into a full blown expansion matching the postwar norm, competition for credit will drive interest rates back toward their postwar norms as well. In an economy characterized by interest rates anywhere near the norm for postwar America the cost of servicing the federal debt will spiral.

The same driving forces have propelled every significant postwar recovery: a sustained rise in private investment and increases in new home building. In those recoveries, the rise in private investment and home building have increased borrowing and driven up interest rates. As the current recovery matures and interest rates normalize we will begin to feel the effect of the unparalleled borrowing of the past decade. The resulting competition for credit will be further exacerbated by the growth in entitlement spending brought on by the aging U.S. population. Debt servicing costs, entitlement spending growth and the federal borrowing they will spawn will produce stiffer headwinds than have faced any strong recovery in the postwar era.

During the Obama recovery, private investment lagged behind the postwar norm and housing starts remained at recessionary levels.[12] Gross private domestic investment is now at the highest level in a decade and housing starts are up 42 percent from the Obama

[12]Bureau of Economic Affairs, "National Data Table 1.1.10: Percentages Shares of Gross Domestic Product" (https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2#reqid=19&step=2&isuri=1&1921=survey; accessed November 8, 2018).

era average.[13] Interest rates are rising as private and public borrowers increasingly compete for available credit. In a full blown recovery, where economic growth rates reached their postwar norm of some 3.5 percent of real GDP, interest costs should be expected to rise toward their postwar norm as government and the private sector compete for available credit.

Interest rates in the postwar period were highly affected by inflation rates, which from 1948 to 2008 averaged 3.8 percent.[14] Interest rates surged when the inflation rate reached double digit levels in the late 1970s. From 1977 to 1982 prices rose on average by 9.2 percent annually and Treasury borrowing costs reached their highest postwar levels at an average rate of 10.6 percent for that period.[15] If the 1977–82 period is dropped as an anomaly, the average annual cost for Treasury borrowing in the postwar period prior to 2009 was 4.8 percent. For the entire 1948–2008 period, the real Treasury borrowing cost (the nominal borrowing cost minus the inflation rate) was 1.2 percent. This suggests that if the Fed could meet its 2 percent inflation target during this recovery, Treasury borrowing rates might be kept in the 3.2 percent range. It should be noted, however, that since the rate on 10-year Treasuries has already reached 3 percent it may be optimistic to assume Treasury borrowing costs will normalize at 3.2 percent over the next five years even if inflation rates are in the 2 percent range.

To obtain a better insight into the effects of rising interest rates on Treasury debt servicing costs and the resulting crowding out of private borrowers, in the analysis below we will use 4.8 percent as the upper bound of Treasury borrowing costs and 3.2 percent as the lower bound. As interest rates rise to either level the impact on Treasury borrowing costs is stunning.

[13]U.S. Bureau of the Census and U.S. Department of Housing and Urban Development, Housing Starts: Total: New Privately Owned Housing Units Started [HOUST]. Available at https://fred.stlouisfed.org/series/HOUST; accessed November 8, 2018.

[14]Bureau of Labor Statistics, "CPI-All Urban Consumers: Series ID CUUR000SAO" (https://data.bls.gov/timeseries/CUUR0000SA0?output_view=pct_1mth; accessed November 8, 2018).

[15]Board of Governors of the Federal Reserve System, "10-Year Treasury Constant Maturity Rate [DGS10]." Available at https://fred.stlouisfed.org/series/DGS10; accessed November 8, 2018.

If the economy continues to grow at a rate near the postwar norm and Treasury borrowing costs rise to 3.2 percent over the next five years, the cost of servicing the federal debt will more than double from $316 billion in 2018 to $666 billion in 2023. If borrowing costs rose to 4.8 percent by 2023, the cost of servicing the federal debt would more than triple, from $316 billion to $1,056 billion in 2023. The cost of servicing the $7.54 trillion increase in the public debt that occurred in the 2009–16 period alone would cost $362 billion, more than the current cost of servicing the entire federal debt today.[16]

Given the size of the national debt, the explosion of entitlement spending as the population continues to age, and the growth of discretionary spending, even with the strong revenue growth that would come from 3.5 percent GDP growth, by 2023 total federal borrowing at a 4.8 percent borrowing cost would be $1,372 billion, 5.2 percent of GDP. Even if the Fed is successful in holding inflation rates in the 2% range and Treasury borrowing costs grow only to 3.2 percent by 2023, total federal borrowing will still be $985 billion, 3.7 percent of GDP. Federal borrowing between 5.2 percent and 3.7 percent of GDP is in fact quite similar to the level of borrowing that actually occurred during the Obama era, 4.6 percent of GDP. But the high borrowing costs of the Obama era, driven by a massive growth in spending and a collapse in revenues, produced little crowding out of private investment in the static growth of the 2009–16 period. In the failed recovery the economy had little pulse and never felt the fever of higher interest rates that would have come if private demand for loanable funds had matched the levels experienced in strong postwar recoveries. But in a full-blown recovery those levels of federal borrowing would crowd out vibrant private demand for available credit and potentially produce interest rates that could choke off the recovery.

In postwar America prior to 2009, the private sector on average has had to compete with the government in a credit market where federal borrowing absorbed only 1.6 percent of GDP, 1.8 percent

[16]Author's calculations based upon CBO's April 2018 budget baseline and economic assumptions. CBO projected GDP for 2018 is adjusted upward for postwar norm of 3.5 percent economic growth. Interest cost reflects the ratio of net interest costs to publicly held debt.

during the so-called high deficit Reagan administration.[17] As the current recovery builds, debt servicing costs and entitlement spending will produce borrowing that by 2023 could preempt as much as 5.2 percent of GDP in available credit, producing significantly larger headwinds than those faced by any other strong postwar recovery.

To get some insight into the forces that will drive federal preemption of private sector credit as the recovery builds, it is instructive to look at what the next five years might look like during a full blown recovery as compared with what might have happened in a stagnant economy, like America was experiencing in 2016. In January 2017, the CBO projected the taxes, spending, and deficits that would be expected if the economic stagnation of 2009 to 2016 were experienced in the future (CBO 2018: 10). The budget baseline was based on the tax structure, spending commitments, and growth rates that existed at the end of the Obama administration.

The three principle differences in the pre- and post-Trump spending, tax, and deficit projections are (1) the Tax Cut of 2017 and the lifting of regulatory burden; (2) the waiver of the discretionary spending caps in the 2011 Budget Control Act, which added both defense and nondefense spending in 2018 and 2019; and (3) the significant increase in the economic growth rate. The spending caps had been suspended every year since 2014 and no doubt would have been suspended in 2018 and 2019 had Obama remained president. To focus on the real policy differences embodied in the Trump program we have added the 2018 and 2019 discretionary outlays to the pre-Trump, January 2017 projections. The differences between the pre- and post-Trump projections are then reduced down to the economic impact of the large tax cuts and the Trump deregulatory effort on private sector spending and of course the stronger economic growth beginning in 2017 and accelerating in 2018.

Specifically we want to look at the current recovery occurring under Trump policies if the current growth rate, now roughly equal to the postwar average, can be sustained for the next five years. A sustained recovery will drive interest costs up and create headwinds that the recovery will have to overcome. It is instructive in identifying the

[17]See the historical tables in CBO (2018) for April 2018. Available at www.cbo.gov/about/products/budget-economic-data.

source of the headwinds to compare the recovery that is now underway with what the economy and federal borrowing would have looked like had the Trump policies not been implemented and the low growth of the previous eight years had continued. The 2017 CBO projections, which assumed the continuation of what was at the time called "secular stagnation," plus the addition of the discretionary spending increases of 2017 and 2018, show revenues rising in 2023 by $742 billion above the 2018 level. The cost of servicing the federal debt rises by only $274 billion based on the low interest rates in the low growth scenario projected by CBO for 2023. Federal borrowing in 2023, despite the lower interest rate and lower debt servicing costs is still projected to be $1,141 billion or 4.7 percent of GDP, slightly higher than the average level of federal borrowing that actually occurred during the Obama years, 4.6 percent of GDP.

The CBO projections in 2018—after the tax cuts and the lifting of regulatory burden, the surge in economic growth, and assuming a sustained recovery with economic growth rates and interest rates reaching their postwar norms—produce the following projections: Revenues would rise by 60 percent more than under the low-growth projections, and interest costs would rise as much as 270 percent more at a 4.8 percent Treasury borrowing cost, but only 28 percent more if borrowing costs could be held to only 3.2 percent. However, the level of projected federal borrowing in 2023 as a percentage of GDP is still between 5.2 percent of GDP and 3.7 percent of GDP depending on how high interest rates rise during the recovery—not significantly different than the 4.7 percent that would have occurred had the Trump Tax Cuts, deregulatory effort, and revived growth not occurred.

Stated in its simplest form, the headwinds of federal borrowing that will occur if the current recovery is sustained are not significantly different than the federal borrowing that would have occurred had the Obama program remained in effect. The difference is, however, that at a growth rate of 1.8 percent of GDP, federal borrowing of some 5 percent of GDP did not produce a crowding-out problem for private borrowers; but at 3.5 percent of GDP growth it will.

While these projections are a simple effort to approximate the impact of changes in a complex economy, they do show that high levels of federal borrowing are baked into our financial future. Whether the economy continues to grow at the average postwar rate or falls

back into the stagnation experienced from 2009 through 2016, the level of federal borrowing will remain roughly the same. While stronger growth will generate more federal revenues, stronger growth coming from strong private investment and consumer demand will drive up the demand for loanable funds, increase interest rates, and force the Treasury to borrow more money to service a federal debt that has doubled since 2008. Using the CBO model and assuming strong growth is sustained through 2023 and a normalization of interest rates to their average postwar levels suggest that the revenues flowing from increased growth are roughly offset by the rising interest costs of servicing the now massive federal debt. The same process works in reverse with growth at the lower level CBO projected at the end of the Obama administration. Revenues are significantly lower under the low growth CBO projections, but so are the interest costs incurred in servicing the federal debt. The difference is, however, with stagnant growth, while the Treasury is borrowing roughly the same amount of money that it would have borrowed if normal postwar growth had continued and interest rates had normalized, it is not competing with the robust private demand for capital that would accompany sustained growth and therefore does not face the same crowding-out problem. But, if our current high growth rate is sustained and our postwar experience is any guide to the future, the pressure of rising interest rates on the cost of servicing a federal debt that has doubled in the past decade will at some point challenge the sustainability of the recovery.

The weakest recovery in the postwar period was bought with a fiscal policy that doubled the national debt held by the public and a monetary policy that expanded the monetary base to a level never approached in the modern era. Never in our history has so much money been spent to produce so little good, and the full bill for that failed policy has yet to arrive.

Caveats and Policy Implications

It is possible, however, that as the recovery builds, some relief from a potential spike in market interest rates might be found in the extraordinary growth in the world economy, which has occurred in the past 30 years. The massive thrift levels in developing countries could be playing some role in producing the moderate interest rates of the past two decades and may in fact be altering the secular trend

in market interest rates. The ability of the United States, with strong growth and stable property rights, to attract foreign capital especially from developing countries might well offset some of the interest rate increases that have accompanied previous strong recoveries in the postwar period. To the extent that the world's financial market is benefiting from a growth in thrift in the developing world, it might be possible for the American recovery to continue with growth at the postwar norm without triggering interest rates that have historically accompanied similar recoveries in the past.

In addition, some argue that a new idea revolution is displacing the industrial revolution and companies are being built with new ideas and not capital. Thus it might be possible to experience historic postwar growth rates without experiencing the historic demand for available capital and high interest rates that have accompanied strong growth in the past. But this idea revolution is built on human capital, the acquisition of which requires investment just as investment in physical capital was required in the industrial revolution. The question then remains as to whether new products can actually be produced and marketed with significantly lower capital investment relative to the value of the product than we have experienced in other postwar recoveries. That is an empirical question. The answer is likely to come only as this recovery progresses and other recoveries occur in the future.

It is possible that the growth in thrift levels in the developing world is ushering in a new period of lower real market interest rates. If that is indeed the case the current recovery might not be as threatened as it would have been in other postwar recoveries since interest rate increases would be muted as compared to the historic norm. It is also possible that modern technology might require less capital to produce and market goods and services than has been the norm in postwar America. But since we don't know whether there has been a secular reduction in interest rates or a reduction in the capital required to produce goods and services, much less the magnitude and significance of such changes, prudence dictates that we not count on them to ward off the dangers that rising interest rates pose given the size of the federal debt.

Finally, what does our current fiscal and monetary reality tell us about the future and what guide does it provide for us to follow in our effort to strengthen and sustain the recovery? The analysis above would suggest the following.

First, the Fed will be incapable of suppressing interest rates to help sustain the recovery without unleashing unacceptable levels of inflation. Given the current level of excess reserves, a failure of the Fed to track increases in market interest rates by raising the rate it pays on reserves could cause the money supply and prices to explode. If Fed policy plays any role in the future of this recovery, other than by lifting regulatory burden to make the financial system more efficient, it will at best be a neutral role. If the Fed can simply drawdown its assets and the excess reserves of the banking system in a sustained recovery without causing interest rates to spike or inflation to spiral above its 2 percent target, it will have performed at an extraordinary level.

Second, to sustain the recovery, the Trump administration should accelerate its deregulatory effort to promote greater economic efficiency. This effort should proceed across the board but especially in the financial sector where 81 percent of the Treasury's recommended changes in regulations imposed under Dodd-Frank have not been implemented.

Third, for the sake of preserving strong growth and attracting capital internationally to hold down domestic interest rates, the Trump administration should find a way to settle existing trade disputes. The strong economic growth flowing from our current expansion and rising U.S. interest rates will attract foreign capital, drive up the value of the dollar, and expand American imports. Nothing we can do in the way of trade policy can prevent this from happening without at the same time significantly damaging the recovery. A nation's capital and trade balances are mirror images of each other and double entry bookkeeping does not yield to politics or anything else. In addition, we will need all the foreign capital we can attract to hold down domestic interest rates and thereby enable us to sustain the recovery. Holding down interest rates, sustaining strong growth, and preventing inflation require that we have more world commerce, not less. Ongoing trade conflicts will make sustaining the recovery increasingly difficult. It's time to make peace on trade and wage war on the deficit.

Fourth, every dollar the federal government does not spend is a dollar it does not have to borrow and in the process compete away from private borrowers. The caps on discretionary spending should be allowed to go back into effect in 2019, entitlements should be

reformed, and new spending programs should require a real spending offset.

Fifth, we should dramatically enhance the incentive to work with the goal of increasing labor force participation. This process should begin by suspending all state waivers in existing welfare work requirements. Work requirements should be instituted in all unearned benefits granted by the federal government. We should determine whether giving the earned income tax credit (EITC) for less than full-time work actually encourages or discourages greater work effort. We should also look at whether the phase-out structure of the EITC actually discourages more work effort at certain income levels.

The greatest source of untapped skilled labor in America is in the millions of workers retiring every year. Older workers should be strongly incentivized to keep working. We should determine the age at which older workers should be exempt from Social Security taxes and Medicare taxes. The income limits for the EITC should be increased significantly for those over 65. Further, seniors should be exempted from the federal wage and hour laws and occupational licensing should not be age limited unless there are legitimate safety concerns involved.

We should raise the retirement age to respond to the obvious fact that people are living longer, healthier lives than when the entitlement programs were established. The early retirement age should be phased up along with the full retirement age. The full retirement age is being phased up to 67 years of age now. That phase up should continue at the current rate to 70, and the early retirement age should be phased up at the same rate to 65. We should set a morbidity standard that would automatically phase up retirement ages as people live longer and healthier lives. Eligibility for Social Security disability should be tightened.

Finally, the story of America is the story of immigrants who come to our country seeking a better life for themselves, and who produce a better life for our country. We should give a green card with their diploma to every foreign graduate of an accredited U.S. college or university. We need to vastly expand legal immigration quotas for people with valuable productive skills. Illegal immigration is illegal and we should enforce the law, but there is plenty of room in America for people who have skills we need, are willing to come legally, and want to work.

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On Money, Debt, Trust, and Central Banking

Claudio Borio

Few issues in economics have generated such heated debates as the nature of money and its role in the economy. What is money? How is it related to debt? How does it influence economic activity? The recent mainstream economic literature is an unfortunate exception. Bar a few who have sailed into these waters, money has been allowed to sink by the macroeconomics profession. And with little or no regrets.

Today, I would like to raise it from the seabed. To do so, I will look to an older intellectual tradition in which I grew up. I would thus like to revisit the basics of monetary economics and draw lessons that concern the relationship between money, debt, trust, and central banking.[1]

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[1]In this sense, my analysis is squarely in the tradition of what Schumpeter (1954) called "monetary analysis"—the presumption that money is not a veil and that understanding how it functions is necessary to understand how the economy works. See also Kohn (1986).

I approach the topic with some trepidation. So much has been written by scholars much better equipped than me, including a number in the audience. Still, I hope to shed some new light on some old questions. A number of the points I will be making are well known and generally accepted; others more speculative and controversial.

My focus will be on the monetary system, defined technically as money plus the transfer mechanisms to execute payments.[2] Logically, it makes little sense to talk about one without the other. But payments have too often been taken for granted in the academic literature, old and new. In the process, we have lost some valuable insights.

Let me highlight three takeaways.

First, two properties underpin a well-functioning monetary system. One, rather technical, is the coincidence of the means of payment with the unit of account. The other, more intangible and fundamental, is trust. In fact, a precondition for the system to work at all is trust that the object functioning as money will be generally accepted and that payments will be executed. But a well-functioning system also requires trust that it will deliver price and financial stability. Ensuring trust is difficult and calls for strong institutions—an appropriate "institutional technology." Central banks have evolved to become key pillars of the whole edifice alongside banking regulatory and supervisory authorities—often central banks themselves.

Second, a key concept for understanding how the monetary system works is the "elasticity of credit"—that is, the extent to which the system allows credit to expand.[3] A high elasticity is essential for the system's day-to-day operation, but too high an elasticity ("excess elasticity") can cause serious economic damage in the longer run.

[2]Giannini (2011) rightly takes this as the starting point of his inquiry into central banking.

[3]This notion of "elasticity" belongs to the family of those used to characterize the potential of monetary arrangements to generate endogenous increases in the supply of money or credit. It goes back to at least Smith (1776), it was common in the Banking School, and it was prominent in authors such as Wicksell (1898) and Hayek (1933). It has affinities also with the earlier Bullionist debate in England and the birth of the Real Bills doctrine (Laidler 1991). It was also enshrined in the founding Act of the Federal Reserve (Meltzer 2003). As used here, it is slightly narrower than the notion used in previous work, defined as the degree to which the financial system is prone to generating financial imbalances (Borio and Lowe 2002). The main difference is that here, given the focus on the monetary system, rather than the broader financial system, I emphasise the elasticity of bank credit, which is directly related to the creation of means of payment. Of course, all forms of credit, monetary or not, are relevant for a financial system's elasticity.

In today's economy, generally blessed with price stability, the most likely cause of damage is financial instability. This form of instability can generate serious macroeconomic costs even well short of banking crises. And when banking crises take place, it threatens to undermine the payments system itself.

Third, price and financial stability are inexorably linked. As concepts, they are joined at the hip: both embody the trust that sustains the monetary system. But the underlying processes differ, so that there can be material tensions in the short run. These tensions can disappear in the longer run provided the appropriate monetary and financial arrangements are in place. Resolving these tensions is far from trivial and is a work in progress.

Along the way, I will touch on a number of subthemes. Examples are the risk of overestimating the difference between money and debt (or credit); the unviability of cryptocurrencies as money; and whether it is appropriate to think of the price level as the inverse of the price of money, to make a sharp distinction between relative and absolute price changes, and to regard money (or monetary policy) as neutral in the long run.

The structure of the speech is as follows. I will first discuss the elements of a well-functioning monetary system. I will then turn to some of the key mechanisms to ensure trust in its day-to-day operation. Finally, I will explore ways to secure trust in price and financial stability in the longer run.

Elements of a Well-Functioning Monetary System

At its most essential, a monetary system technically consists of (1) a unit of account, (2) a means of payment ("settlement medium"), and (3) mechanisms to transfer the means of payment and settle transactions (execute payments). The unit of account measures the value of all goods, services, and financial assets. It is a purely abstract, immutable unit of measurement—like, say, the unit of distance. The means of payment is a generally accepted instrument that settles (extinguishes) obligations.[4]

[4]Strictly speaking, there is a difference between the means of payment and the means of exchange, defined as what is widely accepted in transactions. Think, for instance, of bills of exchange. And not all means of payment are, or historically have been, widely accepted; Polanyi (1957) develops this point. In what follows, the term "means of payment" will be used interchangeably with "means of exchange." Being a means of payment sets money apart from other instruments.

Two points about this definition.

For one, there is no explicit reference to the third well-known function of money—that is, being a store of value. This is not because it is unimportant. Far from it, the function is essential: stability in the value of money will play a key role in what follows. The point is simply that it is not a distinguishing feature of money.[5] Any asset, financial and real, is a store of value. Moreover, and more importantly, a viable means of payment must also be a store of value. So, there is no need to refer to this function explicitly.

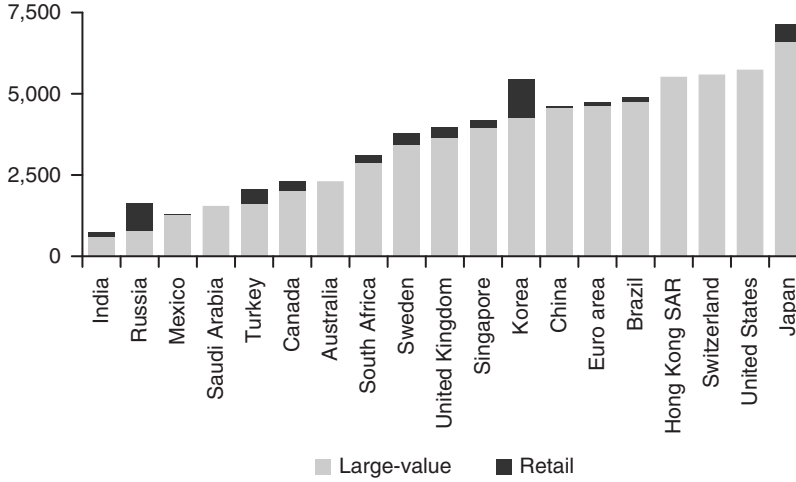
In addition, compared with the traditional focus on money as an object, the definition crucially extends the analysis to the payment mechanisms. In the literature, there has been a tendency to abstract from them and assume they operate smoothly in the background. I believe this is one reason why money is often said to be a convention (Lewis 1969), much like choosing which hand to shake hands with: why do people coordinate on a particular "object" as money? But money is much more than a convention; it is a social institution (Giannini 2011). It is far from self-sustaining. Society needs an institutional infrastructure to ensure that money is widely accepted, transactions take place, contracts are fulfilled and, above all, agents can count on that happening. Even the most primitive communities require generally agreed on, if informal, norms and forms of enforcement. Putting in place the corresponding supporting institutions—or institutional technology—in a way that ensures trust is a major challenge. And the challenge naturally becomes more complex as societies develop.[6] I will return to this point in due course.

The sheer volume of payments in our modern economies highlights their importance. The volume exceeds GDP many times over, thousands of times in fact (Figure 1). To a large extent, this is because most of the payments correspond to

[5]This view harks back to the classics, such as Jevons (1875); see also Laidler (1991) for a review. By contrast, the more modern tradition has placed greater emphasis on the store-of-value function. An archetypal example is Samuelson's (1958) famous model of money in an overlapping-generations framework. See also Tobin (1969) for a less formal but very influential and representative example.

[6]On the importance of institutions and how they evolve with economic development, see North (1990).

FIGURE 1
The Value of Payments Dwarfs GDP
(Percentage of GDP)



Note: The volume of payments in a country's large-value payment system reflects many factors, including the structure of the banking system, access policies, or other requirements. The figures in the graph are indicative of the orders of magnitude of a country's payments, but do not lend themselves to straightforward cross-country comparisons.
Source: CPMI (2017).

financial transactions and their volume dwarfs "real" economic activity. Hence, also the common, largely efficiency-driven, distinction between wholesale payment systems, designed to deal with large-sized transactions, and retail ones, that deal with small-sized ones.

At the very least, a well-functioning monetary system has two properties.

First, technically, it will exploit the benefits of unifying the means of payment with the unit of account. The main benefit of a means of payment is that it allows any economy to function at all. In a decentralized exchange system, it underpins the quid pro quo process of exchange. And more specifically, it is a highly efficient means of "erasing" any residual relationship between transacting parties: they can thus get on with their business without concerns about

monitoring and managing what would be a long chain of counterparties (and counterparties of counterparties).[7] The benefit of a unit of account is that it provides the simplest and most effective way of measuring relative prices, as it greatly reduces the number of relative prices that need to be known.[8] Unifying the two signifies that, by convention, the price of money relative to the unit of account is fixed at one. The benefit is that this greatly reduces the uncertainty about the amount of resources the means of payment can "buy." The residual uncertainty is that which surrounds changes in the prices of goods and services relative to the means of payment (i.e., the value of money).

Historically, we have seen cases where the unit of account and the means of payment have not coincided. But arguably this has generally reflected limitations of the monetary system. Think, for instance, of the coexistence of a multiplicity of settlement media in underdeveloped economic systems (e.g., in some ancient civilizations or in the early Middle Ages) or in fragmented monetary areas (e.g., in the Middle Ages and the Renaissance, notably in Italian city-states (Einaudi 1936; Cipolla 1956; Eichengreen and Sussman 2000). This strikes me as inefficient. Not surprisingly, it has been superseded over time. And in single currency systems, the two functions tend to become decoupled spontaneously only at very high inflation rates—a clear symptom of a dysfunctional monetary system (Heymann and Leijonhufvud 1995).[9] To me, all this indicates that the

[7]In other words, they do not need to rely on a ledger recording the whole history of transactions—the system's "memory." On money as memory, see Kocherlakota (1996). The concept is equivalent to the legal one of "finality." On the idea of such a ledger keeping track of credits, see also Leijonhufvud (1981). The relationship between money and debt is discussed further below.

[8]See, for example, Brunner and Meltzer (1971) and Alchian (1977). See also Doepke and Schneider (2017), who present a theory of why a unit of account becomes dominant in an economy in which noncontingent (debt-like) contracts exist and agents participate in credit chains. By adopting such a unit of account, agents can lower their exposure to relative price risk and limit default (effectively, a way of hedging).

[9]Heymann and Leijonhufvud rightly stress the damage very high inflation inflicts on the economic and social fabric. This is consistent with what none other than Keynes (1919: 220) famously said, attributing the statement approvingly to Lenin: "There is no subtler, no surer means of overturning the existing basis of society than to debauch the currency."

coincidence of the two functions is highly desirable. Thus, I don't agree with proposals to split the two.[10]

Second, and more fundamentally, a well-functioning monetary system will enjoy the solid trust of participants. To be sure, trust that people will accept the corresponding instrument as a means of payment and that the transfer will be effective are absolutely necessary for the system to function at all. But a well-functioning system requires more. It requires trust that the value of the instrument will be stable in terms of goods and services, as fluctuations generate uncertainty, and trust that its value will not change strongly in one direction or the other. What I have in mind here is not just inflation, which erodes the value of the means of payment, or deflation, which increases the value of the debts generated in the monetary system, but also outright defaults, notably on bank deposits (inside money). The role of trust is especially evident when the means of payment is irredeemable ("fiat money"), so that the issuer simply commits to "settle" the IOUs by issuing an equivalent amount of them.[11]

Naturally, ensuring trust is a multifaceted challenge. In addition to the legal and operational infrastructure, it calls for managing risks properly at all the stages of the monetary process. In what follows, to keep things manageable, I will focus only on those trust-building mechanisms closest to the monetary aspects of the challenge.

A Well-Functioning Monetary System: Day-to-Day Operation

Two aspects of a well-functioning monetary system in its day-to-day operation are worth highlighting. One is the need for an elastic supply of the means of payment; the other is the need for an elastic

[10]See, in particular, Black (1970) and Fama (1980); see White (1984a) for a critique. Likewise, historically there have been several indexation proposals, effectively decoupling the means of payment from the unit of account—for example, Jevons (1863), Marshall (1887), Fisher (1911), and, more recently, Friedman (1974), drawing on the Brazilian experience; see also Laidler (1991). The fact that they did not come to be and that indexation of contracts has had such a hard time achieving traction is arguably indicative of the difficulties in implementing such a decoupling successfully.

[11]To be sure, if trust was perfect, there would be no need for settlement: credit would do. Tellingly, the term "credit" comes from the Latin *credere*, meaning "to believe" or "to trust." Perfect trust might conceivably exist in the smallest and most tightly knit of communities: members might have the assurance that all obligations will be honored. But in even slightly more complex societies, generating the necessary trust requires a more elaborate institutional technology.

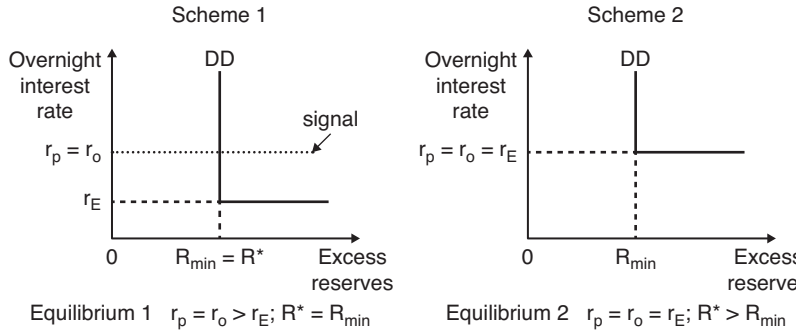
supply of bank money more generally. All this, in turn, points to the risk of overestimating the distinction between credit (debt) and money.

The central banks' elastic supply of the means of payment is essential to ensure that (1) transactions are settled in the interbank market and (2) the interest rate is controlled. The interbank market is a critical component of our two-tier monetary system, where bank customer transactions are settled on the banks' books and then banks, in turn, finally settle on the central bank's books. To smooth out interbank settlement, the provision of central bank credit is key. The need for an elastic supply to settle transactions is most visible in the huge amounts of intraday credit central banks supply to support real-time gross settlement systems—a key way of managing risks in those systems (Borio 1995). But it also underpins the way central banks set interest rates—a process which is often misunderstood. It is worth considering this process in more detail, since it also sheds light on what is the ultimate anchor for credit creation.

Let me just sketch the mechanisms involved with the help of Figure 2; you can find a more detailed explanation in previous work (Borio 1997; Borio and Disyatat 2010). The first point to recall is that our monetary system is a two-tier one: bank clients settle among themselves with bank money (deposits); in turn, banks settle among themselves in the interbank market with central bank money (bank reserves). Thus, Figure 2 illustrates what happens in that market, where the short-term (overnight) interest rate is determined.

There are two polar cases. In the first, the central bank satiates the market with bank excess reserves—the means of payment (scheme 2, right-hand panel). Then the demand for the means of payment becomes infinitely elastic at the rate paid on them, that is, the rate on the central bank deposit facility: supply becomes irrelevant. In the second, the central bank meets exactly the demand for means of payment rather than satiating the market (scheme 1, left-hand panel). The key point here is that because the uncertainty regarding interbank settlement is minuscule and banks can count on the central bank to allow the system to settle by providing the necessary funds, the demand for bank reserves is, in effect, vertical at some frictional level—that is, unresponsive to the interest rate. The central bank then simply sets the desired interest rate by signaling where it would like it to be. And it can do so because it is a monopoly supplier

FIGURE 2
Implementing Monetary Policy: Two Schemes



Note: This figure describes the situation when reserve requirements have no averaging provisions. Consequently, the amount of reserves banks need to hold overnight is determined entirely by banks' settlement needs, including any precautionary element. This demand depends on the wholesale settlement arrangements in place, and is, in effect, independent of the interest rate. Here, it is simply assumed to be zero, so that the equilibrium amount of reserves, R* equals R_{min}. Under scheme 1, the existence of an opportunity cost of reserve holdings—the difference between the overnight rate, r_o, and the rate on the deposit facility, r_E, or $(r_o - r_E)$—implies that, if excess reserves exceeded R_{min}, banks would attempt to lend out this surplus. In so doing, they would drive the overnight rate down to r_E. At this point, the opportunity cost would be eliminated. To avoid this, the central bank sets excess reserves at zero through its liquidity management operations and signals the policy rate it wishes to see. The overnight rate gravitates to that rate in line with the signal. This is because, should the central bank wish to do so, it could force banks to borrow at that rate so as to obtain the necessary funds to meet the reserve requirement needs by keeping banks short through its liquidity operations. Under scheme 2, there is no opportunity cost of holding excess reserves, as the central bank supplies reserves in excess of the minimum requirement, again through its liquidity management (recall that, for simplicity, minimum settlement balances are assumed to be zero). As a result, the overnight rate falls to the deposit facility rate, which in this case is the policy rate.
Source: Borio and Disyatat (2010).

of the means of payment: it can credibly commit to provide funds as needed to clear the market. To simplify, scheme 2 is how the central banks that have engaged in quantitative easing (QE) are setting interest rates today, although some central banks were operating the scheme even before; scheme 1 is how most other central banks are

doing it.[12] What the example makes clear is that, at least under current institutional arrangements, there is no such thing as a well-behaved demand for bank reserves, which falls gradually as the interest rate increases (i.e., which is downward-sloping).

But wait, one might argue: what about cash? Cash, too, is provided elastically—that is, it is purely demand-determined. In fact, the nonbank public would bring any excess to the banks; and the banks, in turn, would exchange any excess holdings for bank reserves.[13] The central bank would have to oblige: this is what convertibility is all about.[14]

This analysis is something any central banker responsible for implementation would find familiar. But it has not filtered through sufficiently to academia. When I first discovered it the mid-1990s, much to my disappointment I had to throw out of the window everything I had learned in textbooks and at university on the topic.

Hence, an implication that will play a bigger role later on. The monetary base—such a common concept in the literature—plays no significant causal role in the determination of the money supply (bank deposits with the nonbank public plus cash) or bank lending. It is not surprising that, as the experience in Japan has shown, large increases in bank reserves have no stable relationship with the stock

[12]The subtleties include reserve requirements with averaging provisions, which result in the demand for bank reserves becoming vertical only at the end of the averaging (maintenance) period, and the possible existence of a corridor around the target rate. See Borio (1997) for a detailed analysis and Bindseil (2004) for a more mathematical treatment assuming optimal bank behavior under some assumptions. The analysis also abstracts from a variety of possible market and regulatory frictions that would simply obscure the basic mechanisms at work (e.g., market segmentation). Woodford (2003) reaches similar conclusions, but neglects the essential role of the payment system and the means of payment. More generally, while there may, of course, be very small day-to-day variations in the overnight rate linked to the amount of excess balances, the key point is that any excess elasticity cannot be exploited to steer the overnight rate toward the policy rate precisely.

[13]This mechanism is related to the old idea of "reflux" that was an important feature of the analysis of certain prominent members of the Banking School in the mid-19th century, such as Tooke and Fullarton. See Skaggs (1991) for an account of its role in this earlier debate.

[14]What would happen if, for whatever reason, cash was rationed? No doubt this would simply disrupt payments and force participants to shift to alternative settlement media with no benefit whatsoever.

of money (Borio and Disyatat 2010). As has become increasingly recognized, the money multiplier—the ratio of money to the monetary base—is not a useful concept.[15] In fact, in systems without reserve requirements the multiplier is, practically, infinite; and nothing calamitous has ever happened. Increasing bank reserves (the means of payment) beyond what markets want simply pushes interest rates to the deposit facility or, in its absence, to zero. It is like pushing on a string and could result in loss of control over interest rates (scheme 2). Bank lending reflects banks' management of the risk-return trade-off they face, and bank transaction deposits reflect the nonbank sector's portfolio preferences.

Thus, the ultimate anchor of the monetary system is not the monetary base but the interest rate the central bank sets. Moreover, there is clearly an element of convention in how interest rates are set nowadays—that is, in how one chooses the point along a de facto vertical demand curve for reserves. This raises questions about how interest rates may have been set before the creation of central banks. As one might infer from the long-run stability of the short-term nominal interest, convention may well have played a bigger role than typically thought (Figure 3). Data limitations aside, this issue deserves further study.[16]

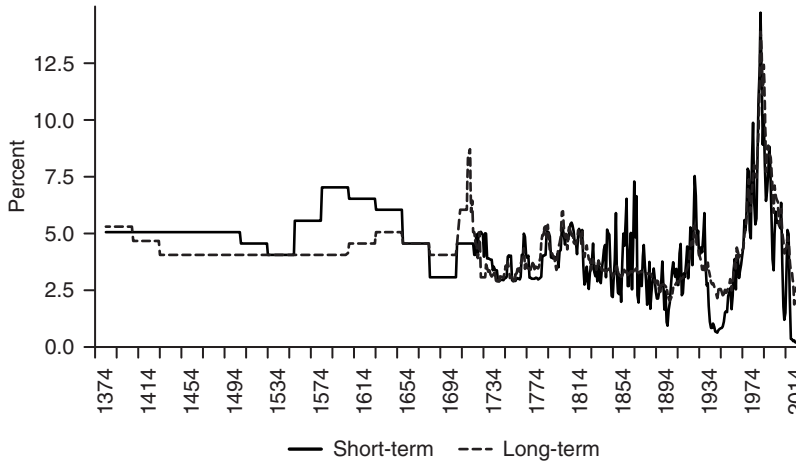
All this points to the critical role central banks play in ensuring the smooth functioning of the payment system, including as overseer (Borio 1995). Indeed, historically the precursors of central banks were arguably the city-state chartered public banks established mostly in 1400–1600.[17] They were set up to improve the efficiency of payment systems by providing a high-quality means of payment and

[15]On this point and some of its broader implications not discussed here, see Goodhart (2010), Disyatat (2008), and, for a reinterpretation of the meaning and effectiveness of "helicopter money," see Borio, Disyatat, and Zabai (2016). The notion that exogenous increases in the monetary base, under the control of the central bank, can generate any increase in the money stock the central bank desires, offsetting possible changes in the demand for money and bank reserves, is the central tenet of the famous Friedman and Schwartz (1963) interpretation of the Great Depression. See also Cagan (1965).

[16]For instance, short-term rates in medieval times were "hidden" in exchange rates (e.g., 90-day bills of exchange), and there is evidence that those fluctuated quite a bit. Nor is it straightforward to produce a representative series for long-term rates.

[17]Such banks were set up in places such as Barcelona, Genoa, Venice, and Hamburg. See Van Dillen (1964), Roberds and Velde (2014) and Bindseil (2018). For the link with central banking, see Ugolini (2017) and Bindseil (2018).

FIGURE 3
Rather Stable Level of "Risk-Free" Interest Rates Historically, Except More Recently



Note: The series is constructed by choosing the lowest interest rates available for each historical phase from various sources. See the original article for details.
Source: Haldane (2015).

centralizing a number of clearing and settlement operations. Thus, they came into being well before central banks started acting as lenders of last resort under stress—commonly regarded as the beginning of the central banking era.[18]

Now, a high elasticity in the supply of the means of payment does not just apply to bank reserves, it is also essential for bank money. This money is created as a counterpart to the loans banks extend or assets they buy.[19] Without it, the economy could not

[18]That said, some public banks had already played this role before, notably the Bank of Hamburg in 1673; see Sieveking (1933), Bindseil (2018), and Schnabel and Shin (2018). Goodhart (1988) is a leading exponent of the view that central banks proper developed only later in the 19th century, when the institutions started to act as lenders of last resort.

[19]It is well known that banks create deposits by extending loans, although the point has disappeared from mainstream macroeconomic models. The recognition is already clear in Wicksell (1906), can be found in several articles in the 1920s and 1930s (e.g., Crick 1927), and was already explicit in Pennington (1826). No doubt, it goes further back. See Humphrey (1987) for a review of key English-speaking authors.

run smoothly. More generally, credit creation is all around us: some we see, some we don't (Borio 1995). For instance, explicit credit extension is often needed to ensure that two legs of a transaction are executed at the same time so as to reduce counterparty risks (delivery versus payment in the case of securities, and payment versus payment in that of foreign exchange transactions): the party in question may need to borrow to bridge the gap. And implicit credit creation takes place when the two legs are not synchronized. Today's economies are "credit-hungry."

In fact, the role of credit in monetary systems is commonly underestimated. Conceptually, exchanging money for a good or service is not the only way of solving the problem of the double coincidence of wants and overcoming barter. An equally, if not more convenient, option is to defer payment (extend credit) and then settle when a mutually agreeable good or service is available. In primitive systems or ancient civilizations, as well as during the middle ages, this was quite common.[20] For instance, in the feudal system a worker would receive a good from his landlord and pay later in kind, through his labor. It is easier to find such examples than cases of true barter.

On reflection, the distinction between money and debt is often overplayed.[21] True, one difference is that money extinguishes obligations, as the ultimate settlement medium.[22] But netting debt contracts is indeed a widespread form of settling transactions.

[20]See Polanyi (1957), among many. Such systems preceded by millennia the invention of coinage. More generally, it has been common for various modes of payment to coexist (e.g., Braudel 1977 and Postan 1973). For example, Braudel (1977) notes that in France as late as the 19th century barter was common in the countryside, silver was more generally used at a national level, and arrangements based on bills of exchange prevailed in international trade, with balances that could not be clearer settled in gold or silver.

[21]See Mitchell-Innes (1914), who takes this argument to its logical extreme. Of course, it goes without saying that not all debt is money: a broad set of debt claims do not serve as a means of payment.

[22]A pivotal debt instrument in the evolution of monetary systems in general, and payments in particular, is the bill of exchange, from the days of the medieval trade fairs in the 12th century. Without necessarily reaching the status of settlement medium, the instrument has played a key role as a medium of exchange, not least in trade financing. See De Roover (1948, 1953) for a detailed analysis and history, Kindleberger (1984) for a general treatment, and Santarosa (2015) for the importance of the introduction of joint liability. Goodhart (1988) elaborates on the use of bills of exchange as payment instruments in the early part of the 19th century in England.

Needless to say, bank deposits constitute by far the bulk of all means of payment and are a form of debt. And even outside money, which is irredeemable, can be regarded as debt. This is so not just because the very instrument that counts as money is a liability (debt or "I Owe You" of the issuing agent) but also because, while not subject to legal default, like any form of money it is vulnerable to confidence crises—a flight to another currency—when the sovereign's creditworthiness is in doubt. For all intents and purposes, this is equivalent to a deposit run and a default. It undermines the role of money as a unit of account and even as a means of payment—think, for instance, of dollarization.

Put differently, we can think of money as an especially trustworthy type of debt.[23] In the case of bank deposits, trust is supported by central bank liquidity, including as lender of last resort, by the regulatory and supervisory framework and varieties of deposit insurance; in that of central bank reserves and cash, by the sovereign's power to tax; and in both cases, by legal arrangements, way beyond legal tender laws, and enshrined in market practice.

At an even deeper level, money is debt in the form of an implicit contract between the individual and society. The individual provides something of value in return for a token he or she trusts to be able to use in the future to obtain something else of value. He or she has a credit vis-à-vis everyone and no one in particular (society owes a debt to him or her).[24]

All this also suggests that the role of the state is critical. The state issues laws and is ultimately responsible for formalizing society's implicit contract. All well-functioning currencies have ultimately been underpinned by a state, with the currency area

[23]This point is related to Gorton's (1985) and Holmström's (2015) notion of debt as an information-insensitive asset, i.e., an asset whose (nominal) value is relatively insensitive to information about the condition of the issuer (see, for example, Holmström 2015, and references therein). One could think of good money as an asset whose nominal value is highly (ideally perfectly) insensitive.

[24]This echoes the insight of Macleod (1855); see Skaggs (1998). A similar point was subsequently made by Simmel, who describes money as "a claim on society" (Simmel 1978). That said, the precise meaning of Simmel's expression is ambiguous, with some seeing it just as a statement of the chartalist position. On the debate, see Dodd (2016). Regardless of the specific interpretation, not surprisingly Simmel, like Wicksell (1898) in his pure credit economy, foresaw the possibility of pure fiat money. On the relationship between Macleod and Simmel, see Frankel (1977).

often coinciding with a given political unit's perimeter.[25] Moreover, it is surely not by chance that dominant international currencies have represented an extension of powerful states—economically, financially, and politically—from Byzantium's solidus to today's U.S. dollar.[26] That said, it is no secret that the relationship between the sovereign and the currency has been a checkered one, to say the least. The sovereign has often yielded to the temptation to abuse its power, undermining the monetary system and endangering both price and financial stability.[27] This simply indicates that it is essential to put in place adequate safeguards. I will return to this point.

A new and controversial payment scheme—cryptocurrencies—illustrates some of the difficulties in generating trust through a fully

[25]There is a long-standing debate between those who see money as emerging spontaneously as a market institution and those who see it as deriving its strength from the state. Prominent members of the first group (referred to as "the catallactic school") include Jevons (1875), Menger (1892), von Mises (1912), and much more recently, Alchian (1977) and Kiyotaki and Wright (1989). Members of the second group (referred to as "the chartalist school") include Knapp (1924), Grierson (1977), Einzig (1949), Polanyi (1957), and Melitz (1974). Ellis (1937) and Goodhart (1998) provide useful classifications and summaries of the debate.

[26]Examples abound, including the Muslim dinar, the Florentine florin, the Venetian ducat, and later on, the pound sterling. For a discussion of the older examples, see Cipolla (1956).

[27]Debasement to raise revenue has been quite common in history—see Eichengreen and Sussman (2000), Sussman (1993), and Bordo (1986), and, for the experience of the German city-states in the 1600s, with an emphasis on competition, see Schnabel and Shin (2018). That said, transparent debasement could also be used as a sophisticated way of carrying out monetary policy; see Cipolla (2013) for the experience in Florence. The public banks also played a role in financing the sovereign—a role that was especially prominent in Genoa (e.g., Fratianni and Spinelli 2006). Likewise, sovereign defaults have been at the origin of many banking crises throughout history, notably the famous one in 1343–46 involving the Bardi and Peruzzi, two leading Florentine merchant and fractional deposit banks, which had lent to the English crown as well as to the city-state government (e.g., Cipolla 2013). Historically, sovereign defaults often caused banking crises: there were several between 1250 and 1600 (Lopez 1979, Blomquist 1979, English 1988, De Roover 1963, and Doucet 1933). Later, particularly in the 20th century, it became more common for banking crises to cause sovereign ones, presumably owing in part to the broadening of safety nets. On a chronology of sovereign defaults, see Reinhart, Rogoff, and Savastano (2003); on the link with banking crises, see Reinhart and Rogoff (2009) and Laeven and Valencia (2012). On the broader ambiguous relationship between the state and markets, both supportive and conflictual, see North (1990).

decentralized system that does not piggy-back on existing institutional arrangements. This is so quite apart from the issues concerning scalability, finality, and incentives to verify, discussed in detail in this year's BIS Annual Economic Report (BIS 2018).[28] The above analysis points to another problem that can undermine trust, as also mentioned in the report: the lack of elastic supply. Hence the cryptocurrencies' extreme price volatility: changes in demand are fully reflected in the price. The volatility undermines the cryptocurrency's role as a unit of account and as a means of payment. Not surprisingly, prices are still quoted and sticky in terms of national currencies.

The problem cannot easily be solved. A fully unbacked currency in elastic supply will not succeed in gaining the necessary trust. Alternatively, seeking to tie it to the domestic currency would require some agent to arbitrage in possibly unlimited quantities between the two, just as when central banks seek to keep exchange rates stable. And simply backing it with a sovereign asset or means of payment on a demand-determined basis would not do either. Not only would it defeat the purpose of having a cryptocurrency in the first place, as it would explicitly piggy-back on sovereign money. As in the case of any mutual fund unbacked by a supply of liquidity and a lender of last resort, it would also be vulnerable to runs (breaking the buck)—the equivalent of having to break the promise of convertibility. Moreover, in all probability it would not to be profitable without taking on significant risk to pick up yield, which would increase the probability of such a run.

A Well-Functioning Monetary System: The Longer Run

Having discussed the issues that arise concerning the need to generate trust in the day-to-day operation of the monetary system, it is now time to turn to those that arise in the longer run in the context of delivering price and financial stability. Given the time available, as I have already covered these themes more extensively in the past, in

[28]The reference here is to open ("permissionless") schemes; permissioned ones do not raise the same issues. Distributed ledger technology (DLT), on which cryptocurrencies are based, has a broader set of potentially useful applications. On the viability of cryptocurrencies, see also Carstens (2018), Shin (2018) and BIS (2018).

particular those concerning financial stability, I will have to be brief and just sketch the main arguments.

The previous analysis suggests that the concepts of price and financial stability are joined at the hip. They are simply two ways of ensuring trust in the monetary system. Inflation, deflation, and price volatility induce instability in the value of money—and its close cousin, debt—in terms of goods and services, undermining its means-of-payment (and store-of-value). Financial instability effectively undermines it through the threat and materialization of default, which can bring the payments system to a halt when bank deposits are involved. Price and financial instability amount to broken promises.

It is no coincidence that securing both price and financial stability have been two core central bank functions. True, over time their interpretation has evolved. During the gold standard, for instance, the focus was not on price stability as such, but on maintaining convertibility and addressing banking stress through the lender of last resort function.[29] The objective of managing the economy, with a varying focus on price stability, made its first serious appearance in the 1920s, culminating in the arrangements with which we are so familiar today.[30] But, interpretations aside, performing both functions relies on the deployment of the central bank's balance sheet, to supply the means of payment, to

[29]During this phase, price and financial instability were more transparently linked, through the single convertibility constraint. True, during this phase, prices were generally stable over long horizons, even as episodes of financial instability (banking distress) were common. But it was the convertibility constraint—internal and external—that acted as a (loose, yet) visible anchor for both price and financial stability. The constraint gave way when the price level increased too much or when financial stress emerged. And it set limits to the central bank's ability to fulfill its lender of last resort tasks, owing to the need to defend the exchange rate peg. This is already clear in Bagehot's (1873) famous narrative.

[30]This, of course, is a stylized description. Price stability was already the focus of the Bullionist controversy during the inconvertibility period in England (1897–1821). Absent price indices at the time—they would only be developed by Jevons (1863) later on—the sterling price of gold played a key role as proxy, alongside the prices of widely traded commodities and the exchange rate. See, for example, Fetter (1965), Laidler (2000), and Flandreau (2008) for analyses of the debate. Moreover, at the time, Attwood (1816), a member of the Birmingham School, had already advocated the active use of monetary policy under inconvertibility to reach full employment; see Laidler (2000).

set interest rates, and in an international context, to manage foreign assets (foreign currency reserves). In this sense, it is hard to separate neatly the two functions; any decoupling would be artificial. This is true even though, over time, more tools have been developed to perform them. A crucial one is the regulatory and supervisory apparatus, which is generally of more recent vintage[31] and in which central banks have typically played an important role.

While, as concepts, price and financial stability are joined at the hip, the processes behind the two differ. Let's look at this issue more closely.

The process underpinning financial instability hinges on how "elastic" the monetary system is over longer horizons, way beyond its day-to-day operation. Inside credit creation is critical. At the heart of the process is the nexus between credit creation, risk-taking, and asset prices, which interact in a self-reinforcing fashion generating possibly disruptive financial cycles (e.g., Borio 2014).[32] The challenge is to ensure that the system is not excessively elastic, drawing on two monetary system anchors.[33] One operates on prices—the interest rate and the central bank's reaction function.[34] It is the interest rate that sets the universal price of leverage in a given monetary system.

[31]See Allen et al. (1938) for a cross-country description of the origins and development of the frameworks since the 19th century. That said, going further back in history, sometimes tight constraints on and supervision of fractional reserve banks had already been in place. This was the case, for instance, in Venice, despite the existence of unlimited liability. Constraints there were implemented following the failure of several banks, seemingly related to the business cycle rather than lending to the state (e.g., Mueller 1997; Lane 1937).

[32]See Claessens and Kose (2018) for an extensive review of the recent literature. Of course, the notion of such financial or credit cycles, and variations on the theme, have a long intellectual tradition. Since the 1970s, Kindleberger (2000) and Minsky (1982) are probably the best-known exponents. Interestingly, the notion has even brought together scholars of opposite political persuasions—for example, Marx (1894) and Hayek (1933). For a historical overview, see Besomi (2006).

[33]See Borio and Lowe (2002) for an early attempt to classify monetary regimes in history based on their elasticity. While, for simplicity, the discussion here assumes that the currency area and state borders coincide, see Borio (2016a) for a discussion of how the dominant role of the U.S. dollar affects the (excess) elasticity of the international monetary system.

[34]Balance sheet policies, such as large-scale asset purchases, are also primarily intended to influence yields (Borio and Disyatat 2010).

The other operates on quantities: bank regulatory requirements, such as those on capital or liquidity, and the supervisory apparatus that enforces them.[35]

These aspects are downplayed in the current vintage of macroeconomic models. One reason is that the models conflate saving and financing (Borio and Disyatat 2011, 2015). Saving is just a component of national income, as it were—just a hole in overall expenditures, without a concrete physical representation. Financing is a cash flow and is needed to fund expenditures. In the mainstream models, even when banks are present, they imply endowments or "saving"; they do not create bank deposits and hence purchasing power through the extension of loans or purchase of assets.[36] There is no meaningful

[35]Sometimes portrayed as an alternative to the prudential framework is the idea of narrow banking. The idea is to make inside money perfectly safe (in nominal terms) by requiring issuing institutions to invest all the proceeds in central bank liabilities. (Some versions allow for government securities, and others extend coverage to forms of deposits other than means of payment). This view was initially popularized in the early 20th century through the Chicago Plan (Simons 1934; Hart 1935) and has had many illustrious adherents, sometimes from the opposite end of the intellectual and political spectrum—for example, Friedman (1956) and Tobin (1985). There is no way to do justice to this topic here. My sense is that such a scheme, depending on its structure, would reduce the elasticity of credit to some extent. But it would not help much with the problem of financial instability. For instance, if deposits that act as a means of payment were so backed, a competitive financial system should be able to boost the velocity of credit, with maturity/liquidity mismatches and default risk migrating outside narrow banks. This would then call for an extension of the lender of last resort function and of the prudential framework to cover the corresponding institutions. Moreover, at times of stress, runs to narrow banks are likely to be stronger, forcing other credit institutions to liquidate their illiquid portfolios in the absence of central bank liquidity support or sovereign guarantees.

[36]This is also true of the so-called New Monetarists; see Williamson and Wright (2010). This perspective, proposed as an alternative to the dominant New Keynesian School, treats money as "essential" and as improving on barter. This is a step forward compared with the inclusion of money in utility functions or the imposition of a cash-in-advance constraint, which limits expenditures artificially and trivializes Clower's (1967) seminal analysis (see also Laidler 2006). But the approach does not develop the implications of the bank credit-induced generation of purchasing power and its implications for the economy. By contrast, Rungcharoenkitkul, Borio, and Disyatat (2018) have recently developed such a model in an overlapping-generations context and discussed how it can help generate a financial cycle driven by monetary policy. For an early attempt to introduce the difference between saving and financing in a dynamic stochastic general equilibrium (DSGE) model, see Benes, Kumhof, and Laxton (2014).

monetary system, so that any elasticity is seriously curtailed. Financial factors serve mainly to enhance the persistence of "shocks" rather than resulting in endogenous booms and busts.

The process underpinning price instability—as typically and, as I shall argue, somewhat misleadingly conceived—is best captured by the famous dictum: inflation is a monetary phenomenon. The process was described in very simple terms in the old days. An exogenous increase in the money supply would boost inflation. The view that "the price level is the inverse of the price of money" has probably given this purely monetary interpretation of inflation considerable intuitive appeal. Nowadays, the prevailing view is not fundamentally different, except that it is couched in terms of the impact of the interest rate the central bank sets.

This view of the inflation process has gone hand in hand with a stronger proposition: in the long run, money (monetary policy) is neutral, that is, it affects only prices and no real variables. Again, in the classical tradition this was couched in terms of the money supply; today, it is in terms of interest rates. Of course, thus defined, neutrality is purely an analytical concept: it refers to the steady state, once prices have adjusted. Views about how long it takes for this process to play itself out in calendar time differ.[37] But proponents argue that the length is short enough to be of practical policy relevance.

Now, no one can deny that monetary accommodation is necessary to sustain inflation. In this sense, just as with financial stability, credit creation and hence the expansion of the means of payment are relevant. Nor can anyone deny that, over time, more of a given effect of a change in the stance of monetary policy will be reflected in prices. The empirical evidence is convincing.

But arguably, this literature, old and new, underestimates the role real factors play in the inflation process and overestimates the relevance of neutrality. Let me mention just three analytical reasons and three pieces of empirical evidence, in that order.

[37]One could think of, say, a decade, but sometimes of even much shorter periods; see, for example, Kocherlakota (2013), who argues that policymakers are simply tracking the natural rate in real time (the natural rate being that rate which equates actual output with potential output and is driven purely by real factors). Indeed, standard DSGE models prescribe optimal monetary policy as largely following the natural real rate much of the time.

First, once we recognize that money is fundamentally endogenous,[38] analytical thought experiments that assume an exogenous change and trace its impact are not that helpful, if not meaningless.[39] They obscure, rather than illuminate, the mechanisms at work.

Second, once we recognize that the price of money in terms of the unit of account is unity, it makes little sense to think of the price level as the inverse of the price of money. This conflates the *price* of money with the *value* of money, in real terms: it is simply a succinct way of stating "what money can buy." But any financial asset fixed in nominal terms[40] has the same property.[41] As a result, thinking of inflation as a purely monetary phenomenon is less compelling.

Finally, once we recognize that the interest rate is the monetary anchor, it becomes harder to argue that monetary policy is neutral, at least over relevant policy horizons. After all, the interest rate is bound to affect different sectors differently, resulting in different rates of capital accumulation and various forms of hysteresis.[42] And for much the same reason, it is arguably not that helpful to make a sharp distinction between what affects relative prices and the aggregate price level. In practice, not least because prices move at different speeds and differ in their flexibility, changes in the overall price level and inflation result from a succession of relative price changes. It stands to reason that, at low inflation rates, the "pure" inflation component, pertaining to a generalized increase in prices, would be smaller, so that the distinction between relative and general price changes

[38]This point is one post-Keynesians have long stressed, although arguably without paying sufficient attention to the factors that constrain the supply of credit noted above; see, for example, Moore (1988). For the relative neglect of the supply side, see Goodhart (1989) and Wray (1995), including references therein.

[39]Such thought experiments are the basis for the appeal of the quantity theory of money. For a classic modern restatement, see Friedman (1956), and for the long history of the hypothesis, see Laidler (1991).

[40]By that I mean an asset that promises a fixed number of units of account to be provided in the settlement medium. This, of course, is quite different from the market value of the claims.

[41]I suspect that the tradition of simply putting money into agents' utility function is partly responsible for this state of affairs. On this, see, in particular, the seminal work of Patinkin (1965). On the "nonessential" role of money in such a general equilibrium setting, see Hahn (1965).

[42]For a critique of the notion of money (monetary policy) neutrality, see also Borio (2016b) and references therein. Of course, the notion that money is nonneutral has a long intellectual tradition, including Keynes (1933, 1936).

becomes rather porous.[43] This, in turn, opens the door for real factors to play a bigger role than normally assumed.[44] It may not be a coincidence that many central banks have been confounded by the behavior of inflation for some time.

Turning to the empirical evidence, this comes from recent decades as well as from back in history.

First, a growing body of work has found that the globalization of the real economy (trade integration) has played an underappreciated role in exerting persistent downward pressure on inflation over the past 20 years or so (e.g., Borio 2017) and references therein). Granted, the proposition has been challenged. But it is hard to imagine that the entry into the global economy of some 1.6 billion people as a result of the opening-up of former communist countries, China and emerging market economies should have had no material impact. Looking forward, one would expect technological advances to play an even bigger role.

Indeed, seen through this lens, the historical experience seems to be consistent with this view. Under the classical gold standard (1870–1914), the central bank did not attempt to manage the economy or inflation explicitly. Moreover, the convertibility constraint acted as an anchor for inflation only over very long horizons. And yet, short-term volatility aside, linked to the composition of the price index, the price level tended to be pretty stable, gradually declining and then rising. One might speculate that inflation was held at bay by qualitatively similar forces to those at work over the past 20 years or so: a globalized real economy and weak pricing power of workers and firms. After all, this was the globalization wave that preceded the current one.

[43]Indeed, studies that have attempted to decompose inflation into the relative price and "pure" inflation components (defined as the shared component of price changes associated with an equi-proportional change in all prices) have found that the pure component is comparatively low. For instance, Reis and Watson (2010) find that, since 1959, the share in the case of U.S. inflation has been some 15 percent. A sizable part of this is likely to reflect the high inflation of the 1970s, as more recent estimates find "pure" inflation to be considerably lower for both the United States and the eurozone (Miles et al. 2017). Similarly, Apaitan, Disyatat, and Manopimoke (2018) found that pure inflation has accounted for only around 10 percent of variation in headline inflation in Thailand since 2002. Presumably, the share would be higher for countries with higher average inflation rates and in which the exchange rate played a key role in generating or sustaining inflation.

[44]Even at low inflation rates, a key monetary influence on inflation is the exchange rate. How durable the impact on inflation, as opposed to the price level, is will depend on the presence and strength of second-round effects.

Second, turning to monetary neutrality, recent research going back to the 1870s has found a pretty robust link between monetary regimes and the *real* interest rate over long horizons. By contrast, the "usual suspects" seen as driving saving and investment—all real variables—do not appear to have played any consistent role (Borio et al. 2017). Given the trends in the data, they work reasonably well from the early 1980s onwards, at least qualitatively, but the relationships do not hold before then. Over the longer sample, no systematic pattern emerges—a sign that the relationships in the more recent period may be spurious.

Finally, studies indicate that financial booms tend to misallocate resources, not least because too many resources go into sectors such as construction, which depresses productivity growth persistently once the boom turns to bust (Borio, Disyatat, and Zabai 2016 and references therein). Furthermore, a large amount of empirical work indicates that the financial busts that follow booms may depress output for a long period, if not permanently.[45] It is hard to imagine that interest rates are simply innocent bystanders. At least for any policy-relevant horizon, if not beyond, these observations suggest that monetary policy neutrality is questionable.

Given that the processes underlying price and financial stability differ, it is not surprising that there may be material tensions between the two objectives, at least in the near term. Indeed, since the early 1980s changes in the monetary system have arguably exacerbated such tensions by increasing the monetary system's elasticity (e.g., Borio 2014). This is so despite the undoubted benefits of these changes for the world economy. On the one hand, absent a sufficiently strong regulatory and supervisory apparatus—one of the two anchors—financial liberalization, notably for banks, has provided more scope for outsize financial cycles. On the other hand, the establishment of successful monetary policy frameworks focused on near-term inflation control has meant that there was little reason to raise interest rates—the second anchor—since financial booms took hold as long as inflation remained subdued. And in the background, with the globalization of the real side of the economy putting persistent downward pressure on inflation while at the same time raising growth expectations, there was fertile ground for financial imbalances to take root in.

[45]Borio (2014 and 2016a) contain many references to the literature.

While the near-term tensions are material, adjustments to the monetary system can help reconcile them over the longer term. Extending policy horizons is essential. Financial imbalances build up only gradually: they pertain to stocks (balance sheets) rather than flows. Typically, they grow over periods that are considerably longer than those associated with business cycles, as traditionally measured (Borio 2014). And financial busts can not only cripple monetary policy but also result in unwelcome disinflationary pressures linked to deep demand weakness.

Strong monetary system anchors are crucial. As argued in more detail elsewhere, putting them in place requires action on two fronts. It calls for effective regulation and supervision. This must be so both in relation to banks (and other financial institutions) assessed on a stand-alone basis (the so-called microprudential perspective) and with respect to the system as a whole (the so-called macroprudential perspective). And it calls for monetary policy regimes that secure long-term price stability while taking advantage of any room for maneuvering to respond to financial stability threats.

Still, all this would be to no avail unless the creditworthiness of the state was ensured. This is the ultimate linchpin of the monetary system. As history demonstrates, failing to ensure it would undermine both price and financial stability. Granted, central bank independence is precious and can provide a degree of insulation. And a strong and independent regulatory and supervisory apparatus can help too. But, even combined, they cannot suffice in the longer run: the monetary system would not be able to survive. The dam would simply be too fragile to hold back the rising water.[46]

It is sometimes argued that, assuming the sovereign remains creditworthy, the private sector could deploy sufficiently strong anchors; central banks and supervisory authorities could be dispensed with.[47] By implication, there would be no need for a monetary policy

[46]Combining adequate monetary and regulatory anchors with the sustained creditworthiness of the state is what BIS (2018) refers to as a "macro-financial stability framework."

[47]For variations on this theme, outlining different models, see Selgin and White (1994). Klein (1974) develops a model in which banks issue competitively irredeemable currencies, which some do not consider a form of "free banking"—a term they reserve for a system that requires convertibility into an outside scarce settlement medium, such as a commodity (e.g., gold) or even central bank money.

to actively manage the currency. Fully functioning central banks did not spread until the second half of the 19th century, but there were long periods of relative price stability while financial crises were not necessarily more frequent or severe than they are now. Free banking is sometimes recalled with nostalgia.[48]

But I find this conclusion highly doubtful. In particular, the evaluation of free banking is overly rosy. For instance, some scholars have argued that even the Scottish experience is not well understood: according to them, the degree to which banks depended on London and the Bank of England has been underestimated (e.g., Goodhart 1988).[49] More to the point, I cannot imagine that a completely laissez-faire solution could meet today's challenges. Our current financial system is several orders of magnitude larger and more complex. Competitive pressures are too fierce. Risk-taking incentives are too great.[50] The role of the safety net in abating them is overestimated: to my mind, the experience suggests that during financial booms it is not so much the reassuring comfort of safety nets that is at work, but the temptation to believe that "this time is different," to quote that felicitous expression (Reinhart and Rogoff 2009). Banks, other financial institutions, and businesses alike do not face sufficient discipline during financial expansions; rather, they enjoy indiscriminate and misplaced trust.[51] And should a financial crisis erupt—sooner or later, one will—I simply cannot imagine it could be

[48]Recent proponents of free banking include White (1984b), Selgin (1988), and Dowd (1992). Hayek (1978) outlines a system à la Klein (1974); see Selgin (2015). Dowd (1992) includes articles describing the experience with free banking around the world.

[49]Equally, on the other side of the debate, there are questions about how "free" banking was in the United States in 1837–61, given the state regulations in place, not least unit-banking restrictions. See, for example, Dwyer (1996).

[50]For similar reasons, I do not think clearinghouse arrangements like those in the United States would succeed today. On the U.S. experience, see Timberlake (1984) and Gorton (1985).

[51]Not surprisingly, the evidence about the effectiveness of market discipline is about the cross-sectional—differentiation across institutions—rather than about the time dimension—the evolution of risk in the system as a whole. This is why financial cycles are so dangerous. For a survey of the cross-sectional evidence concerning U.S. banks, see Flannery (1998). In fact, one could think of the financial cycle as partly reflecting a "trust" cycle. Booms signal too much (i.e., blind) trust in the monetary system; trust evaporates during a crisis; and trust is rebuilt during the subsequent expansion. This perspective is already articulated in Hicks (1967) with reference to the instability of the credit system.

handled effectively without the central bank as lender of last resort. The private sector is not well placed to perform this function. Whoever ends up performing it has to take too much risk and be implausibly immune to conflicts of interest.[52]

None of this means that the current system is perfect—far from it.[53] Nor that what we have today is the final destination. But the present system encapsulates many of the valuable lessons we have learned during a long journey through history—a sometimes painful journey of trial and error, with setbacks and false starts. Those lessons should not be unlearned.

Conclusion

The monetary system is the cornerstone of an economy. Not an outer facade, but its very foundation. The system hinges on trust. It cannot survive without it, just as we cannot survive without the oxygen we breathe. Building trust to ensure the system functions well is a daunting challenge. It requires sound and robust institutions. Lasting price and financial stability are the ultimate prize. The two concepts are inextricably linked, but because the underlying processes differ, in practice price and financial stability have often been more like uncomfortable bedfellows than perfect partners. The history of our monetary system is the history of the quest for that elusive prize. It is a journey with an uncertain destination. It takes time to gain trust, but a mere instant to lose it. The present system

[52]The importance of a lender of last resort in a monetary system to help manage stress is obvious. This is consistent with the view that the function emerged to overcome the inadequacy of previous arrangements (e.g., Goodhart 1988), with one well-known example being the creation of the Federal Reserve in 1913, following the 1907 crisis, and the establishment of a special commission that drew on the European experience (see also Smith 1936). This general view, however, has not gone unchallenged. For instance, Calomiris, Flandreau, and Laeven (2016) stress the role of political expediency. Bagehot (1873) himself was of the same opinion concerning the Bank of England; not surprisingly, he was a supporter of free banking. Interestingly, this contrasts with Thornton (1802), the other famous scholar of the lender of last resort function.

[53]What Hicks said in 1967 about the inherent instability of the credit system and the corresponding ebb and flow of trust is still fully applicable today: "To find a framework which can be relied on to give support when it is needed, and to impose restraint just when it is needed, is very difficult. I do not think it has ever been perfectly solved. Even in this day we do not really know the answer" (Hicks 1967: 159).

has central banks and a regulatory/supervisory apparatus at its core. It is by no means perfect. It can and must be improved.[54] But cryptocurrencies, with their promise of fully decentralized trust, are not the answer.

Paraphrasing Churchill's famous line about democracy, "the current monetary system is the worst, except for all those others that have been tried from time to time."

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[54]Moreover, while its fundamental features are likely to remain the same, the system will no doubt evolve with technology. Just to mention one example: in the early 20th century, improvements in recording and communication technologies allowed bank deposits to take over from banknotes. Until then, notes had had a broader reach; in fact, for a long time deposit transfers required either the physical presence of the counterparties at the bank or, later, a notary document. Recently, the advent of distributed ledger technology (DLT) has not only led to the creation of fully decentralized cryptocurrencies, but has also raised questions about central banks' adoption of the technology, either to improve wholesale interbank clearing and settlements or, indeed, to replace notes and coins. On these issues in general, see, for example, Bech and Garratt (2017) and BIS (2018); on the issuance of central bank digital currencies, see CPMI (2018).

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The Fed's Operating Framework: How Does It Work and How Will It Change?

Stephen D. Williamson

In September 2008, during the global financial crisis, the Federal Reserve commenced an unprecedented program of asset purchases. At that time the Fed's total assets were about $925 billion, and when the balance sheet expansion ceased in October 2014, total assets stood at about $4.5 trillion. Before the financial crisis, the Fed's asset portfolio was financed primarily by circulating currency, but by October 2014 currency outstanding was about $1.3 trillion and interest-bearing reserves were about $2.6 trillion.

The intention of the Federal Open Market Committee (FOMC) was to use the balance sheet expansion as an accommodative tool to supplement its zero interest rate policy, under which the target for the fed funds rate had been reduced to a range of 0–0.25 percent in December 2008. However, the Fed's balance sheet expansion created the necessity for important changes in how the policy directives of the FOMC were implemented in the postfinancial crisis period. Moreover, in ultimately winding down its experiment with unconventional monetary policy—that is, large-scale asset purchases and zero interest rates—the Fed was, and is, sailing in uncharted territory. Therefore, careful evaluation and adjustment along the way was

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and is critical to the Fed's success in managing the experiment and potentially repairing any damage.

What are we to make of the Fed's experiment with a large balance sheet expansion (also known as quantitative easing or QE)? Was the experiment worth it? Has policy implementation been handled correctly during QE? Was the move toward normalization handled in a timely way? What will normalization ultimately entail, and what should it entail? What lessons should we have learned that permit better policymaking in the future?

Fed Intervention before the Financial Crisis

Prior to the large balance sheet period that began in September 2008, the Fed effectively implemented monetary policy in a channel or corridor system. In countries in which interest is paid on reserve balances held with the central bank, channel systems have been formalized as part of central bank communications and implementation. For example, in Canada, the Bank of Canada's policy interest rate is a secured overnight interest rate. The Bank sets a target for that interest rate, and the target falls in a channel. The upper bound on the channel is the interest rate at which the Bank stands ready to lend to financial institutions, which is 25 basis points higher than the target. And the lower bound on the channel is the interest rate at which interest is paid on overnight deposits (reserves) with the Bank, which is 25 basis points below the target. Financial arbitrage dictates that the policy rate must fall between these upper and lower bounds, though typically the Bank achieves the overnight target interest rate with a very small margin of error.

Before the financial crisis, most central banks in rich countries (with some exceptions due to idiosyncratic institutional arrangements) implemented monetary policy in a corridor system that worked similar to Canada's. But monetary policy in the United States worked somewhat differently. First, the Fed targeted an unsecured overnight rate—the fed funds rate. In other countries, unsecured overnight markets may exist, but the target rate—as in Canada—is typically an interest rate on overnight repurchase agreements (repos), that is, a secured rate. Second, the Fed did not pay interest on reserves. This made the effective lower bound on its policy rate zero. However, like other central banks, the Fed conducted lending through the discount window at interest rates higher than the fed

funds interest-rate target, so the fed funds rate was bounded in a channel demarcated by zero on the low side and the discount rate on the high side.

Though the Fed's pre-2008 target interest rate was the unsecured fed funds rate, the Fed did not intervene directly in unsecured credit markets to peg the fed funds rate (nor does it do so currently). In managing its asset portfolio, the Fed focused on an essentially all-Treasury portfolio consisting of bills, notes, and bonds—assets that, for the most part, were held until maturity. Day-to-day intervention to achieve the fed funds rate target occurred in the market for repos. At any given time the Fed was active on both sides of the repo market. That is, it would lend in the repo market, and borrow in terms of reverse repos. Typically, most of the variation in the Fed's repo market intervention occurred through variation in repo activity, rather than reverse repo activity. This intervention procedure is often framed (see Potter 2018) as a process by which the Fed managed the supply of excess reserves, so that the market for excess reserves would clear at an interest rate as close to the fed funds rate target as possible.

It is perhaps more helpful to think of the overnight credit market as involving substitution between secured and unsecured credit. Financial arbitrage between the overnight repo market and the fed funds market is somewhat imperfect because of different timing in these markets during the day (details concerning when the funds go to the borrower one day, and when the debt is settled the next day), friction due to the time it takes to find a counterparty for a particular transaction, and counterparty risk. However, imperfections in arbitrage between secured and unsecured overnight markets did not prevent repo rates from moving together with the fed funds rate. Thus, the Fed's pre-2008 implementation procedure effectively involved influencing repo rates with the goal of pegging the fed funds rate. Sometimes this could be a quite noisy process, particularly during the financial crisis when the fed funds market became contaminated with counterparty risk and the dispersion in interest rates across fed funds transactions became quite large on any given day.

One could certainly make a case that the Fed could have opted for a simpler and more effective channel implementation procedure prior to the financial crisis. Perhaps a better guide for policy is a safe short-term rate of interest—an overnight repo rate rather than the

unsecured fed funds rate—which could have been targeted through a fixed-rate full-allotment auction that would effectively set the overnight repo rate by allowing the quantity traded to vary appropriately. The Fed's focus on the fed funds market seems more the result of historical accident and inertia rather than sound analysis.

Monetary Policy with a Large Balance Sheet

An alternative to a corridor system for monetary policy implementation is a "floor system." In theory, under such a system the central bank conducts open market operations in such a way that, at market interest rates, there exists a positive stock of overnight excess reserves in the financial system. In general, financial institutions that are permitted to hold reserve accounts will have alternatives to lending to the Fed in the form of excess reserves held overnight. These institutions could also lend overnight on the fed funds market or in the repo market. Financial arbitrage then dictates that, absent any market frictions, the interest on excess reserves (IOER) will determine all overnight market interest rates.

Goodfriend (2002) argued, long before the financial crisis, that a floor system would potentially be a simpler and more effective approach to targeting the fed funds rate in the United States. Rather than intervening indirectly in repo markets to control the fed funds rate—and sometimes missing the target significantly—the Fed could simply pay interest on reserves and implement monetary policy by administering IOER.

In the United States, Congress authorized the payment of interest on reserve balances, to go into effect in 2011. There are standard economic arguments for paying interest on reserves relying on efficiency (going back at least to the work of Friedman 1969), but this legislative change also opened the door to implementation of monetary policy through a floor system. Thus, because of the future asset purchase interventions that the FOMC contemplated in the fall of 2008, payment of interest on reserves was permitted as of October 2008, and the floor system approach became a reality in the United States.

From December 2008 to December 2015, the announced fed funds rate target was 0–0.25 percent, with IOER set at 0.25 percent. In the absence of financial market frictions, theory tells us that the fed funds rate should have been pegged at 0.25 percent by IOER. But, over the December 2008 to December 2015 period, fed funds

typically traded at from 10 to 20 basis points below IOER. Clearly, the floor system did not work in the United States as, for example, Goodfriend (2002) anticipated. This was a cause for concern for the Fed, particularly as regarded the path to policy normalization—the process of ultimately increasing the fed funds target and reducing the balance sheet, possibly to precrisis levels. For example, what would happen if the Fed retained its large balance sheet for some time, while increasing the fed funds rate target? If the Fed were engaged in attempting to hit the increasing target by increasing IOER, would the fed funds rate follow IOER one-for-one, would the margin between IOER and the fed funds rate increase, or would it decrease?

To understand what was going on, it was important to determine the frictions that were behind the difference between IOER and the fed funds rate. Martin et al. (2013) represent conventional views about the source of this interest rate differential. They argued that the interest rate differential was potentially the result of imperfect competition in overnight financial markets. But, perhaps the primary source of the differential, according to them, was bank balance sheet costs, arising due to some quirks in how interest is paid on reserves. That is, when Congress wrote the law governing interest on reserves, it specified that interest could not be paid on the reserve balances of government-sponsored enterprises (GSEs), for example Fannie Mae, Freddie Mac, and the Federal Home Loan Banks. As these financial institutions could potentially be in possession of substantial liquid overnight funds, they had a powerful incentive to earn positive interest on those funds, rather than have them sit in a Fed reserve account earning zero.

But, for private regulated financial institutions holding reserve accounts that bear interest, there are costs to lending on the fed funds market—to GSEs, or to any other financial institutions. That is, deposit insurance premia are tied to bank assets, as are capital requirements. Because a bank's assets and its leverage rise if it borrows on the fed funds markets, there could possibly be substantial balance sheet costs associated with lending on the fed funds market, which could explain a margin of 10 to 20 basis points between IOER and the fed funds rate. Further, these costs could be large enough that the interest rate differential would increase above 20 basis points as IOER went up.

Ultimately, the FOMC decided, prior to "liftoff," in December 2015, when the fed funds rate target range rose from 0–0.25 percent

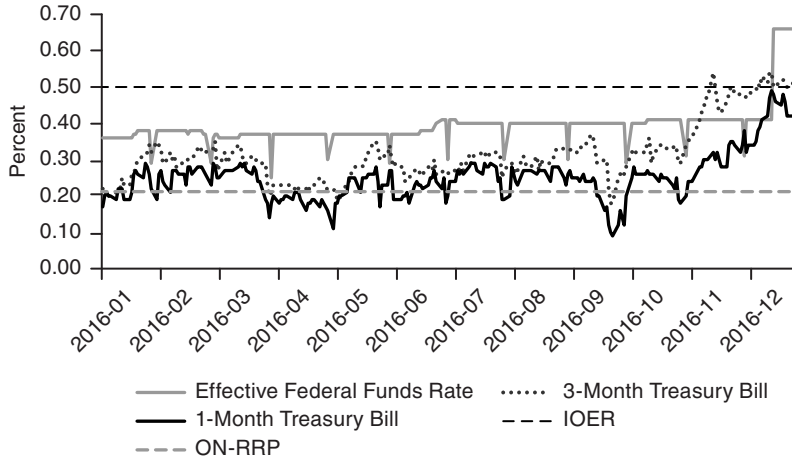
to 0.25–0.50 percent, that the Fed needed to provide a type of sub-floor to the floor system, which had been in place since the end of 2008. In practice, this took the form of an overnight reverse repo (ON-RRP) facility at the New York Fed, which would conduct daily temporary open market operations. As discussed earlier, reverse repos had existed on the Fed's balance sheet prior to the financial crisis, but with the ON-RRP facility, the FOMC envisioned a particular mechanism for maintaining control of the fed funds rate within the announced trading range.

ON RRPs are loans to the Fed (primarily overnight), secured by assets in the Fed's portfolio, with the actual lending conducted through a third party. There is a specified set of counterparties in the ON-RRP market, which include commercial banks and money market mutual funds. It may seem curious that overnight lending to the Fed needs to be secured by collateral posted by the Fed—why would the Fed ever default on an overnight loan? Basically, ON RRPs are reserves by another name, which allow the Fed to extend the reach of its interest-bearing liabilities beyond the financial institutions it traditionally deals with (i.e., those institutions holding reserve accounts) to institutions such as money market mutual funds that cannot hold reserve accounts. ON-RRP lending might also be attractive to GSEs, which do not receive interest on reserve balances, but could hold interest bearing ON-RRP balances with the Fed.

From December 2015 until early in 2018, the Fed set a target range of 25 basis points (beginning with a range of 0.25–0.50 percent) for the fed funds rate, and set IOER at the top of the range, and the ON-RRP rate at the bottom of the range. The ON-RRP rate would then be pegged through a fixed-rate full-allotment procedure, whereby the interest rate is fixed, and take-up in the market is determined by willing lenders at that rate.

Figure 1 shows how the Fed's floor system worked during 2016, when IOER was set at 0.50 percent, and the ON-RRP rate was 0.25 percent. There was significant take-up in the ON-RRP market every day (though perhaps not as large a take-up as was anticipated), and the fed funds rate was typically well within the FOMC's target range. By the end of 2016, the margin between IOER and the fed funds rate had dropped below 10 basis points. Of particular note, as shown in Figure 1, is that 1-month and 3-month Treasury bill interest rates were usually well below the fed funds rate—this in spite of the fact that these T-bill rates include a term premium over overnight

FIGURE 1
Fed's Floor System, 2016



Source: Federal Reserve Bank of St. Louis, FRED.

lending rates. Thus, in the introductory year of the Fed's floor approach, banks required a premium, which was often more than 25 basis points, to hold reserves rather than 1-month T-bills. Also of note in Figure 1 are the month-end downward spikes in the fed funds rate. This appeared to have been due to end-of-month balance sheet adjustment (for accounting purposes) by key lenders in the fed funds market.

So, in its first year of operation, the Fed's floor system behaved in a manner consistent with conventional understanding of how overnight markets were operating under a large Fed balance sheet. The ON-RRP facility seemed to be important for putting upward pressure on the fed funds rate, and the behavior of the fed funds rate relative to IOER appeared to be consistent with the existence of significant balance sheet costs.

Phasing Out of Reinvestment and Changing Behavior in Overnight Markets

During its balance sheet expansion period from late 2008 until fall 2014, the FOMC established a reinvestment policy, according to which the Fed would replace maturing securities on its balance sheet

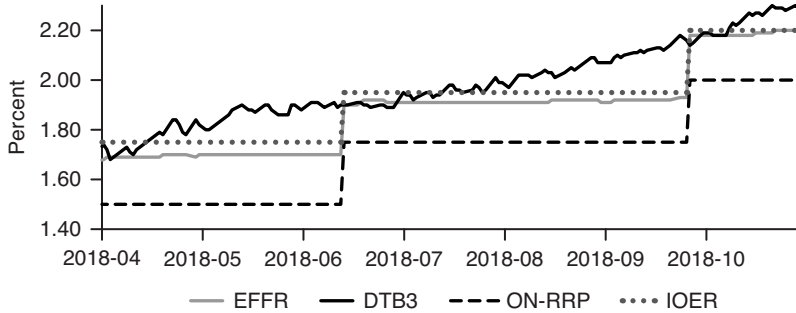
with new asset purchases, so as to maintain a constant nominal balance sheet size even after the cessation in large-scale asset purchases. One option for the Fed would have been to normalize monetary policy by simply reversing the order in which its unusual interventions—during the financial crisis and after—were done. In particular, since the fed funds target was first reduced essentially to zero, followed by three rounds of large-scale asset purchases (QE1, QE2, QE3) and an intervening period of increases in the average maturity of the Fed's asset portfolio ("operation twist"), why not sell assets to reduce the balance sheet to its former configuration, and then increase the fed funds target?

For the FOMC, the 2013 "taper tantrum" appeared to be a key event. On May 22, 2013, Ben Bernanke announced an imminent—though as yet unofficial—tapering in the Fed's asset purchase program, then currently underway. The large increase in bond yields that resulted seemed to be unanticipated by the Fed, and perhaps is the primary reason why the FOMC became skittish about balance sheet reduction—or at least outright asset sales as a means to reduce the balance sheet.

By October 2017, after four 25 basis-point increases in the fed funds rate range, the FOMC finally implemented a balance sheet reduction program. This was a rather modest program, entailing caps on the quantities of Treasury securities and mortgage-backed securities that would be permitted to mature within a given month without reinvesting to replace the maturing securities. These caps then increased until reaching their final resting points in October 2018. Since October 2018, the Fed's securities holdings have been declining, albeit at a slow rate. If the Fed's assets continue to fall at the current rate, and currency outstanding continues to rise at the current rate, the stock of excess reserves outstanding will reach zero in about 4.5 years.

Coincident with the phasing-out of the Fed's reinvestment program has been a change in behavior in overnight markets. In Figure 2, we show IOER, the ON-RRP rate, the fed funds rate, and the 3-month Treasury bill rate for the period April 2, 2018 to November 1, 2018. At the March FOMC meeting the fed funds rate range was set at 1.5–1.75 percent, at the June meeting the range changed to 1.75–1.95 percent, and in September this changed to 2.00–2.20 percent. Of particular note is that the difference between IOER and the fed funds rate over this period has fallen from a few

FIGURE 2
Short-Term Markets
(April 2, 2018 to November 1, 2018)



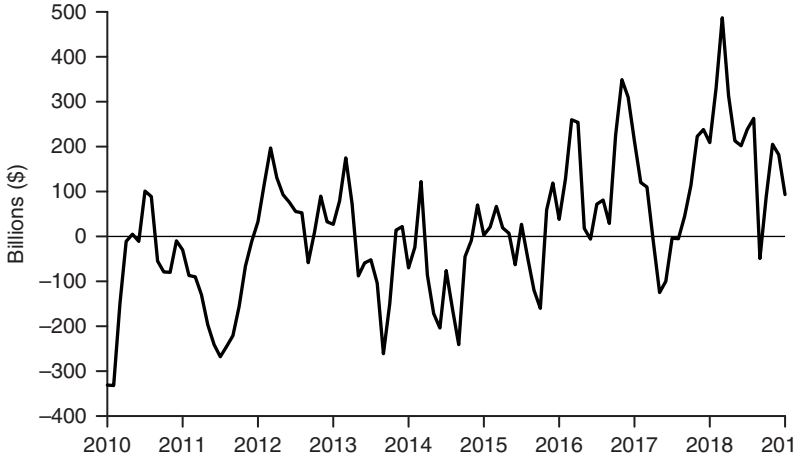
Source: Federal Reserve Bank of St. Louis, FRED.

basis points to zero, with fed funds now trading at IOER. As well, the one-month Treasury bill rate which, as we showed earlier, had fallen below the fed funds rate, and even below the bottom of the fed funds trading range in 2016, is now close to the fed funds rate. Note as well that the downward month-end spikes in the fed funds rate observed during 2016 have disappeared.

Thus, the floor system now appears to be working much more like it does in theory. IOER is now determining overnight rates, and interest rate differentials that formerly appeared highly persistent have gone away. Therefore, if balance sheet costs were important in determining the IOER/fed funds rate differential in 2016, that is no longer the case. Further, the ON-RRP market has recently become essentially inactive, with close to zero take-up in the daily auction. The fact that overnight interest rates, including the fed funds rate, were trading close to the top of the fed funds rate range prompted the FOMC to make an adjustment to the IOER, setting it five basis points below the top of the target range, as of the June 2018 FOMC meeting. The FOMC's goal seems to be to reduce IOER so that the fed funds rate will be roughly in the middle of the target range.

What is going on? The Fed's interpretation (Potter 2018) seems to be that unusually large issues of Treasury bills have encouraged activity in the overnight repo market, so that repo market interest rates have become more competitive relative to fed funds. This has had

FIGURE 3
Treasury Bill Net Issuance, 6-Month Moving Average



Source: Securities Industry and Financial Markets Association (SIFMA).

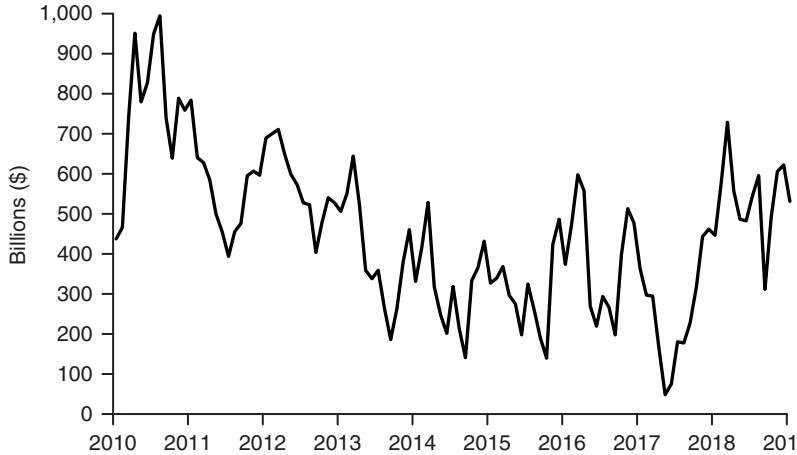
spillovers in the market for Treasury bills as well, with T-bill rates now close to IOER.

Figure 3 shows a six-month moving total of net Treasury bill issuance for the United States, which shows a trend increase in net T-bill issuance in 2018, though the series is quite volatile. However, in Figure 4, total net Treasury issuance, again calculated as a six-month moving total, is higher in 2018 than in the previous two years, but lower than in 2010–12.

So, the story that high net Treasury bill issuance is responsible for the tightening-up of interest rates in the overnight market is questionable. If Treasuries of all maturities are useful as collateral in repo markets, why would there be a substantial difference between IOER and the fed funds rate in 2010–12? And net Treasury bill issuance is highly volatile. So why would a temporary increase in net bill issuance in early 2018 matter, but previous blips in T-bill issuance not matter?

Perhaps, then, the phasing out of the Fed's reinvestment program matters for the behavior we are now seeing in overnight markets. Certainly the timing is hard to ignore, as overnight markets tightened up at the same time reinvestment was being phased out. So, a plausible story is that the phasing out of reinvestment has freed up

FIGURE 4
Total Treasury Issuance, 6-Month Moving Total



Source: Securities Industry and Financial Markets Association (SIFMA).

on-the-run long Treasury securities for use in overnight repo markets. This, combined with larger net issues of T-bills, increases repo collateral of all maturities, increasing the quantity of credit activity in overnight markets, and putting increased pressure on unsecured fed funds credit.

Does Quantitative Easing Work as Advertised?

Quantitative easing in the form of swaps by the central bank of interest-bearing reserves for long-maturity assets is typically marketed (see, e.g., Bernanke 2010) as a program that exploits segmentation in asset markets. That is, in the markets for Treasury securities, for example, Treasuries of different maturities are imperfectly substitutable, as the argument goes. So, according to the conventional story, even if Treasury bills were essentially perfect substitutes for interest-bearing reserves, if the central bank swaps reserves for long-maturity Treasury securities, in a floor system in which IOER pegs the Treasury bill rate, then long bond yields will fall, as the relative supply of long Treasuries has decreased. Then, according to conventional central bank reasoning, if long bond yields fall, this increases spending and, through a Phillips curve effect, raises inflation.

But, there are good reasons, from theory and evidence, to think that this conventional story does not hold water. First, financial intermediation theory (see Williamson 2017) tells us that central bank intervention matters for economic outcomes because of the special advantages the central bank has over private sector financial intermediaries. In particular, the Bank of England established a model for other central banks in acquiring, over time, a monopoly on the issue of paper currency. Conventional central banking, in a world in which excess reserves are essentially zero, can be viewed as working through asset swaps of outside money—ultimately showing up as currency—for interest-bearing assets (typically government debt). Open market operations matter because private financial intermediaries cannot issue close substitutes for currency.

But, a swap of reserves for long maturity government debt—in a floor system—is a swap of overnight assets for long-maturity government debt, and the private sector seems to be good at converting long-maturity government debt to overnight assets. Both regulated and unregulated financial intermediaries do this. So, a theorist's best guess might be that quantitative easing has no effect at all. Or he or she might go so far as to argue that the Fed is actually worse than private financial intermediaries at converting long-maturity government debt into overnight assets. This is because reserves are a relatively poor overnight asset, as they can be held only by a subset of financial institutions, and those institutions are highly regulated.

There appears to be little or no evidence that QE has any effect on variables that central banks ultimately care about, particularly inflation. Japan is the most obvious case in point in that the Bank of Japan has, since 2013, engaged in a massive quantitative easing program, with the goal of creating a sustained inflation rate of 2 percent. This program has been unsuccessful in that, if we account for the effects of the increase in Japan's consumption tax in 2014, average CPI inflation from 2013 to 2018 has been about zero in Japan.

Evidence that QE may actually be harmful is evident in the observations above on overnight market behavior in the United States after the financial crisis. The effect of the phasing out of reinvestment—the final step in stopping the QE program—has been to, apparently, make overnight markets function more efficiently. Possibly the Fed did harm to financial markets with QE, by replacing good collateral (Treasuries and mortgage-backed securities) with poor collateral (reserves).

What Comes Next?

It appears the FOMC may soon make decisions on the nature of its long-term implementation strategy. The FOMC needs to decide whether it wishes to maintain the current floor system, or revert to mechanisms resembling what existed before the financial crisis. If it keeps the floor system, the key question is how much reserves should be kept in the system so that IOER determines overnight interest rates. Secondary problems are how to communicate policy to the public—as a fed funds rate range, or as a single interest rate, IOER. However, if the Fed reverts to a corridor system, a difference from before the financial crisis will be that reserves pay interest, so the Fed will need to make decisions about the width of the corridor, and perhaps the choice of the target interest rate. For example, the target could be a repo rate rather than the fed funds rate.

It is not clear that the existing floor system has any distinct advantages. First, while a floor system is simple, and accurate in achieving an overnight interest rate target, if the Fed were to target a repo rate in a corridor system, that could also be simple and accurate. Second, it could be argued that an abundance of reserves makes daylight interbank trading more efficient. However, there are approaches that would allow the Fed to advance reserves to financial institutions during the day, and to remove those balances at the end of the day, without implications for overnight markets, within a corridor system. Further, as discussed above, reserves are a poor asset relative to Treasuries, so if a floor system requires a significant quantity of reserves to work, then this implies a significant inefficiency.

Central bankers are concerned about persistently low real interest rates and the implications for monetary policy in the future. If low real interest rates persist, this implies that, to sustain 2 percent inflation, the average short-term nominal interest rate must be lower than in the past. Central bankers speculate that this implies that central bankers will encounter the effective lower bound on nominal interest rates with higher frequency in the future than was the case in the past. At the effective lower bound, central banks—including the Fed—will be tempted to resort to balance sheet expansions. As has been discussed, it seems hard to make a case that this would be a good idea. Unfortunately, central bankers have a difficult time admitting errors, which increases the chances of repeating those errors.

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The Fed's New Operating Framework: How We Got Here and Why We Shouldn't Stay

George Selgin

Much talk concerning the Fed lately has to do with its strategy for "normalizing" monetary policy—that is, its plans for reversing unconventional policies it pursued during the last financial crisis and subsequent recovery.

Most people are aware of two of the Fed's unconventional policies. One consisted of the relatively low interest rate targets it set during the crisis and for some time afterward. The second consisted of several rounds of large-scale asset purchases it engaged in, generally known as "quantitative easing" (QE). But the Fed's unconventional policies included a third, less well-appreciated component. This was its decision to switch, during October 2008, from its conventional "corridor-type" system for regulating interest rates to a new "floor-type" system. A central bank that uses a corridor-type system influences market interest rates by adding to or subtracting from the available supply of bank reserves. In contrast, one that uses a floor system influences market rates by changing the interest rate it pays on the reserve balances that banks keep with it.

Although the Fed has already begun to undo the more well-known components of its unconventional crisis-era policies by

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gradually raising its interest rate target and by allowing its balance sheet to shrink, it has chosen not to revert to a corridor-type operating system. I believe that sticking to the present floor system, instead of switching to a corridor system, is a mistake, for reasons I will summarize later. First, however, I wish to quickly review how the Fed's switch to a floor system came about, and some of the consequences of that switch.

From a Corridor to a Floor System

The Fed's October 2008 switch to a floor system was itself the result of two developments. The first consisted of the new policy it inaugurated that month of paying banks a positive rather than zero interest rate on their Federal Reserve account (a.k.a. "reserve") balances. The second consisted of a substantial increase in the total supply of reserves the Fed supplied to the banking system, originally stemming from the Fed's emergency lending, but eventually continued, on a much larger scale, through its various rounds of QE.

Because the Fed paid interest on both banks' required reserves and their excess reserves (i.e., reserves held above minimum legal requirements), and because it soon set the interest rate it paid on both sorts of reserves above prevailing short-term market interest rates, banks became inclined to hold on to any fresh reserves that came their way, even though that meant holding far more reserves than the law required them to. In contrast, prior to October 2008, banks held only very trivial amounts of excess reserves.

The fact that banks could earn more by holding on to Fed balances than they might by lending them to other banks on the federal funds market meant that interbank lending on that market dried up. It also meant that changes to the available quantity of reserves no longer had any influence on the prevailing fed funds rate. Instead, that rate tended to fall somewhere below the rate of interest on excess reserves, or IOER rate, rising or falling as the Fed raised or lowered its IOER rate. Although the Fed continued to express its intended monetary policy stance in terms of a chosen fed funds rate "target" (eventually changed to a target "range"), its IOER rate had replaced its ability to purchase or sell assets as the tool it relied upon to influence short-term market interest rates and thereby achieve its monetary policy goals. This change marked the Fed's transition from a corridor-type operating system, in which the Fed's rate target was

always somewhere between its (historically zero) IOER rate and its emergency lending rate (the rate at which the Fed lends reserves to institutions lacking in any other source of credit), to a floor system, in which its IOER rate is always at or above its desired rate target.

As I have noted, the Fed's normalization plans thus far include plans for raising interest rates toward a presumably "normal" rate of close to 3 percent, and for shrinking its balance sheet at least to some nontrivial extent, but *not* for reverting to a corridor-type operating system. Indeed, "raising interest rates" in the present context *means* raising the IOER rate, and raising it sufficiently to keep reserves attractive relative to other assets. And that in turn means that the Fed's balance sheet "normalization" must itself be limited, for although that balance sheet can fall substantially from the extraordinary heights it achieved during the recovery, so long as the Fed chooses to maintain a floor system it cannot allow its balance sheet to shrink to the point at which reserves become scarce again. For this reason, the Fed is unlikely to allow its balance sheet to ever fall below $3 trillion, which is still more than three times its precrisis level. Indeed, the Fed (whose assets, as of this writing, still exceed $4 trillion) is already mulling the possibility of suspending the unwind it began in October 2017 much sooner than it had planned (Timiraos 2019), so as to avoid any risk of unintentional credit tightening. The Fed's decision to retain a floor system is thus tantamount to a decision to maintain a much larger balance sheet than it might otherwise keep, thereby further limiting its already half-hearted normalization efforts. The "new normal" to which the Fed seems to be headed is, in short, not very normal at all.

Genuine versus Pseudo Normalization

In *Floored!* (Selgin 2018) I make the case for a genuine, rather than pseudo, normalization of Fed policy. Such a genuine normalization requires that the Fed abandon its present floor system of monetary control in favor of a corridor system. This doesn't mean that the Fed should no longer pay interest on bank reserves, much less that it must revert to the particular corridor-type system it relied upon before the crisis. Neither step is, in my opinion, either necessary or desirable. Instead, genuine normalization calls for the Fed to adopt some sort of relatively orthodox corridor system of the sort widely employed by central banks around the world. Such a system would

typically involve a positive interest rate on bank reserves, though one set below rather than above the Fed's overnight rate target, which could still be a fed funds rate target, although it might instead be a secured overnight rate target. Genuine normalization thus requires that the IOER rate be set low enough, relative to other rates, to make banks unwilling to stockpile excess reserves. It requires, at the same time, that the quantity of excess reserves on the Fed's balance sheet be small enough to give at least some banks an incentive to borrow on the fed funds market. In principle, these two changes—one aimed at reducing the demand for excess reserves, the other at reducing their nominal quantity—can be so coordinated as to be consistent with any policy stance the Fed chooses to maintain during the normalization process.

Backward and Forward-Looking Criticisms

But why is such a genuine normalization, with the tricky transition to a corridor system it entails, preferable to the Fed's present, half-hearted alternative? My criticism of the Fed's floor system consists of two components. One is backward looking, while the other is forward looking. The backward-looking criticism has to do with the particular use the Fed made of its floor system during the crisis and recovery. The forward-looking one has to do with what I see as the inherent drawbacks of a floor system. Because my backward-looking criticism of the Fed's floor system itself refers to potential, if not inherent, dangers that a floor system poses, a quick review of this criticism may also help to inform a weighing of the relative merits of a floor system going forward.

Fighting Inflation and Promoting Recession

A closer look at the origins of the Fed's floor system is particularly enlightening in this respect. That system came into being in October 2008, when the Fed secured congressional permission, with the passage of the Emergency Economic Stabilization Act, to immediately start paying interest on bank reserves—as the 2006 Financial Services Regulatory Relief Act would have allowed it to do starting in 2011. The authors of the 2006 Act had themselves never contemplated the possibility that the Fed would employ the new power they granted it to effect a radical change in the Fed's operating system. Instead, their aim was the far more measured

one of allowing banks to earn a modest return on their reserves, particularly on their required reserve balances. Nobody at the time imagined that the law would instead be used to change the way monetary policy was conducted.

But in October 2008, Fed officials were not merely interested in compensating banks for having to hold required reserves. They wanted to make all reserves, including excess reserves, so attractive that banks would hoard them. Why would the Fed want to encourage banks to hang on to reserves, instead of trading them for loans and other assets, just when the U.S. economy was experiencing its deepest contraction since the Great Depression? The answer is that, although we now know that the Great Recession was well underway by October 2008, neither Fed officials nor most other people knew it then. Instead, since April of that year, the Fed's primary concern was inflation. Core inflation had been consistently above the Fed's implicit 2 percent target, while headline inflation was ratcheting higher.

Although those inflation numbers reflected temporary shortages of oil and other commodities, rather than robust spending growth, the Fed was determined to keep a lid on them. Yet the Fed was simultaneously engaged in substantial lending to financial institutions weakened by the still-ongoing decline in real estate prices. Policymakers thus faced a challenge: how to go on aiding a struggling financial industry without promoting inflation. In particular, how could the Fed go on hitting the 2 percent fed funds rate target it had set, and which it regarded as essential for fulfilling its dual mandate, despite all its emergency lending?

For some months the Fed solved the problem by "sterilizing" its emergency loans: for every dollar it lent to this or that financial institution, it sold an equal sum of Treasury bills from its portfolio, thereby keeping its balance sheet and the quantity of bank reserves constant. Come September, however, the Fed no longer had Treasury securities to spare. Then Lehman Brothers failed, triggering a run on AIG, to which the Fed responded with its biggest burst of emergency loans yet. Despite all the havoc, the Fed still hoped to keep the fed funds rate from dropping below 2 percent. That's when it thought about paying interest on reserves.

The idea was simple: if the Fed could not avoid creating fresh reserves, it could make it worthwhile for banks to stockpile fresh reserves that came their way. So it sought, and got, permission to pay

interest on reserves ahead of schedule. It then simply ignored the 2006 Act's stipulation that the interest rate on excess reserves not exceed "the general level of short-term rates," instead setting IOER high enough to make it more profitable for banks to hold on to reserves than to dispose of them by lending to other banks or by acquiring other assets.

This brings me to my main, historical criticism of the Fed's floor system, which is that by switching to that system, the Fed inadvertently contributed to the Great Recession by tightening credit. While Fed officials may have been confused at the time regarding the true state of the U.S. economy, we now know that their anxiety about overstimulating the economy throughout much of 2008, and particularly as late as the fall of 2008, was seriously misplaced. Policymakers were endeavoring to combat inflation when they ought to have been combatting recession. An above-market interest rate on excess reserves, and the floor-based system of monetary control that went hand in hand with it, was their weapon of choice.

From Sterilization to Stimulus

But the story gets even worse. For by November 2008, Fed officials finally came to realize that the U.S. economy was collapsing, and that monetary stimulus was, after all, just what it needed—and badly. So instead of worrying about the unintended, inflationary consequences of unavoidable reserve creation, the Fed began planning an ambitious program of intentional reserve expansion. Although Fed officials spoke of "large-scale asset purchases," everyone else called it "quantitative easing ."

Here's the catch: for all their determination to stimulate the U.S. economy, Fed officials were no less determined to stick to their new floor operating system, with its built-in tendency to encourage banks to hoard reserves. Although the Fed did eventually reduce the IOER rate to just 25 basis points, by the time it did so market rates had fallen lower still. Consequently, banks could be expected to respond to the Fed's deliberate program of reserve creation just as they had responded to its incidental reserve creation beforehand—namely, by accumulating that many more excess reserves. In short, the same arrangement that had been put in place to prevent the Fed from stimulating economic activity inadvertently would now tend to prevent it from intentionally stimulating such activity. In testifying

before Congress on this history a few years back (Selgin 2016), I observed that if insanity is indeed doing the same thing over and over again and expecting different results, one has to wonder whether Fed officials at the time were not quite in their right minds.

To defend their planned stimulus, Fed officials had to find some way to explain how expanding the stock of reserves might stimulate economic activity despite not leading to any corresponding increase in either bank lending or broad money stock measures. And so, they and their staff produced several new theories of how QE might work, many of which appealed to the possibility that large-scale Fed purchases of long-term assets might stimulate investment by lowering long-term, rather than short-term, interest rates. That those officials themselves, or some of them at least, found these theories less than fully convincing was made abundantly clear by Ben Bernanke's notorious 2014 quip that "the problem with QE is that it works in practice but not in theory."

But while many agree with the second part of Bernanke's statement, the jury is still out concerning the first part. Although most (though not all) authorities agree that QE succeeded in lowering long-term interest rates, which was its immediate objective, there's only scant evidence that by so doing it also led to substantial increases in spending, inflation, or employment. Allowing for this, it seems reasonable to conclude, in retrospect, that by resorting to a floor system in 2008, the Fed both deepened the recession and hampered its ability to contribute to the recovery.

Why a Floor System Is Still a Bad Idea

That the Fed implemented a floor system at the wrong time, and for the wrong reasons, and that by doing so it limited artificially its capacity to spur recovery from the 2008 crash, does not necessarily mean that it shouldn't keep its floor system in place. In principle, after all, a floor system is capable of keeping monetary policy in line with the Fed's inflation and unemployment objectives. The problems of the past were, at bottom, problems not with the floor system per se but with the Fed's particular IOER rate settings which, being too high, made its policy stance too tight.

But what's past is past. Monetary policy is arguably no longer too tight—and there is no reason why it should be either too tight or too loose going forward. So why shouldn't the Fed stick to its

floor system? That system does have certain obvious advantages. It allows the Fed to make the banking system as liquid as it likes, just by pumping more reserves into it. It also spares the staff at the New York Fed from having to "fine tune" the supply of bank reserves in order to keep the fed funds rate on target or (as is now the case) within the Fed's announced target range. Achieving a desired level of interest rates is a simple matter of adjusting the IOER rate, and watching other market rates gather around it, like so many moths gathering around a candle.

But a floor system also has serious drawbacks. By encouraging banks to hold excess reserves, it all but ends interbank lending on the unsecured federal funds market. Before the crisis, that market saw about $200 billion a day in activity; today, despite interim GDP growth, the figure is about a quarter of that amount. Moreover, the remaining activity consists, not of interbank lending, but of lending from government-sponsored enterprises (GSEs), which do not earn interest on balances they keep at the Fed, to banks.

Why does this matter? It matters because by destroying the unsecured interbank loan market, the Fed's switch to a floor system also destroyed an important—perhaps the most important—venue for interbank monitoring. So long as banks engaged in routine, interbank lending to other banks, they had reason to keep informed about the soundness of prospective bank counterparties. The result was that any bank that found itself in hot water was likely quickly to be shut out of the fed funds market. Like the proverbial canary in a coal mine, the fed funds market served as a reliable indicator of banks' health. So long as a bank remained in good standing there, it was unlikely to be in any danger. By certifying soundness, and doing so reliably, the fed funds market helped to contain irrational runs and panics, contributing to the financial system's integrity (Rochet and Tirole 1996; Furfine 2001).

A second shortcoming of the Fed's floor system is that it calls for a much-enlarged Fed balance sheet compared to what a corridor system requires. Though some experts (for example, Williamson 2018) claim that the Fed might maintain its floor system with just a few hundred billion dollars in excess bank reserves, most expect it to go no lower than $1.2 trillion. Indeed, if recent reports are to be credited, the Fed may suspend its current balance sheet "unwind" before excess reserves fall much below their current level, which as of this writing is about $1.6 trillion. That's roughly 100 times the level of

excess reserves in early 2008. It is also about 10 percent of the total outstanding federal debt.

What's wrong with that? Floor system proponents claim that there's nothing wrong with it: the increase in banks' reserves holdings, and corresponding increase in the size of the Fed's balance sheet, amount to a "free liquidity lunch." The Fed's holdings of Treasury and agency securities have risen, while public holdings have declined; and those who formerly held the securities now hold additional bank deposits representing the proceeds from selling them (Selgin 2017).

But this "free lunch" perspective neglects the bigger picture, which is best seen by considering that, by creating a new and permanent (if not permanently expanding) demand for government and agency securities, the Fed ultimately contributes to a reorientation of investment behavior that favors the government issuers of those securities over private-sector borrowers, in much the same way as it might by purchasing as many newly issued securities directly from their sources. In a state of full or nearly full employment, that means relatively less real private investment. In short, a floor system entails more "crowding out" of private investment than a scarce-reserve corridor system, and leads to what's likely to be a less productive economy.

But the biggest drawback of a floor system, in my opinion, is the danger it poses of allowing the Fed to abuse its powers of debt monetization. Charles Plosser (2018) has been especially good at drawing attention to this danger. As he notes, under a floor system, the size of the Fed's balance sheet is no longer a crucial determinant of the stance of monetary policy. Therefore the Fed's decisions concerning the timing and magnitude of its asset purchases or sale must be informed by factors other than the state of the macroeconomy. But what other factors might these be? A floor system requires a larger balance sheet than a corridor system does, but beyond that there are no obvious rules—or none that the Fed has articulated—regarding just how big its balance sheet should be. Thus, the size of the Fed's balance sheet has become what Plosser calls a "free parameter"—that is, free to become an object of political meddling, with the Treasury and other interest groups jostling to put pressure on the Fed to monetize this and monetize that.

In the good old prefloor system days, the Fed found it relatively easy to fend off such entreatments: "Sorry, we can't do that, because

we'll end up with more inflation, which is against our mandate." Today that argument won't wash. Instead, Fed officials will have to explain to Congress, or to the president, why the Fed shouldn't create more "free" liquid assets, while helping at the same time to finance some sorely needed government project (a big, expensive wall, perhaps). If you would rather not see that sort of thing happen, then you have at least one reason to regret the Fed's new operating system.

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Interest on Reserves: History and Rationale, Complications and Risks

Peter N. Ireland

Among the enduring legacies of the 2007–09 financial crisis, interest on excess reserves (IOER) now plays a central role in the Federal Reserve's policymaking framework. Famous arguments justify paying interest on required (but not excess) reserves on economic efficiency grounds. However, the Fed has used its power to pay IOER to facilitate credit market interventions that extend well beyond those required by its traditional central banking functions—namely, conducting monetary policy to stabilize the aggregate nominal price level and acting as a lender of last resort to illiquid but solvent depository institutions. One must question the wisdom of making IOER a permanent part of the Fed's toolkit, given the resulting complications and risks.

History and Rationale

George Tolley (1957) and Milton Friedman (1960) first argued that since bank reserves can be created at zero marginal cost within a fiat money regime, economic efficiency dictates that the opportunity cost to banks of holding reserves should be driven to zero as well. Tolley and Friedman also pointed out that one way to satisfy this efficiency condition is for the central bank to pay interest on required

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reserves at a rate approximating those available on other safe and highly liquid short-term assets, such as United States Treasury bills.

Based largely on this economic efficiency argument, it seems, the Financial Services Regulatory Relief Act of 2006 granted the Federal Reserve authority to begin paying interest on bank reserves, though the Act postponed the effective date for its interest-on-reserves provision to October 1, 2011. The Emergency Economic Stabilization Act of 2008 pulled this effective date forward to October 1, 2008. On October 6, 2008, the Federal Reserve Board announced plans to begin paying interest on required and excess reserves at rates 10 and 75 basis points, respectively, below the Federal Open Market Committee's federal funds rate target. Two days later, the Federal Open Market Committee (FOMC) cut its target for the fed funds rate from 2 to 1.5 percent. Thus, on October 9, 2008, a new policy regime took hold, with the Fed paying banks interest at the rate of 1.4 percent on their required reserves and 0.75 percent on their excess reserves.

The Fed's October 6 press release (Federal Reserve Board 2008) offered a mixed rationale for the announced change in regime. Tolley and Friedman's efficiency arguments survived, explaining the higher interest rate on required reserves, which according to the press release would "essentially eliminate the opportunity cost of holding required reserves, promoting efficiency in the banking sector." The press release gave different reasons, however, for paying IOER:

> Paying interest on excess balances should help establish a lower bound on the federal funds rate. The payment of interest on excess reserves will permit the Federal Reserve to expand its balance sheet as necessary to provide the liquidity necessary to support financial stability while implementing the monetary policy that is appropriate in light of the System's macroeconomic objectives of maximum employment and price stability.[1]

In late 2007 and early 2008, the Federal Reserve successfully financed its Term Auction Facility and its lending to facilitate JP Morgan's purchase of Bear Stearns from sales of U.S. Treasury securities from its own portfolio. Nevertheless, the failure of Lehman Brothers and bailout of AIG in the fall of 2008 required far more

[1]Walter and Courtois (2009), Goodfriend (2011), and Selgin (2016) provide more detailed interpretations and analyses of the Board's statements.

emergency lending, which the Fed could finance only by creating new reserves. Ordinarily, reserve creation puts downward pressure on the fed funds rate. However, by paying IOER, the Fed hoped to place a floor beneath which the funds rate could not fall, since no bank will lend reserves in the federal funds market at rates below what it can receive on its deposits at the Fed.

Elsewhere I have provided a monetarist perspective of the Fed's decision to start paying interest on reserves (Ireland 2017). My view, which is consistent with the Fed's, interprets the fed funds rate as a market rate of interest rather than a policy tool, and emphasizes how the central bank uses its role as monopoly supplier of base money to stabilize the price level. Specifically, by paying IOER, the Fed shifted the demand curve for reserves to the right. This increase in demand allowed the Fed to simultaneously shift the supply curve for reserves to the right as required by emergency lending without also generating an increase in the aggregate nominal price level.

In hindsight, therefore, two aspects of the Fed's 2008 decision to begin paying IOER stand out. First, it made monetary policy *tighter* than it would have been, as measured either by the higher fed funds rate or the lower equilibrium price level implied by the shifting but still intersecting demand and supply curves for reserves. The use of IOER to minimize the effects of emergency lending on the price level seemed prudent. However, it turned out to be a mistake. As Hetzel (2012) points out, monetary policy ought to have been substantially more accommodative than it was throughout 2008, considering the severe deflationary recession that followed. Second, the Fed adopted its interest on reserves policy in 2008 largely to facilitate interventions in private credit and capital markets that, as argued by Goodfriend (2011), extended well beyond those associated with its traditional role as lender of last resort to depository institutions.

Consistent with this interpretation, Federal Reserve Chairman Ben Bernanke (2009a) described the central bank's large-scale asset purchase programs, introduced in fall 2008 and expanded in early 2009, as a series of credit market interventions rather than a continuous effort to stabilize the price level by increasing the supply of reserves and base money:

> The Federal Reserve's approach to supporting credit markets is conceptually distinct from quantitative easing (QE), the policy approach used by the Bank of Japan from 2001 to 2006.

> Our approach—which could be described as "credit easing"—resembles quantitative easing in one respect: It involves an expansion of the central bank's balance sheet. However, in a pure QE regime, the focus of policy is the quantity of bank reserves, which are the liabilities of the central bank; the composition of loans and securities on the asset side of the central bank's balance sheet is incidental. Indeed, although the Bank of Japan's policy approach during the QE period was quite multifaceted, the overall stance of its policy was gauged primarily in terms of its target for bank reserves. In contrast, the Federal Reserve's credit easing approach focuses on the mix of loans and securities that it holds and how this composition of assets affects credit conditions for households and businesses.

IOER took on yet another role in the aftermath of these large-scale asset purchase programs. As early as July 2009, in his "Semiannual Monetary Policy Report to Congress," Bernanke (2009b) singled out IOER as the "most important tool" that the Fed could use to raise interest rates—thereby normalizing its monetary policy stance—while retaining on its balance sheet longer-term assets acquired during and after the crisis. Indeed, since December 2015, the FOMC has increased its target for the fed funds rate nine times, from a range between 0 and 0.25 percent to its current range between 2.25 and 2.50 percent, while continuing to maintain a balance sheet significantly larger than before the crisis, by increasing in similar steps the interest rates its pays on required and excess reserves.

Ireland (2017) outlines, again from a monetarist perspective, how under the floor system the Fed is using today, increases in the fed funds rate brought about through increases in IOER work to shift the demand and supply curves for bank reserves in ways that allow the Fed to continue using its role as monopoly supplier of reserves to stabilize the aggregate price level. It is true, therefore, that IOER is helping the Fed achieve its conventional central banking mandate. But it is also true that IOER allows the Fed to pursue those traditional objectives while maintaining an outsized role in credit markets through its large portfolio that includes, not only longer-term U.S. Treasury bonds, but substantial holdings of U.S. government agency mortgage-backed securities as well. By paying IOER at rates close to if not above those available on other money market instruments, the

Fed has satisfied Tolley (1957) and Friedman's (1960) efficiency criterion by driving the user cost of reserves to zero. But neither Tolley nor Friedman anticipated the complications and risks that arise when the Fed uses its power to create reserves to allocate credit as well as to stabilize the aggregate nominal price level.

Complications and Risks

Because the rationale for IOER has changed so much over time, the details of the legislation granting the Federal Reserve power to pay interest on reserves has inadvertently given rise to two sets of complications in the use of this new policy tool.

First, section 201 of the Financial Services Regulatory Relief Act of 2006 originally provided the Fed authority to pay interest on "balances maintained at a Federal Reserve bank by or on behalf of a depository institution." Section 203 of the same Act set October 1, 2011 as the effective date for this amendment to the Federal Reserve Act. Section 128 of the Emergency Economic Stabilization Act of 2008 then amended section 203 of the earlier Act by advancing the effective date to October 1, 2008.

The operational complication arises because other, nondepository institutions, including U.S. government-sponsored enterprises (GSEs) and Federal Home Loan Banks, are also eligible to hold deposits at Federal Reserve banks but remain ineligible, according to the word of law, to receive interest payments on those deposits. In theory, banks could borrow reserves from those nonbank institutions at the fed funds rate and hold the reserves in their own interest-earning accounts at the Fed. This arbitrage activity would then keep the fed funds rate, if not above then at least very close to, IOER. In practice, however, a myriad of regulatory and institutional constraints has limited banks' ability and willingness to exploit this arbitrage opportunity. And for reasons as yet unknown, the Federal Reserve itself appears to have stymied attempts by a newly organized "narrow bank," described by Derby (2018), Koning (2018), and Selgin (2018b) among others, to provide a free-market solution to this problem.

As a result, in the Fed's new system, the floor on the funds rate continues to be set not by IOER, but rather by the interest rate on overnight reverse repurchase agreements (ON RRPs) that the central bank designed to pay interest on the short-term obligations it

issues, not just to GSEs and Federal Home Loan Banks, but to numerous other nonbank institutions, including money market mutual funds.

Goodfriend (2015: 8) notes:

> The Fed's use of ON RRPs is unfortunate because the use of managed liabilities on a large scale via ON RRPs addresses an *operational issue* by violating an *implicit principle of central banking* in the United States—that where possible the central bank should minimize its interference in financial intermediation and credit allocation in managing the monetary system.

In other words, an oversight in the original legislation, not allowing the Fed to pay interest on all deposits held at the Federal Reserve banks, has inadvertently led to the creation of ON RRPs that further expand the Fed's reach into private financial markets. This should be easy for Congress to fix, exactly as suggested by Goodfriend (2015), through legislative amendments that either allow the Fed to pay interest on deposits held by the GSEs and Federal Home Loan Banks or restrict the Federal Reserve banks to accept deposits only from the depository institutions already authorized to receive interest on reserves. Alternatively, if the Fed were to allow it, the free market could fix this, too, through the operation of narrow banks that accept deposits from nonbank financial institutions and hold the funds as reserves at the Fed.

Second, section 201 of the Financial Services Regulatory Relief Act of 2006 granted the power to set interest rates on reserves to the Federal Reserve Board of Governors, not to the FOMC. This allocation of power makes sense if the principal rationale for paying interest on reserves is the efficiency argument originally articulated by Tolley and Friedman. As noted by Plosser (2017) and Selgin (2018a), however, now that IOER is being used as one of the key levers in the Fed's floor system for targeting the federal funds rate, a potential problem of governance arises. What happens if a majority on the FOMC vote to change the fed funds rate target, but a majority on the Federal Reserve Board refuses to change IOER? Again, this problem has an easy fix: Congress should amend the 2006 Act, reassigning to the entire FOMC the power to set IOER.

There are bigger risks, however, posed by the Fed's new ability to expand its balance sheet seemingly without limit, using its authority to pay IOER. These risks are both economic and political.

Economically, after specifically buying longer-term U.S. Treasury and government agency bonds in its large-scale asset purchase programs, the Fed has exposed itself to interest rate risk. In what Goodfriend (2014) has aptly called "monetary policy as a carry trade," the Federal Reserve now borrows short and lends long, earning profits so long as the yield curve continues to slope upward but facing losses if the yield curve inverts. Studies by Carpenter et al. (2013), Greenlaw et al. (2013), and Christensen, Lopez, and Rudebusch (2015) present simulations suggesting these economic risks are manageable. Yet it is still worth considering that similar risks were once faced—and presumably deemed manageable—at Bear Stearns and Lehman Brothers. As Bassetto and Messer (2013) clearly and skillfully show, the Fed could minimize the economic risks posed by its expanded balance sheet by matching its interest-bearing liabilities—reserves and reverse repurchase agreements—with interest-earning assets of similar maturity, such as very short-term U.S. Treasury bills.

The political risks of the Fed's ability to expand its balance sheet almost indefinitely loom even larger. Reserves and reverse repurchase agreements represent a low-cost source of funds that the Fed has already used to finance a large portfolio of mortgage-backed securities, thereby actively channeling funds to a specific sector of the private economy. And the Fixing America's Surface Transportation Act of 2015 drew directly on the Fed's surplus capital, earned as profits from its carry trade, to help fund federal highway spending; the Bipartisan Budget Act of 2018 did the same to finance more general increases in government spending. The risks of pushing still further are described most vividly by Plosser (2017: 8):

> First and foremost, an operating regime where the Fed's balance sheet is unconstrained as to its size or holdings is ripe for misuse, if not abuse. . . . Congress would be free to lobby the Fed through political pressure or legislation to manage the portfolio for political ends. . . . More generally the temptation would be to turn the Fed's balance sheet

> into a huge hedge fund, investing in projects demanded by Congress and funded by forcing banks to hold vast quantities of excess reserves on which the central bank pays the risk-free rate. Of course, this just represents off-budget fiscal policy.

One way of managing this risk would be for the Fed to commit to a "Treasuries only" policy according to which, in the future, it agrees to purchase only direct obligations of the U.S. Treasury. Then, specific spending initiatives or credit market interventions could be undertaken only through an act of Congress. But a better way might be to remove temptation altogether, by abandoning IOER.

Conclusion

In modern central banking as in modern design, it is often true that less is more: monetary policy works best when the central bank's focus is narrow. By using its monopoly supply of base money to stabilize the aggregate price level, the central bank creates the most favorable environment within which the private economy adjusts most efficiently to shocks and remains closest to its long-run growth path. Though originally conceived of as a tool for promoting further economic efficiency, IOER has threatened the Fed's ability to remain focused on its core functions.

Upon adoption in the midst of the financial crisis, IOER made monetary policy perversely less accommodative than it should have been, contributing to the recession that followed. Indeed, Dutkowsky and VanHoose (2018) point out that reducing IOER more rapidly than the federal funds rate would make Fed policy more expansionary when the next downturn threatens. Moreover, even if the Fed's IOER policy has mitigated the impact of large increases in base money on the price level, it has left the central bank with a large balance sheet—exposing the Fed to significant economic losses and political pressures, all of which could lead to *higher* inflation down the road.

Finally, IOER, as implemented, led the Fed to become more deeply entrenched in financial markets and more actively engaged in the allocation of credit. As Taylor (2016: 719) notes, IOER "enables the Fed to be more like a discretionary multipurpose institution rather than the rule-like limited purpose institution that

has delivered good policy in the past and that can deliver good policy in the future."

Having previously proposed a system involving interest on required reserves, Friedman (1969) showed that the same efficiency condition could be achieved by asking the central bank to steadily contract the money supply to produce enough aggregate price deflation to reduce nominal interest rates to zero. Zero nominal interest rates are, of course, linked more closely in central bankers' minds to the Keynesian liquidity trap than to Friedman's rule for the "optimum quantity of money." Nevertheless, outcomes approximating the Friedman rule can still be achieved by policies that simply aim to keep inflation low and stable. The best policy would be for the Fed to shrink its balance sheet as quickly as possible, eliminate IOER and ON RRPs, and restore the emphasis on long-run price stability.

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Assessing Global Financial Stability

Tobias Adrian

In the decade since the global financial crisis, there has understandably been great concern about potential threats to global financial stability, and policymakers have wisely remained vigilant in watching for warning signs of possible economic risk. At the International Monetary Fund (IMF), we remain committed to providing our 189 member countries with farsighted analyses of trends in the financial markets, thus guiding them toward sound policy choices that help maintain economic stability.

Risks for the Global Economy

Global economic growth has remained strong, and the IMF's latest analysis suggests that a global recession is not around the corner. However, as we look ahead, the risk of a decline in global growth has increased. Global financial conditions have tightened appreciably in the past few months of 2018, with a significant global sell off in many major financial markets in the last quarter of the year. While there has been a partial retracement of that sell off in 2019—globally, markets are now looking for signs that the financial cycle may finally be turning. That is especially true in the United States, which has been further ahead in the economic and financial cycle compared to most other regions. In addition, investors are focused on the Federal Open Market Committee (FOMC), trying to judge whether the Federal Reserve may be close to ending—or at least pausing—its recent

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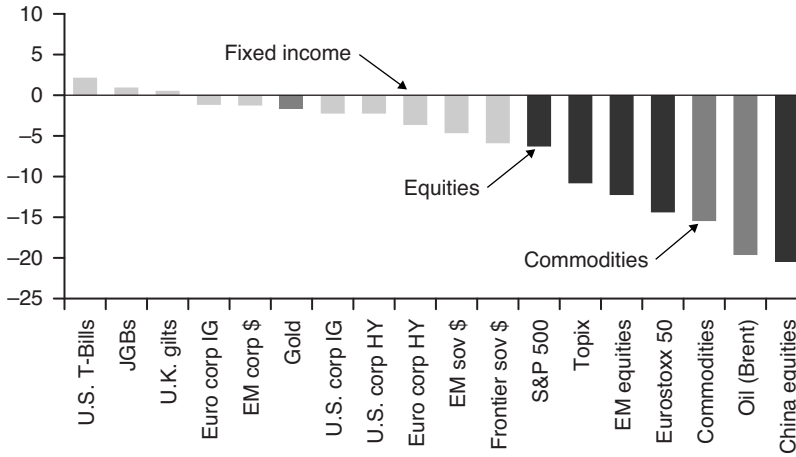
series of interest-rate hikes. Other key concerns include the slowdown in the Chinese economy, continuing trade tensions, and political risks such as Brexit.

In fact, 2018 was the most difficult year for markets since the global financial crisis (Figure 1). Almost every asset class saw negative returns. The few major areas that showed positive results were "safe haven" assets such as U.S. Treasuries, U.K. gilts, and Japanese government bonds. Global financial markets also saw the return of significant volatility in 2018. The VIX index, which is often seen as a proxy for market anxiety, saw several spikes over the course of the year. Markets have recovered somewhat in the new year—with stocks making up about half of their 2018 losses, and with credit spreads tighter by about one-third.

The IMF's Growth-at-Risk Approach

The tightening in financial conditions is important because it can have an impact on downside risks to growth. This relationship is encapsulated in the IMF's Growth-at-Risk approach, which was first introduced in the October 2017 edition of our *Global Financial Stability Report* (IMF 2017).

FIGURE 1
Returns by Asset Class During 2018
(Percent)

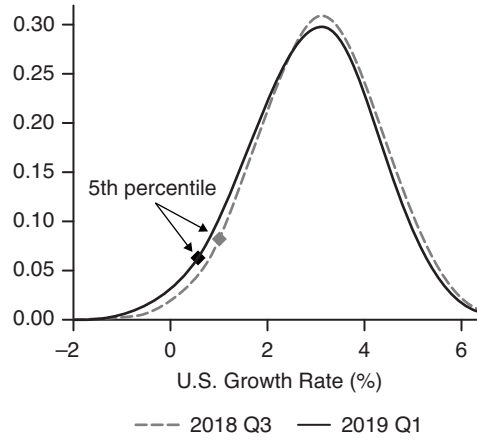


Using statistical techniques, we project a distribution of possible outcomes—which, in turn, helps us identify the most adverse scenarios located in the "left tail" of the distribution (with a 5 percent likelihood of occurring). Over time, we can track the changes in these 5 percent tail scenarios, and we can analyze how they respond to changing economic and financial conditions.

Running our growth-at-risk model for the United States, we find that risks to U.S. growth have increased somewhat. The distribution has moved slightly to the left compared to the third quarter of 2018, even after accounting for the partial retracement of the market sell-off (Figure 2).

One key driver for the tightening of global financial conditions was the negative data surprises we saw in parts of the world in 2018. Eurozone economic data were weak; data from emerging markets were often disappointing; and even the strong U.S. economy began to show signs of a slowdown. Another important catalyst was a pessimistic season of "forward guidance" from corporate management—underscoring trade fears, political uncertainty (especially in Europe and the United Kingdom), rising labor costs, and slowing economies worldwide. In the United States, corporate earnings growth is projected to decline in 2019.

FIGURE 2
U.S. Growth Forecast, One Year Ahead
(Probability Density)

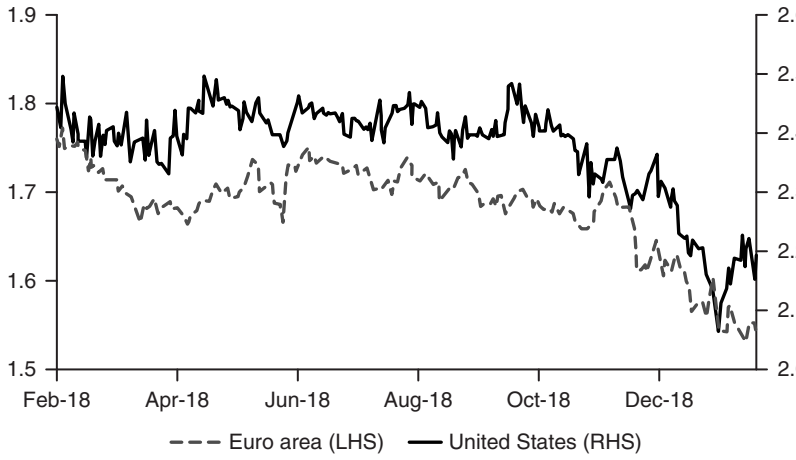


The Outlook for Inflation

Together, these two trends led to lower market expectations for inflation. We can see this clearly when looking at inflation swaps, which are among the most important instruments for determining market inflation forecasts for the United States and the eurozone. In both regions, markets are predicting that inflation will remain subdued over the next five years (Figure 3). Options on inflation swaps allow us to estimate the implied probabilities for potential inflation outcomes in the future. These options suggest that inflation is likely to remain low with there being little chance of U.S. or eurozone inflation hitting 3 percent for a full year, over the next five-year period.

This outlook for inflation has led markets to expect a more dovish path for central banks. In the United States, markets now expect the Fed to stay "on hold" in 2019–20. By contrast, the current "dot plot" from the FOMC has a median forecast of two hikes in 2019. How these Fed projections and market forecasts are reconciled, will be one of the key questions for 2019. For the European Central Bank (ECB), markets predict the first hike in 18 months—up from 12 months as recently as October.

FIGURE 3
Market Pricing of Inflation Protection:
5Y5Y Inflation Swap Forward Rate (Percent)



Signs of Late-Cycle Behavior

Meanwhile, many observers foresee that the end of the current financial cycle may be getting closer in the United States. A variety of economic and financial variables display late-cycle behavior. Although financial conditions are tightening, credit spreads are still narrow by historical standards, and M&A activity has been strong—a factor that we often see near the end of cycles. The yield curve has begun to flatten—a process that tends to occur before the onset of a downturn. Corporate margins may have peaked; wage growth is picking up; and unemployment is very low.

There are additional signs of late-cycle behavior, especially in the U.S. bond market. Term premia and credit spreads are compressed today, as they usually are near the end of the cycle. In addition, bond markets may be underpricing credit risk. Probabilities of default, calculated using widely used models, are very low despite a much higher level of corporate debt. Easier financial conditions lead to lower default forecasts in these models, causing investors to tolerate higher credit risk. That is when credit problems tend to build up in markets.

A deterioration in corporate credit quality is a growing concern among market participants, as well as among regulators. In some countries, corporate debt levels have spiked in the decade since the global financial crisis, and they have remained high in other major markets (see Adrian 2018). The increasing issuance of lower-rated debt, with fewer covenants or other investor protections, has led to heightened scrutiny by the Federal Reserve, European regulators, and others. Weaker corporate credit could become a major problem if forecasts of lower earnings turn out to be correct. The weak tail of corporations, whose earnings are only just high enough to cover their interest costs, could become vulnerable to default if the economy slows down and if their earnings become insufficient to service their debt (Figure 4). This weak tail could grow larger if the downturn is severe, as it did in the United States in 2000 and in 2008.

Moreover, the nonbank financial sector has come to play an increasingly important role in the provision of credit, as banks have reined in their lending due to competitive pressures, regulation, and other factors (Figure 5). As a result, the market for leveraged loans has grown significantly worldwide—and, remarkably, in the United States it is now larger than the high-yield bond market (Adrian, Natalucci, and Piontek 2018). Collateralized loan obligations (CLOs)

FIGURE 4
Weak Tail of U.S. Companies by Interest Coverage Ratio
(Share of U.S. Companies with ICR<2, Percent of Total Debt)

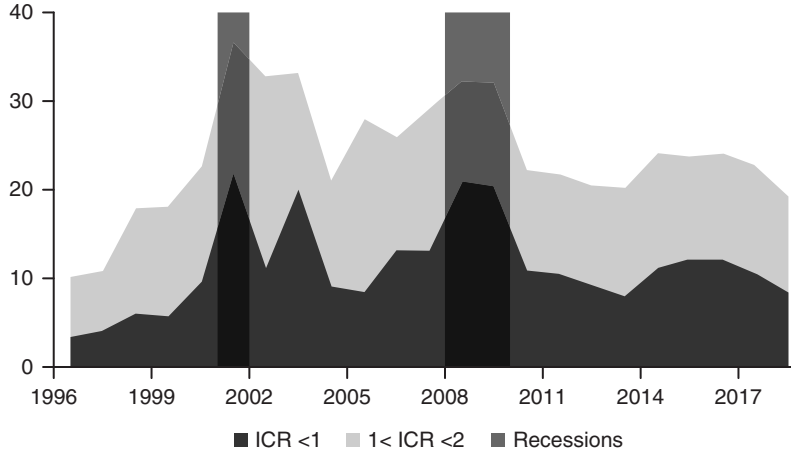
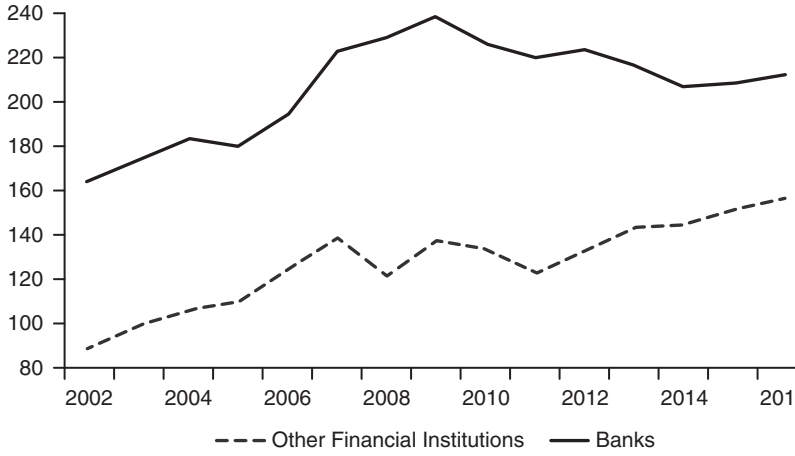


FIGURE 5
G-20 Bank and Other Financial Institutions' Assets
(Percent of GDP)



and loan mutual funds now play a dominant role in the leveraged loan sector. Private equity, hedge funds, and pension funds also have a large footprint in nonbank lending, both through CLOs and direct loans. Worries about credit quality made 2018 a bumpy year for U.S. credit markets. There were major episodes of investor selling during the year, and December was the first month in a decade where there was no issuance in the U.S. high-yield market.

Policymakers have limited means to take remedial action in nonbank lending, even as credit quality deteriorates. Liquidity and maturity mismatches among asset managers are a significant concern. With banks no longer willing to provide liquidity, a flood of investor redemptions could lead to significant market dislocations if asset managers need to sell. Today, much of the nonbank sector remains uncovered by macroprudential policies. Few policy tools are now available, because some only apply to money-market funds rather than the wider set of investment funds. Authorities should explore a wider range of macroprudential measures to address these issues.

Emerging markets have also been affected by the market selloff. Portfolio inflows fell, although they have come off their lows in recent weeks. Rising spreads and higher volatility have caused emerging market and frontier issuers to face higher funding costs and lower investor demand.

China and Europe

China remains front-and-center for global financial markets, with a great deal of focus on the health of the economy and the tariff dispute with the United States. Volatility in Chinese markets could have a negative impact on other emerging markets. The correlation between Chinese stocks and other emerging-market equities has been rising since trade tensions flared up last year. Another area of vulnerability for emerging markets is a stronger dollar, because emerging-market corporates ramped up their dollar borrowing in recent years to take advantage of low funding costs.

China's stock market was the worst-performing major market in 2018, as trade tensions flared up amid regulatory tightening. Stocks with significant U.S. exposure were especially hard hit. Although the authorities have introduced measures to ease conditions, funding costs did not fall appreciably, perhaps due to lenders' concern about the creditworthiness of corporate borrowers. This year, the

authorities have introduced several additional measures to ease conditions, and local markets have started the year on a modestly positive note.

Turning to Europe, Brexit-related uncertainty remains very high. U.K. stocks have significantly underperformed global equities over the past few years. Volatility in the sterling foreign-exchange options market has spiked, and the demand for protection against depreciation grows, especially around key risk periods such as the run-up to Brexit.

In Europe, another risk facing investors is the "sovereign-bank" nexus. This is the negative feedback loop that builds up when banks face problems because of the credit woes of their home countries. Banks typically have large holdings of government bonds issued by their home countries, but these bonds lose value when markets begin to worry about the home country's credit risk. An escalation of credit-related worries about a country leads to an escalation in credit risk for the banks themselves.

Italy was in the spotlight for much of the year amid the budget standoff with the European Union, given its banks' large holdings of Italian government securities, or "BTPs." Yield spreads between BTPs and German bunds flared up in the summer, and they have yet to fully recover, while Italian equities underperformed at the height of the tension.

Summary

To summarize what I have outlined: global financial conditions tightened in the fourth quarter of 2018, on the back of a correction in corporate valuations. They saw a partial retracement in early 2019, with equities recovering about half of their losses, and with credit spreads tightening by about one-third. But global conditions are still tighter on net.

Moreover, the data suggest that the financial cycle in the United States could be approaching its end. Other key risks on the horizon include additional weakening in economic activity, a further tightening of financial conditions, trade policy concerns, and political risks as exemplified by the Brexit issue.

At the IMF, we are committed to monitoring global financial trends very carefully, aiming to help national authorities shape sound policies that protect against financial vulnerabilities. As we approach our spring meetings in April, when we will publish the next edition of

our *Global Financial Stability Report*, we are continuing to study global financial developments very closely, remaining watchful for any factors that could put economic growth at risk.

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An Unconventional Assessment of Unconventional Monetary Policy

Vincent Reinhart

Beginning in late 2008, the Federal Reserve—an independent, technical agency of the U.S. government—experimented with resources cumulating to about one-fifth of annual nominal GDP. There was no settled body of research supporting the intervention. Indeed, there was not much research on the topic in the prior 35 years. But it seemed like a good idea at the time to the leadership of the Fed and proved sufficiently obscure to the media and elected classes to mostly fly under the radar relative to the scale of the commitment involved.

Ten years and $3.5 trillion of net asset purchases later, there is still no established answer to what effects the Fed's unconventional policies produced or what the legacy of those polices will be. Yet, the footprint of those policies remains considerable. The Fed's balance sheet (Table 1) is still close to $4 trillion and about 20 percent of nominal income, even after allowing some maturing investments to run off. The irony of quantitative easing (QE) is that its effects are hard to quantify. Prior to 2008, Fed officials lived in a comfortable world delimited to the basis point—actually to 0.25 percentage point—to which their interest-rate decisions always rounded.

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TABLE 1
Federal Reserve Balance Sheet
($ Millions, February 13, 2019)

Assets		Liabilities and Net Worth	
Securities		Federal	
Held Outright	3,829,969	Reserve Notes	1,661,886
Treasury	2,205,604	Reverse Repurchases	246,265
Agency	2,409		
MBS	1,621,956	Treasury Deposits	375,119
Other assets	198,462	Bank Deposits	1,700,375
		Other Liabilities	5,626
Total Assets	4,028,431	Total Liabilities	3,989,271
		Capital	39,161

Source: Federal Reserve H4.1, accessed 2/21/2019.

But unconventional policy, which includes adjusting guidance on interest-rate intentions and manipulating the size and composition of the central bank balance sheet, maps uncertainly into interest-rate expectations and liquidity preferences of investors.

In this article, I offer three perspectives on the Fed's unconventional monetary policy. First, I draw on my work with Ben Bernanke in 2004, in which we framed expectations on the efficacy of unconventional monetary policy. The next section revisits those arguments.

Second, there is a cottage industry, including many contributions by Fed staff, in assessing the effects of unconventional policy.[1] This article employs finance theory to identify windows where views on policy are likely to be revealed and to look for relative price discrepancies among mostly similar instruments to parse policy effects. This is the popular solution to look under the lamp post for the missing item; I widen the window of observations to demonstrate that the effect proves ephemeral.

Third, this article exploits the enormous comovement among yields along the Treasury term structure. As has been known since

[1]See, for instance, d'Amico et al. (2012), Gagnon et al. (2011), Krishnamurthy and Vissing-Jorgenson (2013), and Swanson (2018).

Litterman and Sheinkman (1991), rates along the yield curve are well described by the current level, slope, and curvature of the yield curve. The fascinating feature is that any portion of the yield curve predicts other portions, a property I use to determine if the relationship between short and long rates changed pre- and post-QE. Long-term yields were a bit lower in the QE episode than short rates predicted but much more subsequently. Both approaches suggest that QE matters, but the effects are small relative to other macro forces pulling yields lower and likely to erode as the Fed's relative footprint in markets shrinks over time.

The last section crosses over to the normative issue of the appropriateness of a large and lingering Fed footprint in markets. The revealed preference of policymakers is that they do not have sufficient confidence in market mechanisms or respect for the role of risk in directing the efficient allocation of resources. A healthier respect for both would place stricter limits on the extent to which a central bank leans against financial market volatility than was the case. The problem is that the precedent lowers the bar for future intervention and leaves the Fed operating under too large an ambit in our market economy.

What Were They Thinking?

The prior time that the Federal Reserve had a near brush with the lower bound of zero to the nominal policy rate was from 2002 to 2004.[2] The nominal federal funds rate touched the then unprecedented level of 1 percent, and replicating the ongoing "lost decade" of poor economic performance in Japan appeared a worrisome possibility. Among the work done at the time identifying policy alternatives was Bernanke (2002), Bernanke and Reinhart (2004), and Bernanke, Reinhart, and Sack (2004). When confronted by an adverse shock but pressed by the zero lower bound to nominal interest rates, a central bank could (1) signal to keep interest rates low for a sufficient time to pull longer maturity yields lower, (2) increase the amount of reserves beyond that necessary to push the policy rate to zero, (3) purchase assets in volume to influence their relative spreads, and (4) use administrative policies to subsidize lending.

[2]The time before was in the 1930s, as discussed in Reinhart and Reinhart (2011).

TABLE 2
The Four Channels of Unconventional Monetary Policy

	Past	Present
Signals Intent	Official can convince market participants that rates will be kept low for long.	Staying on message is hard. Starting is easier than stopping.
Reserve Creation	More reserves in the banking system is a direct stimulus.	Capital-constrained banks do not use reserves.
Porfolio-Balance Effects	Removing long-term debt from the public lowers term premia.	Difficult to quantify. Impedes liquidity.
Opens "Fiscal Space"	Reduced government interest expense allows more fiscal stimulus.	Ignores political reality and market pressures.

Source: Bernanke and Reinhart (2004), as updated by author.

The subject of this article is the third tool, also known as quantitative easing and large-scale asset purchases (LSAPs), although all these tools attempt to exploit one or more of four potential channels of influence on the economy. These channels are listed in the first column of Table 2. In particular, large-scale asset purchases might be seen as a demonstration of the willingness to keep interest rates low for a long time or "to do whatever it takes" in the memorable phrase of Mario Draghi, head of the European Central Bank. Assets are purchased through the creation of reserves and any money-multiplier effect may support lending and economic activity. If assets are imperfect substitutes, the purchase of some might influence risk premiums (in the manner discussed by Hanson and Stein 2015, and Krishnamurthy and Vissing-Jorgenson 2013).

Moreover, the willingness of the central bank to purchase government securities might encourage politicians to issue more of them, providing fiscal impetus to an economy that was flagging (as discussed in Bernanke 2002). The diplomatic term for the collaboration of monetary and fiscal policy makers is creating "fiscal space." The less delicate terms for QE that is never reversed are "debt monetization" and "financial repression."

In retrospect, only two of these mechanisms got traction, and even those had drawbacks. Rate guidance had a material effect on rates, but sending a consistent message proved hard, especially in a committee setting (the Federal Open Market Committee or FOMC) when different views are expressed (Faust 2016). By way of example, for most of the stay at the zero lower bound from 2012 on (when rate guidance was first made explicit in the Summary of Economic Projections, SEP, of FOMC participants), investors viewed the stated policy direction as more hawkish than would actually be delivered. In addition, expressing the intention to keep rates at zero turned out to be easier than signaling the onset of tightening—it is easier to give than take away accommodation.

Large-scale asset purchases were associated with declines in yields, through some combination of forward guidance and portfolio-balance effects. The magnitude of such effects is hard to quantify and does seem to have had diminishing marginal effectiveness. On the other side of the ledger, market liquidity suffered as holdings became concentrated in official hands.

As for the two unconventional policies that never left the starting gate, reserves were created exactly when banks were risk averse and capital constrained, lessening the ability of banks to use them. Meanwhile, the Fed paid a market-related rate on excess reserves, lessening the incentive of banks to deploy them. As a result, reserves mostly sat on private balance sheets as excess reserves. That is, the money multiplier cratered. And politicians might have had the apparent ability to issue more debt but in many cases were unwilling to do so, in part on the fear of testing the tolerance of markets and the watchdogs at institutional financial institutions (as discussed in Reinhart, Reinhart, and Rogoff 2015).

The case for unconventional policy, then, rests on rate guidance and large-scale asset purchases. The former has long been part of Fed policy architecture, from the first publication of the SEP in 1977, the inclusion of a "bias" in the FOMC directive in the 1980s, the release of the FOMC statement in the 1990s, and expectations-shaping language such as "a considerable period" and "a measured pace" in the early 2000s (discussed in Lindsey 2003). The new wrinkle was the aggressive use of the balance sheet, QE, to be assessed quantitatively in the next section.

Quantifying Quantitative Easing

The Fed's announcement of plans to add to its holdings of securities represents a natural experiment in how markets work and investors behave. To the extent that the news comes as a surprise, the repricing of long-lived assets reveals investors' beliefs as to its effects. To the extent that they are concentrated in certain maturities, twists in turns in the yield curve may be informative about the role of guidance on the future path of rates versus portfolio-balance effects. We will follow these two paths in turn.

Looking under the Lamp Post

Event studies are an especially popular research strategy tracking price movements of long-lived assets in a narrow window surrounding an announcement (a small representative set is Gagnon et al. 2011, Krishnamurthy and Vissing-Jorgenson 2013, and Swanson 2018). An event is informative, however, only if the announcement is a surprise, which is difficult to guarantee when policymakers speak in public frequently and act in part in response to published economic data and prior market movements. Moreover, market capacity constraints might produce undershooting or overshooting of prices in brief time spans, and looking only at the announcement presumes there are no flow effects associated with actual purchases.

The analysis revolves around the seven FOMC announcements concerning asset purchases listed in Table 3. The first six involve the decisions to add to holdings and the seventh, "The Taper Trick," occurred when the FOMC continued with asset purchases at the prevailing pace despite the predominant market view it would slow them. The last two rows provide the dates of reversals and are included for information's sake. The window of observation was widened to one week (from the Friday to Friday bracketing the news) allowing time to observe the market absorption of QE news at the cost of adding non-QE noise. Table 4 provides the raw changes in financial market quotes for 19 assets. The choices are somewhat Treasury-security heavy because that is ground-zero for central bank policy intervention.

As is evident in the first six rows, LSAP news flattened the Treasury yield curve, consistent with signaling rates would be lower for longer as the front end was pinned at its zero lower bound and perhaps evidence of a portfolio-balance channel given that purchases skewed toward longer maturities.

TABLE 3
Federal Reserve Balance Sheet Actions, 2008 to 2018

	Dates of Action	
	Announce	End
LSAP Agency Debt and MBS	11/25/2008	1/31/2010
QE1 Treasuries	3/18/2009	3/30/2011
QE2 Treasuries	11/3/2010	6/30/2011
OT Treasuries	9/21/2011	6/30/2012
QE3 MBS	9/13/2012	10/29/2014
QE3′ Treasuries	12/12/2012	10/29/2014
Taper Trick	9/18/2013	12/18/2013
Actual Taper	12/18/2013	10/29/2014
Balance Sheet Normalization	9/20/2017	?

Source: Federal Reserve, www.federalreserve.gov/monetarypolicy/quarterly-balance-sheet-developments-report.htm.

Across the seven easing actions, the 10-year yield fell 61 basis points, all of which came out of the estimated term premium, at least as judged by the proxy calculated by the Federal Reserve Bank of New York.[3] Risk spreads mostly stayed unchanged, implying the change in Treasury yields passed onto borrowing costs. Mortgage-backed securities (MBS), which were a focus of Fed action, benefited particularly. LSAP announcements tended to curb the expected volatility of financial prices and to encourage risk taking in equity markets. The latter would follow both from a reduction in the discount rate and improved confidence about the economy. The fact that the dollar appreciated and gold prices fell probably indicate more weight should be put on the latter mechanism. These are squarely in line with other research and show that QE had market traction. However, two observations put this result in a more appropriate perspective.

[3]The framework is explained in Adrian, Crump, and Moench (2013). It is best not to overemphasize this parsing. An arbitrage-free term structure model infers the term premium through joint estimation of the price of risk and the present value of the path of the short-term interest rate. If the expected mean to which the short rate reverts falls suddenly, older observations will hold up the model's estimate, which comes one-for-one at the expense of the term premium.

TABLE 4
Selected Market Quotes
(Change in the Week Bracketing an FOMC Announcement, Percent)

	LSAP (1)	QE1 (2)	QE2 (3)	OT (4)	QE3 (5)	QE3′ (6)	Taper trick (7)	Actual Taper (8)	Balance-sheet normalization (9)	Sum (1) through (7)
Treasury yields										
1-year	−0.03	−0.06	−0.01	0	0.01	−0.03	−0.02	−0.01	0.04	−0.14
2-year	0.03	−0.07	−0.03	0	0	0	−0.1	0.02	0.08	−0.17
3-year	0.02	−0.13	−0.08	−0.02	0	0	−0.15	0.03	0.09	−0.36
5-year	−0.06	−0.18	−0.13	−0.06	0.04	0.04	−0.19	0.07	0.1	−0.54
7-year	−0.16	−0.21	−0.14	−0.1	0.08	0.07	−0.18	0.06	0.09	−0.64
10-year	−0.28	−0.17	−0.06	−0.16	0.12	0.07	−0.13	0.03	0.08	−0.61
Five-year/five-year forward	−0.50	−0.16	0.01	−0.26	0.20	0.10	−0.07	−0.01	0.06	−0.68
Risk-free 10-year yield	−0.13	0.18	0.06	0.27	−0.20	−0.05	−0.13	0.13	0.05	−0.01
Adrian, Crump, and Moench term premium	−0.15	−0.35	−0.12	−0.43	0.32	0.12	0.00	−0.10	0.03	−0.60
Merrill Lynch rate option implied volatility	1.1	−19.8	−18.1	6.9	−0.1	−0.3	−18.4	−5.3	−0.1	−48.7

(Continued)

TABLE 4 *(Continued)*
Selected Market Quotes
(Change in the Week Bracketing an FOMC Announcement, Percent)

	LSAP (1)	QE1 (2)	QE2 (3)	OT (4)	QE3 (5)	QE3′ (6)	Taper trick (7)	Actual Taper (8)	Balance-sheet normalization (9)	Sum (1) through (7)
U.S. aggregate credit spread	0.01	−0.02	−0.03	0.16	−0.09	−0.02	−0.03	−0.05	−0.02	−0.02
Long U.S. credit spread	−0.07	0.11	−0.05	0.18	−0.12	−0.04	−0.02	−0.08	−0.04	−0.01
U.S. MBS fixed rate OAS	−0.15	0.01	−0.04	0.02	−0.24	−0.06	−0.01	−0.02	0	−0.47
Wilshire 5000 price	7.4	7.0	1.9	−2.2	1.9	0.8	1.7	0.8	0.5	18.5
S&P 500 price	12.0	1.6	3.6	−6.5	1.9	−0.3	1.3	2.4	0.1	13.6
S&P 500 implied volatility	−17.4	3.5	−2.9	10.3	0.1	1.1	−1.0	−2.0	−0.6	−6.3
S&P 500 skew	3.3	−6.0	4.7	−3.4	13.3	8.2	8.6	−6.5	0.3	28.8
Major currency index	0.1	−1.2	−0.6	−0.1	−1.3	0.1	−0.8	0.0	0.4	−3.7
Gold	−4.9	−8.3	4.8	1.8	−2.4	−6.6	0.1	−2.3	2.1	−15.5

Source: See Appendix: Data Sources.

Table 5 compares the net effect of the seven policy events (the second column) with the cumulative change from the start of the Fed's expansionary efforts to the beginning of balance-sheet renormalization (the first column). The market mostly moved to provide financial accommodation over the period, but the bulk of the action occurred outside policy windows. QE mattered, but not that much.

Second, to see how lasting these effects were, the observation window was progressively widened one week at a time, calculating the change from the Friday before the announcement to up to 13 weeks later.[4] Those changes were then regressed on a dummy variable identifying LSAP events, distinguishing between accommodative and restrictive announcements, and the change in the intended federal funds rate from 2006 to 2018 to soak up other policy noise. The first observation shown at the left in Figure 1 is the coefficient on the dummy marking out the seven accommodative LSAP announcements in the first regression for a one-week window.

Arithmetically, this matches the result in Table 4, as seven events with an average effect of 8.7 basis points lowers the 10-year yield 61 basis points. The estimate differs from zero statistically and holds initially as the window is widened along the horizontal axis. However, five weeks on, there is no reliable reduction in yields. Put another way, with eight FOMC meetings scheduled regularly each year, an LSAP announcement at one of them left no reliable trace on the 10-year yield by the time of the next one.

Up and Down the Yield Curve

The second strategy is to exploit an extraordinary feature of the Treasury yield curve. As first shown by Litterman and Sheinkman (1991), the movement in yields across the term structure are well explained by three factors. As an even more important aid to intuition, those factors can be interpreted as the general level of yields, the slope of the yield curve, and its curvature. Moreover, those factors extrapolate across maturities, in that estimates gotten from one portion of the yield curve predicts yields at other portions of the yield curve that are of out of the estimation sample.

[4]This methodology follows Swanson (2018) and, from here on, the focus is on the 10-year Treasury yield, the poster child for Fed action.

TABLE 5
Selected Financial Market Quotes

	Net change (percentage points)	
	From 8/3/2007 to 9/22/2017	In the seven policy weeks around unconventional announcements
Treasury yields		
1-year	−3.52	−0.14
2-year	−3.12	−0.17
3-year	−2.96	−0.36
5-year	−2.73	−0.54
7-year	−2.57	−0.64
10-year	−2.51	−0.61
Five-year/five-year forward	−2.29	−0.68
Risk-free 10-year yield	−1.64	−0.01
Adrian, Crump, and Moench term premium	−0.87	−0.60
Merrill Lynch rate option implied volatility	−44.9	−48.7
U.S. aggregate credit spread	−0.15	−0.02
Long U.S. credit spread	−0.04	−0.01
U.S. MBS fixed rate OAS	−0.47	−0.47
Wilshire 5000 price	77.2	18.5
S&P 500 price	55.7	13.6
S&P 500 implied volatility	−15.6	−6.3
S&P 500 skew	−1.7	28.8
Major currency index	11.2	−3.7
Gold	72.7	−15.5

Source: See Appendix: Data Sources.

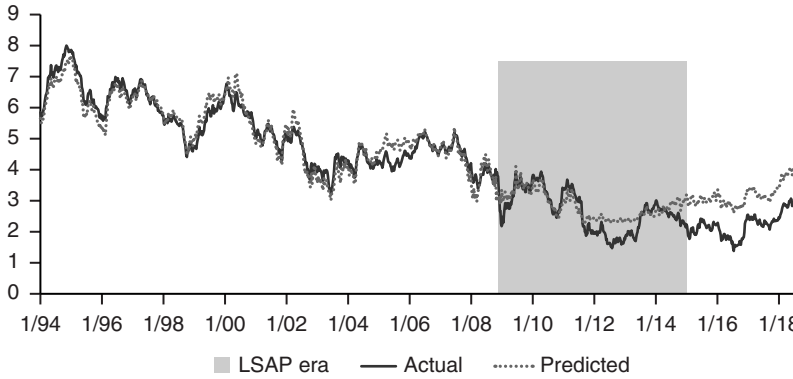
FIGURE 1
Response of 10-Year Treasury Yield to QE Announcements Estimated over Various Windows (Percent)

Source: Author's estimate from 2/10/06 to 7/27/18 using constant-maturity 10-year Treasury yield and announcements on rate and balance sheet actions from the Federal Reserve. Yield data are from FRED.

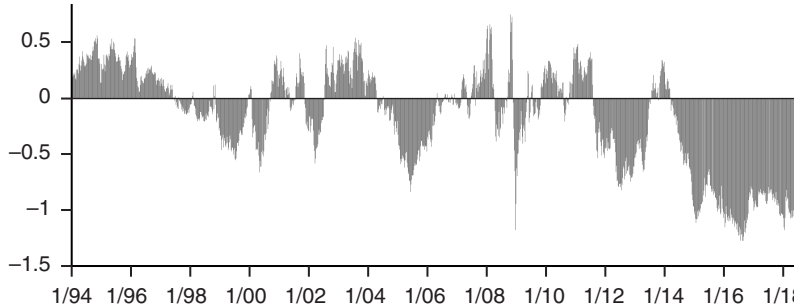
There are multiple ways to exploit this feature, but the stratagem here is to approach the yield curve from the front—use three factors derived from maturities up to two years to produce out-of-sample predictions of the 10-year yield in the QE period. The results are shown in Figure 2 and Table 6, where the factors—level, slope, and curvature—are defined as in Hamilton and Wu (2012), in which the 10-year yield is explained by rates up to two-years in maturity in the modern era of Fed communications up to the financial crisis, from 1994 to 2007. The predicted value (the dashed line) follows the actual (the solid line) over the sample period. Within the QE experiment period (the shaded LSAP area in the top of Figure 2), the yield is lower, by a little bit, as in the lower part of Table 6, consistent with the event study evidence that there is an effect but not a permanent one. Following the QE experiment, the 10-year yield systematically tracks materially below the prediction from short rates, about 1 percentage point, suggesting that other forces mattered more than the Fed's balance sheet, which was shrinking relative to the amount of Treasury securities outstanding.

That is, long rates were relatively lower after the sunset of QE in the United States, not at its sunrise.

FIGURE 2
Ten-Year Treasury Yield: Actual and Predicted Using Yields to the Two-Year Maturity
(Percent)



Predictive Error
(Percent)



Note: Prediction of the 10-year nominal Treasury yield using the level, slope, and curvature of yields to two-years maturity, with weekly data from January 1994 to August 2007.
Source: Data are from the Federal Reserve, release H.15, accessed via FRED.

TABLE 6
Explaining the 10-Year Yield with Short Rates
(Using Weekly Data from 1/7/94 to 8/3/07)

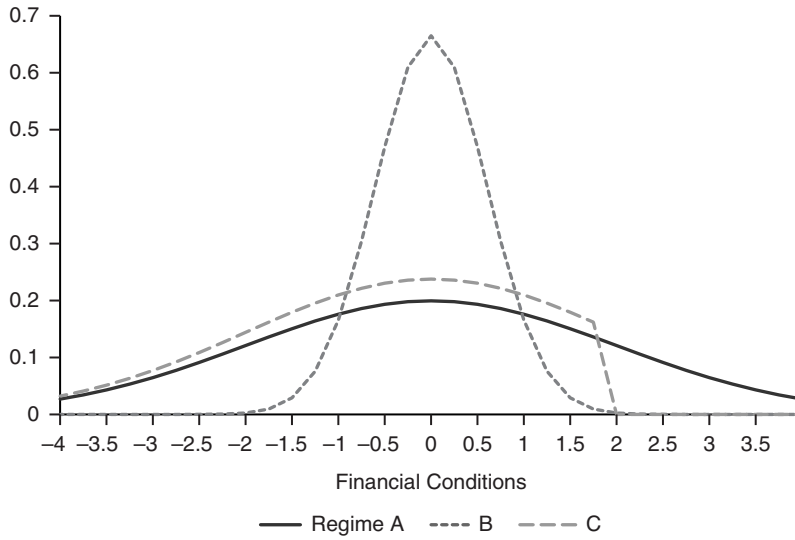
	Coefficient	s.e.e.	t-statistic
Constant	2.05	0.04	48.2
Slope	21.57	0.52	41.2
Level	0.62	0.01	75.2
Curvature	−1.58	0.12	−13.2
R^2	0.92		
Average Errors			
8/10/07	to	11/14/08	0.15
11/21/08	to	1/2/15	−0.17
1/9/15	to	10/19/18	−0.98

Two Cheers for Risk

Central bank actions in the financial crisis and thereafter were designed to reduce the volatility of financial prices. Sticking like glue to the effective lower bound on the nominal policy rate and offering explicit guidance about future policy kept investor uncertainty to a minimum about the rate to discount asset values. Large-scale asset purchases placed a floor on the prices of Treasury, agency, and mortgage-backed securities. Flooding the banking system with reserves ensured banks had safe collateral on their books. Deep down, this reflects a concern that an outsized deterioration in financial conditions (writ large across many assets) could trigger a more widespread deterioration, say perhaps as depositors run on a challenged institution that is solvent but illiquid or leads investors to dump assets in a fire sale.

The idea is presented in Figure 3, which gives three possible distributions of overall financial conditions with different variances. In Regime A, which represents the environment within a financial crisis when investors were uncertain about the economic outlook and skittish toward risk, the area in the adverse right tail potentially creates an unacceptable chance of costly knock-on effects. The central bank response was to offer variance-damping

FIGURE 3
Potential Outcomes of Financial Conditions
(Percent)



Source: Author's calculations

reassurance (to get to Regime B) or outright price supports to cut off that tail (as in Regime C).

The titles of the memoirs of financial officials serving in 2008 and 2009 indicate considerable concern about those right-tail events and the imperative to act in the logical sequence of *On the Brink, Stress Test*, to the culmination in *The Courage to Act*.[5] That these actions were appropriate in 2008 is far from settled (as discussed in Reinhart 2011) but at least the case for unconventional policy action in the United States was more compelling than it is for the continuation of those policies so long after the shock.

In particular, an outsized willingness to tamp down the volatility of financial prices neglects three important features of markets. First, not all volatility is unhelpful. The risk of capital loss leads investors to

[5]These were the titles of the memoirs, respectively, of Henry Paulson (2010), Timothy Geithner (2014), and Ben Bernanke (2015).

be more discriminating in asset choice and, over time, rewards those with more skill, a longer perspective, and a greater tolerance for risk. This encourages saving and directs capital to relatively more productive uses. Put the other way, by absorbing risk, the Fed lessened market discipline on institutions and investors. Moral hazard matters in its reward to indiscriminate risk taking and its distortion of capital decisionmaking.

Second, not all interventions are equal. Specific price supports (Regime C in Figure 3) shift the mean of expected outcomes, inflating asset prices. Included among the actors influenced are politicians, who may be encouraged to increase spending and cut taxes because there is little consequence for borrowing costs. To be sure, creating fiscal space may have been compelling in an economic recession, but it puts the long-term trajectory of government debt on a dangerous trajectory when low borrowing costs made U.S. deficits look more attractive in 2017–18. It also creates the political incentive for future monetization.

Third, by becoming a larger counterparty in specific markets, the Fed crowded out private-sector transactions. Indeed, some intermediation activity may disappear altogether, as was the case with the U.S. interbank market in the mid-1930s through the 1940s when the Fed tarried at the zero lower bound (Reinhart and Reinhart 2011). It is worth noting that, this time around, settlement volumes on Fed payment systems notched lower after 2008.[6]

These points combine to highlight the risk that overstaying market support may impair the efficiency of market mechanisms over time. But this is nothing new. In "Ironies of Automation," Lisanne Bainbridge (1983) explained that people relying on machines may lose core competencies in the skills being automated. We no longer, in the modern setting, remember phone numbers because they are in our contact lists. Aside from inconvenience or embarrassment, the degradation of skills may impair the resilience of a system in response to unusual events. What do you do if the phone battery dies? More seriously, how can we keep pilots sharp enough to react in an emergency if most of their time in the cockpit is spent watching the autopilot work? How can we expect traders and investors to

[6]The data are found here: www.federalreserve.gov/paymentsystems/fedsecs_ann.htm.

react reliably to shocks in the future if their past is one in which they have been protected by a benevolent central bank? This feature, by rendering markets less resilient, makes future official intervention more likely and self-justifying.

Conclusion

Unconventional monetary policy was an important driver of Treasury yields from 2008 to 2013, but not the only one nor the major one. Anyone asserting a more important role for the Fed has to explain why longer-term yields stayed low even as asset purchases reversed and short-term rates rose appreciably.

If the quantitative contribution of QE is limited, then the balance with its mostly uncounted adverse effects needs to be reassessed. An enlarged Fed presence influences market functioning and risk taking. Central to those effects are the extent to which the Fed absorbs risk that the private sector normally bore and disintermediates private parties in market activity.

The latter involves both sides of the Fed's balance sheet. Risk absorption follows from the approximately $3.5 trillion of additional assets held by the Fed instead of the private sector. Purchased by creating the liability otherwise known as reserves, the Fed must find willing holders over time of its deposits or counterparties for its reverse repurchase facility. In both respects, this displaces traditional intermediation.

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Appendix: Data Sources

Data	Source
Treasury constant maturity yields	
1-year	Federal Reserve Board, H.15, accessed via FRED
2-year	"
3-year	"
5-year	"
7-year	"
10-year	"
Five-year/five-year forward	Author's calculation
Risk-free 10-year yield	"
10-year term premium	Federal Reserve Bank of New York, accessed via Bloomberg
Merrill Lynch rate option implied volatility	Merrill Lynch, accessed via Bloomberg
U.S. aggregate credit spread	Bloomberg-Barclays' index, accessed via Bloomberg
Long U.S. credit spread	"
U.S. MBS fixed rate OAS	"
Wilshire 5000 price	Wilshire Associates, accessed via FRED
S&P 500 price	CBOE, accessed via FRED
S&P 500 implied volatility	CBOE, accessed via FRED
S&P 500 skew	CBOE, accessed via FRED
Major currency index	Federal Reserve Board, H.10, accessed via FRED
Gold prices	Bloomberg

Note: All data were updated 2/21/2019.

Political Economy of the Fed's Unconventional Monetary and Credit Policies

Scott A. Burns and Lawrence H. White

Most textbooks and professional literature on monetary policy assume that the Federal Reserve seeks only to promote the public interest. Many of the Fed's actions over the past decade, particularly those actions that show signs of favoritism to particular firms, however, are difficult to square with that assumption.

After the housing price bubble burst, the Fed expanded its total asset portfolio five-fold, reaching $4.5 trillion in October 2016 (and remaining there until September 2017) from a starting point of $900 billion in August 2008. With some small asset runoffs since October 2017, the assets currently stand at about $4 trillion. Ordinarily, monetary expansion is intended to increase the growth rate of the broader monetary aggregates to satiate the excess demand for money that arises during a liquidity crisis. But by paying interest on excess reserves (IOER) for the first time, the Fed deliberately prevented the expansion of its liabilities (mostly banks' excess reserves), which financed the Fed's asset purchases, from increasing the broader monetary aggregates like M2.

This dramatic change in the size of the Fed's asset portfolio was accompanied by an equally dramatic change in its composition. Between October 2007 and November 2018, the Fed's holdings of

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Treasury securities declined from 88 percent of its asset portfolio to 56 percent, while its holdings of mortgage-backed securities (MBSs) went from zero to 40 percent. During the crisis, the Fed created lending facilities for nonbanks and began accepting riskier assets as collateral for loans. It also stood ready to lend to insolvent banks (e.g., standby credit lines for Citibank and Bank of America) and to purchase dodgy assets from nonbanks (e.g., Bear Stearns and AIG). The Fed discarded its longstanding practice of purchasing almost exclusively short-term Treasury securities: it switched into longer-term Treasuries ("Operation Twist 2") and purchased $1.7 trillion worth of MBSs.

In all of its midcrisis and postcrisis improvisation, the Fed departed from a focus on overall market liquidity and stability of aggregate demand. It allocated credit to specific firms and sectors at the expense of the general market. It also greatly expanded its exercise of powers under Article 13 (3) of the Federal Reserve Act (Meltzer 2011). By lending on highly questionable collateral at subsidized rates, it departed dramatically from Walter Bagehot's classical lender-of-last-resort doctrine (Bagehot 1873; Hogan, Le, and Salter 2015). The Fed's actions can be described as "preferential credit allocation" (White 2015), that is, as a move toward greater top-down financial flows (Hummel 2011).

The Fed's choices of unconventional monetary and credit allocation policies during and after the Great Recession have reopened a discussion of the political economy of Fed policymaking that had gone largely dormant during the Great Moderation. In this article, we offer a public-choice account of the Fed's unprecedented response to the Great Recession. We consider the Fed's reluctance to pursue monetary policy "normalization" in this light. In theory, the Fed could readily shrink its bloated balance sheet and return it to normalcy. In practice, the Fed has dragged its feet under pressure from political, bureaucratic, and private interests. We conclude that the case for strict rules designed to limit the range of central bank actions, and the need to consider institutional arrangements that offer an alternative to central banking, are stronger than ever.

Our inquiry is rooted in a long-standing literature that takes a "cynical" public-choice approach to explaining Fed policymaking (see, e.g., Kane 1980 and Havrilesky 1990), in contrast to the "utopian" view that the Fed aims only at advancing the public interest. The renowned monetary historian Allan Meltzer concluded:

"History does not offer evidence of [the Fed] seeking to optimize policy in the interests of consumer welfare" (Meltzer 2011: 47). Given how politics and powerful private interest groups shaped the legislation that created the Federal Reserve System (see Selgin 2016), it should not be surprising that elected officials, financial-market actors, and its own bureaucratic imperatives have continued to shape Fed policies to the present day. Like any individual or firm or other agency, the Fed's decisions can be explained as responses to the incentives and constraints it faces (Wagner 1986: 519).

Preferential Credit for Primary Dealers

In its initial response to the subprime mortgage crisis, the Fed redistributed liquidity from the general market toward financially suspect but "systemically important" financial institutions. It lent on highly questionable collateral and often at subsidized rates. It later made outright asset purchases designed to raise asset prices, specifically in the housing sector (Thornton 2015; Hummel 2011; Goodfriend 2014; White 2015).

With rising mortgage defaults, especially on adjustable-rate mortgages, the prices of MBSs began to decline in late 2007 and early 2008. Many investment banks were exposed to substantial losses on their MBS holdings (Gorton 2010) and had difficulty rolling over short-term funding in the form of overnight repos and commercial paper (Hummel 2011). Bear Stearns experienced a sudden stop in its funding in March 2008 when its short-term funders suspected (rightly) that it was insolvent.

Had the Fed followed the modern prescription for a lender of last resort, it would have let Bear Stearns fail while providing sufficient liquidity to the banking system as a whole. Instead, the New York Fed created "Maiden Lane LLC" to purchase nearly $30 billion of dubious mortgage-related assets from Bear Stearns to sweeten JP Morgan Chase's acquisition of the firm, thereby shielding Bear's bondholders and other lenders from losses.

In the same month, the Fed also created a special emergency lending program for "primary dealers," a group of broker-dealers and investment houses (including Citigroup, Goldman Sachs, J. P. Morgan Securities, Merrill Lynch, Morgan Stanley, and Wells Fargo Securities) that serve as regular counterparties in the Fed's bond purchases and sales. The Fed treated the primary dealers as "too big

to fail" on the grounds that failures would disrupt the traditional money-supply transmission mechanism (Fisher and Rosenblum 2009; Selgin 2012). Ironically, the Fed itself would soon disrupt the traditional money-supply mechanism by paying IOER, which severed the linkage between open-market operations and broader monetary aggregates. Under a more robust institutional arrangement for open-market operations, as proposed by Selgin (2012), the Fed would not have a reason to rescue broker-dealers.

The Fed began funneling credit to the primary dealers for the first time through the creation of two new lending facilities: (1) the Primary Dealer Credit Facility (PDCF), which extended collateralized loans to primary dealers; and (2) the Term Securities Lending Facility (TSLF), which allowed primary dealers to swap riskier assets on their balance sheets for Treasury securities to employ as collateral for PDCF loans. Acharya and Öncü (2010: 337) describe the creation of these special lending facilities to grant credit to well-connected nonbank entities as the "most radical shift in monetary policy since the Great Depression." But their creation is better described as a radical shift from monetary to credit policy (Goodfriend 2014).

The Fed held the monetary base constant for many months, by selling off $310 billion in Treasury securities to sterilize the special lending, which reallocated funds toward favored institutions and away from the rest of the banking sector.[1] As Robert Eisenbeis (2010: 287) noted, the PDCF and TSLF served not to maintain liquidity in the market (as was warranted at the time) but to "reallocate to primary dealers reserves that would have otherwise been available to smaller banks" to support lending in the general economy.

Preferential Credit Allocation to the Housing Sector

In response to the developing recession, the Fed began to expand the monetary base dramatically, but it simultaneously adopted policies that sterilized the potential impact on broader monetary aggregates. Between September 3 and November 12, 2008—as the

[1]Between July 2007 and September 2008, the Fed's holding of Treasuries fell to $480 billion from $790.6 billion. For this reason, the monetary base only increased by 2.24 percent between August 2007 and August 2008, well below its 7.5 percent annual average over the preceding two decades.

Fed increased credit to banks, primary dealers, and foreign central banks—the monetary base doubled from $850 billion to $1.7 trillion. Simultaneously the Fed introduced two new policies to offset the impact on the broader monetary aggregates.

First, the Fed and the Treasury introduced the Supplemental Financing Account (SFA), whereby the Treasury's account balance at the Fed grew by $560 billion to keep those funds from swelling bank reserves. The Federal Reserve Bank of New York (2008) stated: "Funds in this account serve to drain reserves from the banking system, and will therefore offset the reserve impact of recent Federal Reserve lending and liquidity initiatives." As Alan Blinder (2010: 468) observed, this operation breached the traditional "wall between fiscal and monetary policy."

Second, and more significant, the Fed began paying IOER in October 2008. As Ben Bernanke (2015: 325) noted, this policy was deliberately designed to reward banks for not lending their excess reserves—thereby preventing the broader money aggregates from swelling and preventing the federal funds rate from moving below the Fed's target. Banks responded by dramatically increasing their holdings of excess reserves from less than $2 billion to $767 billion by December 2008. By paying generous interest rates on reserves (by comparison to Treasury yields at the time) the Fed in effect borrowed back the injected funds (Hummel 2011).

The same pattern prevailed in the Fed's subsequent "quantitative easing" (QE) programs. The point of QE of the monetary base was evidently not to expand the money supply in the hands of the public. The growth of M2 hardly budged. The point was to finance bailouts (such as $85 billion to AIG), targeted lending facilities, and purchases of MBSs. When the Board of Governors (2008a) stated in its press release on October 6, 2008, that "the payment of interest on excess reserves will permit the Federal Reserve to expand its balance sheet as necessary," they meant that it will allow the Fed to purchase MBSs and lend to favored recipients (including investment houses, money market mutual funds, and AIG) without creating a corresponding rise in M2 and the price level.[2]

[2]Some of the Fed's targeted credit programs included the Commercial Paper Funding Facility, the Term Asset-Backed Securities Loan Facility, the Revolving AIG Credit Facility, and Maiden Lane II and III, which benefitted major AIG counterparties—particularly Goldman Sachs (see GAO 2011).

In December 2008, the Fed announced that it would purchase $1.25 trillion in MBSs in addition to another $250 billion in agency debt and commercial paper. The policy, known as "QE1," abandoned the Fed's longstanding policy of buying predominately short-term Treasuries. The Fed sought to drive housing prices back up and reduce risk premiums in the housing finance market. According to the Fed's press release from November 25, 2008, "This action is being taken to reduce the cost and increase the availability of credit for the purchase of houses, which in turn should support housing markets and foster improved conditions in financial markets more generally" (Board of Governors 2008b). The Fed did not acknowledge that directing a larger share of credit toward housing markets meant a smaller share toward other market segments.

In September 2011, the Fed introduced "Operation Twist 2," whereby it sold short-term Treasuries and bought long-term Treasuries in an effort to lower long-term interest rates relative to short-term rates. The express purpose was to benefit housing finance firms, including the government-sponsored enterprise (GSE) guarantors and private holders of MBSs, by lowering rates on 30-year fixed-rate mortgages and, correspondingly, raising house prices. The operation was enlarged in June 2012. In September 2012, the Fed introduced QE3, a plan to buy $40 billion in MBSs per month, plus some Treasuries, until further notice.

To be clear, the Fed's preferential redirection of credit was not necessary for the Fed to run an expansionary monetary policy or to fight recession. Open-market purchases of Treasuries could have accomplished any desired expansion of monetary aggregates.

In fact, the Fed did not run an expansionary monetary policy (relative to trend) during the recession, or even an anticontractionary monetary policy. To Chairman Bernanke's chagrin, nominal GDP actually shrank during 2009. Both the price level and real output fell as the Fed allowed an unsatisfied excess demand for money to develop. In other words, the Fed failed to offset a sharp decline in the velocity (turnover) of M2.

The primary beneficiaries of the Fed's credit policies were financial firms heavily invested in housing. Through the final quarter of 2008, the Fed made clear its intention "to help reduce the cost and increase the availability of residential mortgage credit" (Board of Governors 2008b). The reallocation of credit to housing finance came

at a substantial cost to the rest of the real economy. Several classes of credit demanders—such as small businesses, college students, and auto buyers—complained about "tight credit conditions," while the Fed was busy diverting credit to housing (White 2015: 20). The U.S. flow of funds accounts show that despite the decline of housing construction, the growth of mortgage credit remained slightly positive throughout late 2008 and 2009, while credit to other parts of the private sector, such as nonmortgage consumer credit and total business credit, contracted (Board of Governors 2014: 3). Credit allocation policies therefore delayed the necessary adjustment in financial intermediation away from overinvestment in housing and toward more sustainable lending.

The Fed was not forthcoming about the details of the recipients and the terms of its lending. Only a freedom of information request by Bloomberg News revealed the extent to which the Fed was lending at below market interest rates. Reporters estimated that the total subsidy to the borrowers was roughly $13 billion (Ivry, Keoun, and Kuntz 2011).

The Fed's Move into Fiscal Policy

Borrowing money and spending it on bailouts, or relending it to subsidize special interests, is traditionally the role of Congress rather than the Fed. It is a fiscal policy, not a monetary policy—as it neither aims to provide liquidity to the financial system as a whole, nor to alter the trajectory of the money supply to achieve macroeconomic objectives (see Buiter 2009; Blinder 2010: 476; Meltzer 2011: 47; Cargill and O'Driscoll 2013: 428).

With its $4 trillion balance sheet, the Fed now allocates a larger proportion of the nation's credit than at any time in its history. Its evident willingness to bailout failing financial firms invites moral hazard. Because the Fed allocates funds with discretion, it invites rent seeking—that is, socially unproductive lobbying efforts from would-be recipients of preferential credit.[3] Although the postcrisis Dodd-Frank Act limits Fed rescues to "broad-based lending programs," this appears merely to ban single-firm rescues like the AIG or Bear Stearns interventions. It does not limit preferential allocation of

[3]For instance, lobbyists from the Commonwealth of Puerto Rico sought the Fed's aid to avoid default on Puerto Rican bonds in 2015.

funds to the firms in a particular segment of the financial industry, say housing finance. As Lee Hoskins and Walker Todd (2018) stated, "The Dodd-Frank Act of 2010 imposed new conditions on but did not contract the greatly expanded federal safety net and failed to reduce the substantial increase in moral hazard."

When the Fed redirects funds that would otherwise flow to more productive sectors, it stunts long-run overall economic growth. Thus, the Fed's preferential credit programs likely contributed to the sluggishness of the economic recovery after 2009.

Policy Normalization

Nine years since the official end of the Great Recession, why has the Fed not yet normalized the composition and size of its balance sheet? The special loan facilities have been wound up, but other programs have not. Only in October 2017 did the Fed start, very slowly, the process of not replacing some Treasury and MBSs as they matured. If the aim of QE, including purchases of trillions in MBSs, and of lengthening of the Fed's securities portfolio, were only to serve the public interest by promoting macroeconomic recovery, it stands to reason that the programs would have ended by now. The measured output gap, which was −6.5 percent in 2009, became slightly positive in 2018: actual output exceeds estimated full-employment output (Quandl 2018). The current unemployment rate, at 3.7 percent, is well below the estimated natural or full-employment rate.

The Fed would serve the public interest by minimizing its intervention into the allocation of credit and returning financial intermediation to private firms subject to market discipline. Delay in doing so suggests that the Fed places a higher value on special interests—particularly, the Treasury, the Fed bureaucracy, and those of rent-seeking financial institutions that have benefited from the programs in place—rather than on the welfare of society as a whole.

The U.S. Treasury has received larger income transfers from the Fed with the expansion of the Fed's balance sheet and the change in its composition from short-term Treasuries to higher yielding (riskier) MBSs and longer-term Treasuries. In the five years before the financial crisis and QE, the Fed remitted an average of $29 billion per year to the Treasury. From 2010 through

2017, the Fed remitted an average of $86.1 billion per year.[4] Total remittances for the 2010–17 period total $689 billion, which is $457 billion more than if remittances had remained at $29 billion per year. Given that the Fed's interest income on Treasury securities comes from the Treasury to begin with, we can equally think of the Fed's QE2 and QE3 purchases of Treasury securities as simply relieving the Treasury of its debt service burden on those securities.

The Fed's own budget has expanded with its balance sheet. According to the Fed's 2017 *Annual Report*, "From the actual 2008 level to the budgeted 2018 amount, the total operating expenses of the Federal Reserve System have increased an average of 4.7 percent per year. Over the same period, nondefense discretionary spending by the federal government has increased an average of 1.4 percent per year."[5] This trend may reflect a variety of factors, but it is consistent with Mark Toma's (1982) hypothesis that the Fed retains some share of additional seigniorage. The Fed cannot use its retained seigniorage to pay its employees bonuses, or to pay higher dividends to its member-bank shareholders (dividends are capped by statute), but it can increase expenditures on its own operations, especially by hiring more staff.[6]

As the logic of collective action (Olson 1965) implies, the benefits of the Fed's current policies are concentrated on the aforementioned interest groups and the costs are dispersed throughout society. The alignment of these interests favors a continuation rather than a reversal of the postcrisis status quo. Fed officials have accordingly shown very little concern for ending their credit allocation policies promptly or for shrinking the size of their balance sheet.[7] Reducing excess

[4]Data from the Fed's January 10, 2018, press release, www.federalreserve.gov/newsevents/pressreleases/other20180110a.htm. These remittances exclude the one-time $19.3 billion transfer from the Fed's capital in 2015.

[5]See www.federalreserve.gov/publications/2017-ar-federal-system-budgets.htm.

[6]"The FAST Act reduced the dividend rate applicable to Reserve Bank depository institution stockholders with total assets of more than $10 billion (large member banks) to the lesser of 6 percent or the most recent 10-year Treasury auction rate prior to the dividend payment" (Board of Governors 2016).

[7]For the evolution of Fed thinking on "exit strategies," see Bernanke (2010, 2013) and Board of Governors (2011, 2014).

reserves to a more normal level means selling off MBSs and long-term Treasuries, and thus depressing their prices—which is contrary to the interests of housing finance firms. On October 25, 2018, Richard Clarida, vice chairman of the Fed's Board of Governors, gave a talk at the Peterson Institute on the "Outlook for the U.S. Economy and Monetary Policy." Although he used the term "normalization," he said nothing about shrinking the balance sheet, ending Operation Twist 2, or IOER (see Clarida 2018).

Conclusion: Toward a Nondiscretionary Future

The highly discretionary nature of the Federal Reserve's credit policies means that a great deal rides on the theoretical views and tactical concerns of the Fed's leadership. Under a purely discretionary regime, future Fed policy is highly uncertain. That is why Milton Friedman (1962: 50) argued that "any system which gives so much power and so much discretion to a few men . . . is a bad system."

One way to limit discretion is through institutional reform that would replace the present-day Fed with an arrangement bound by a strict constitution. Many authors have written about desirable features and characteristics of a monetary constitution (see, e.g., Yeager 1962; White, Vanberg, and Köhler 2015; Buchanan 2010; Horwitz 2011; and Salter 2014). Regardless of the specifics, under a constitutional approach either no monetary authority exists, or it is subject to a binding rule specifying a policy target and delineating allowable actions in pursuit of that goal.

A movement to tie the Fed's hands cannot be expected to arise from the Fed's current beneficiaries—namely, Congress, the Fed's leadership, or the recipients of Fed largesse in the financial industry and academia. For this reason Wagner (1986: 532) argued that "monetary reform without political reform to redress the rent-seeking excesses of prevailing political institutions seems likely to be a short-lived aberration." Thus, the goal of constitutional monetary reform needs to be linked to the broader goal of constitutional fiscal reform to adopt what Buchanan (1962) called a "generality norm," requiring that federal programs be beneficial to citizens in general, rather than providing rents to some at the expense of others. Concerned scholars and citizens will have to propose appropriate rules for fiscal as well as monetary policies, and offer guidance on how to move toward a rules-based monetary and fiscal regime.

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Improving the Monetary Regime: The Case for U.S. Digital Cash

Michael D. Bordo and Andrew T. Levin

A fundamental purpose of the monetary system is to provide a stable unit of account that facilitates the economic and financial decisions of households and businesses. Thus, as of a few decades ago, monetary economists were primarily concerned about how to prevent a recurrence of the "Great Inflation"—that is, how to design a systematic and transparent monetary policy framework that would ensure low and stable inflation.

More recently, however, a number of advanced economies have experienced protracted periods of relatively weak aggregate demand, with inflation falling persistently short of its stated objective and conventional monetary policy constrained by the effective lower bound (ELB) on nominal interest rates that arises from the zero interest rate on paper cash. Consequently, a number of major central banks—including the Bank of Japan, the European Central Bank, and the Federal Reserve—have deployed unconventional policies such as quantitative easing that have proven to be complex, opaque, discretionary, and ineffectual.

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Thus, a crucial task now is to strengthen the U.S. monetary system to ensure that the Federal Reserve can provide sufficient monetary stimulus to preserve price stability and foster economic recovery even in the face of severe adverse shocks. One potential option would be to raise the inflation target by several percentage points, essentially allowing inflation to return to the levels last experienced a half-century ago. By raising the normal level of nominal interest rates, the Federal Reserve would have more room to cut rates sharply without being constrained by the ELB; see Blanchard, Dell'Aricca, and Mauro (2010), Ball (2014), and Ball et al. (2016). However, such an approach would complicate the decisions and plans of ordinary families and businesses, and the inflation target would most likely become a political football rather than a credible anchor.

Therefore, our analysis indicates that the Federal Reserve should take active steps to establish digital cash as the fulcrum of the U.S. monetary system.[1] Digital cash—often referred to as "central bank digital currency"—can serve as a practically costless medium of exchange and as a secure store of value that yields essentially the same rate of return as U.S. Treasury bills. Individuals and businesses would remain free to use paper cash if desired, but its obsolescence would be accelerated by the convenience, security, and ubiquity of digital cash. Arbitrage between paper cash and digital would be mitigated by a graduated system of transfer fees, thereby eliminating the ELB. Thus, the Fed would be able to follow a systematic and transparent strategy in adjusting the interest rate on digital cash, without the need to rely on unconventional policy tools, and would be able to foster true price stability.

The remainder of this article is organized as follows. We begin by documenting the muted effectiveness of unconventional monetary policy tools. We then set forth basic principles for the design of digital cash, discuss the characteristics of the monetary policy framework, consider some near-term practical steps that the Federal Reserve can take in the process of establishing U.S. digital cash, reflect on financial stability issues, and offer some concluding remarks.

[1]A number of central banks are actively exploring the potential introduction of digital cash. Most notably, the Sveriges Riksbank has been engaged in public consultations about introducing digital cash ("e-krona") in Sweden; see Skingsley (2016) and www.riksbank.se/en-gb/payments—cash/e-krona.

Assessing Unconventional Monetary Policies

Paper cash pays zero interest and hence limits the extent to which a central bank can provide conventional monetary accommodation by reducing nominal interest rates in the face of weak aggregate demand and persistently low inflation. In the wake of the global financial crisis, the Federal Reserve and other major central banks became constrained by this ELB and deployed two basic forms of unconventional monetary policy: quantitative easing (QE) in the form of large-scale asset purchases, and forward guidance about the likely trajectory of short-term nominal interest rates. Each of these policy tools is intended to provide monetary stimulus, thereby fostering the pace of economic recovery and bringing inflation back upwards to its stated objective; thus, these tools are intrinsically different from the emergency liquidity measures that a central bank may implement in serving as a lender of last resort during a financial crisis.

In deploying these unconventional policies, central bankers and other analysts were quite optimistic that implementing QE and forward guidance could substantially mitigate the severity of the ELB. However, those projections relied heavily on extrapolations from statistical patterns over preceding decades and on event studies of policy actions taken in the midst of the financial crisis. Consequently, such assessments were necessarily subject to a high degree of uncertainty.[2] With the passing of time, however, it has become increasingly evident that QE and forward guidance are subject to intrinsic limitations and hence have relatively muted benefits in providing monetary stimulus; see Borio (2018), Greenlaw et al. (2018), and Hamilton (2018). This suggests that the Fed may be hampered in offsetting the next recession more than it believes.

The Federal Open Market Committee (FOMC) began providing specific forward guidance in its August 2011 statement, which indicated that the target federal funds rate was likely to remain

[2]For example, Hamilton and Wu (2012:12) noted: "As should be clear from the description of the exercise, we are talking about a quite dramatically counterfactual event. If one considers the analogous forecasting equations,[this] would represent a 36σ event, obviously something so far removed from anything that was observed during the historical sample as to raise doubts about interpreting the parameter estimates as telling policymakers what would happen if they literally implemented a change of this size."

unchanged "at least until mid-2013." That announcement was associated with a decline of about 10 basis points in the 2-year Treasury yield—roughly similar to a small surprise in conventional monetary policy during the precrisis period; see Williams (2013). By contrast, subsequent revisions in the Federal Open Market Committee's forward guidance in January 2012 ("at least through mid-2014") and in September 2012 ("at least through mid-2015") were associated with very small reductions in the 2-year Treasury yield of about 4 basis points and 1 basis point, respectively. Finally, in December 2012, the FOMC reframed its forward guidance in terms of specific quantitative thresholds for unemployment and inflation. According to the Federal Reserve Bank of New York's survey of primary dealers, that reframing came as a surprise to financial market participants but had negligible effects on their expectations regarding the likely timing of liftoff from the ELB.

The Federal Reserve initiated its first round of large-scale asset purchases (QE1) during the most intense phase of the financial crisis. In particular, at the tail end of 2008 and the first half of 2009, the Fed purchased $1.35 trillion of agency debt and mortgage-backed securities, predominantly issued by Fannie Mae and Freddie Mac, with the specific aim of "providing support to the mortgage and housing markets" by reducing risk spreads on those securities.[3] QE1 also included $300 billion in purchases of Treasury securities. In 2010–11, the FOMC initiated purchases of an additional $600 billion in Treasuries (QE2) and a program to expand the average maturity of its Treasury holdings (often referred to as "Operation Twist"). Nonetheless, the recovery remained sluggish and inflation remained well below target.

The FOMC's third major round of asset purchases, commonly known as QE3, was launched in autumn 2012 and concluded about two years later. The Federal Reserve concluded all of its emergency lending programs during 2009–10, and measures of U.S. financial stress remained at low levels thereafter. Thus, the QE3 program was clearly aimed at providing additional monetary stimulus. Indeed, the FOMC specifically stated that QE3 was intended to push down longer-term bond yields, thereby fostering a more rapid economic recovery and pushing inflation upwards to the FOMC's 2 percent goal.

[3]See www.federalreserve.gov/newsevents/pressreleases/monetary20081216b.htm.

In explaining the rationale for launching QE3, Federal Reserve officials extensively cited the analysis of Chung et al. (2011), who conducted simulations of the FRB/US model to assess the benefits of QE; see Bernanke (2012, 2014) and Yellen (2012, 2015). That Federal Reserve study indicated that a $600 billion asset purchase program would reduce the term premium by 20 basis points, expand nonfarm payrolls by about 700,000 new jobs, raise real GDP by nearly 1 percent, and push up core inflation by about 0.3 percent. Given that the FRB/US model is essentially linear, the predicted macroeconomic effects of QE3 (which comprised $1.9 trillion in purchases) would be roughly three times larger—reducing the term premium by 60–70 basis points, expanding nonfarm payrolls by 2 million jobs, raising real GDP by about 3 percent, and raising core inflation by nearly a percentage point.[4] Indeed, internal staff memos that were sent to the FOMC in 2012 (and which have been subsequently released to the public after a five-year time lag) used this methodology to quantify the likely benefits of the QE3 program.[5]

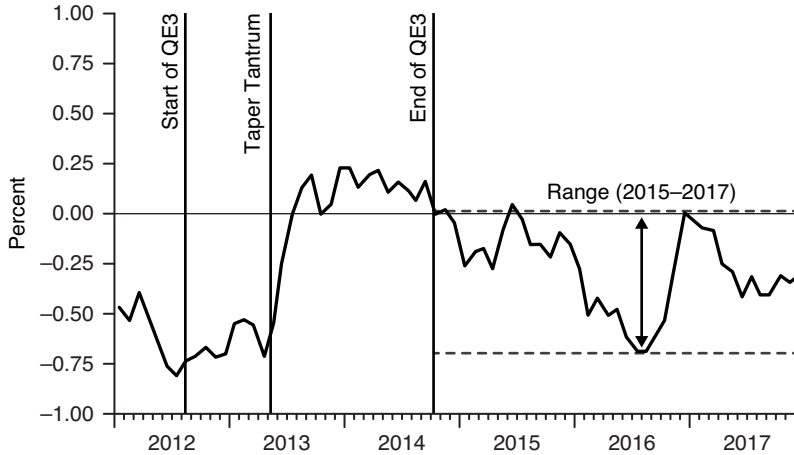
Nonetheless, as shown in Figure 1, the term premium on 10-year U.S. Treasury securities was broadly stable during the second half of 2012 and the first quarter of 2013, even as the FOMC initiated QE3. The surveys of primary dealers conducted by the Federal Reserve Bank of New York indicate that the launch of QE3 was largely unanticipated prior to September 2012 and that over subsequent months financial market participants made large upward revisions to their assessments of its likely duration and cumulative size.

Any near-term effects from launching QE3 were subsequently swamped by the so-called taper tantrum in spring 2013. At that time, Fed officials suggested that the tantrum was a transitory phenomenon and that bond yields would quickly subside. However, the New York Fed's June 2013 survey indicated that most primary dealers attributed the tantrum to market confusion about the FOMC's policy strategy. And the term premium remained elevated over the subsequent year, even as investors made further upward revisions about

[4]The FRBNY's parallel analysis by Chen, Curdia, and Ferrero (2012) obtained much smaller effects of QE, roughly one-eighth those of Chung et al. (2011). However, those results were not cited by Bernanke (2012) or Yellen (2012).

[5]See the staff memos by Laforte et al. (2012) and Cambron et al. (2012), which were sent to the FOMC on August 28, 2012 and November 30, 2012, respectively.

FIGURE 1
Term Premium on U.S. 10-Year Treasury Securities



Source: Federal Reserve Board, authors' calculations.

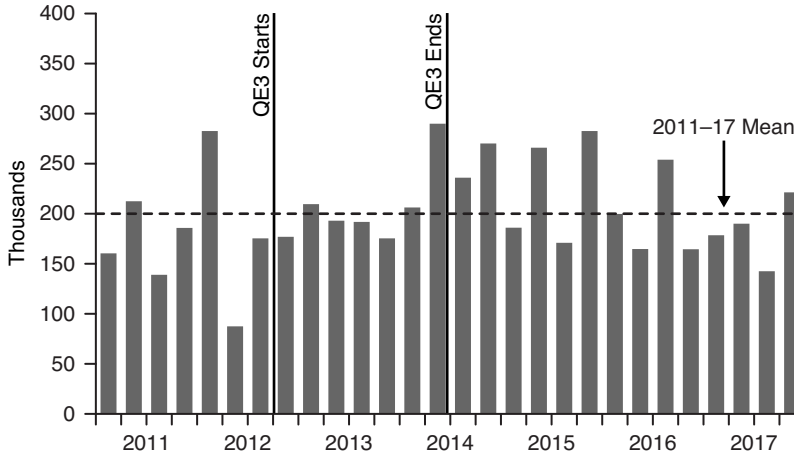
the likely size of the Fed's balance sheet, and did not fall significantly until after the end of QE3 in late 2014.

As shown in Figure 2, the launching of QE3 and the initiation of explicit forward guidance appear to have had only muted effects on the U.S. labor market. Growth in nonfarm payrolls during 2013–14 was practically identical to its average pace from 2011 to 2017, with no evident acceleration due to QE3 nor any apparent deceleration following the conclusion of QE3.

Likewise, QE3 had no visible impact on the broader U.S. economy, as evident in Figures 3 and 4. Real GDP growth remained in a narrow range of about 1.50 to 2.75 percent from 2011 through 2016; the only exception was a temporary pickup in the first half of 2015, well after the conclusion of the QE3 program. Likewise, core PCE inflation (the Fed's preferred measure of underlying inflation) averaged just over 1.5 percent during 2013–14, little different from its average pace over preceding and subsequent years.

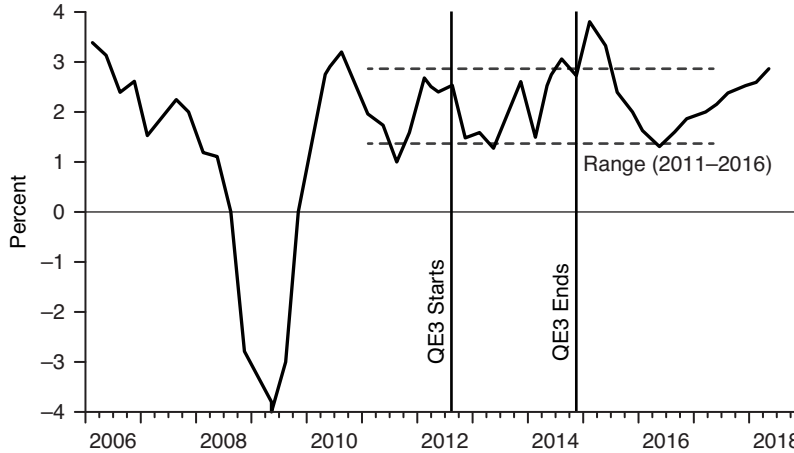
Evidently, the transmission mechanism of QE is fundamentally different from that of conventional monetary policy. A long empirical literature has documented that an unanticipated shift in the target federal funds rate has a significant impact on output and employment

FIGURE 2
Monthly Growth of U.S. Nonfarm Payrolls
(Quarterly Average)



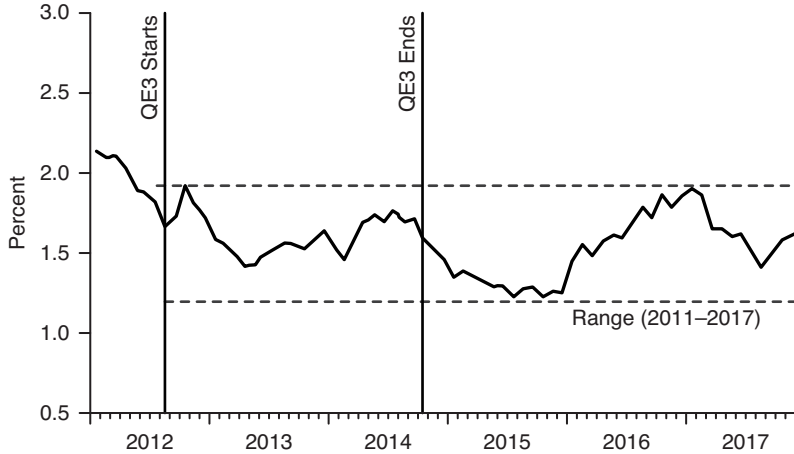
Source: Bureau of Labor Statistics, authors' calculations.

FIGURE 3
U.S. Real GDP Growth



Source: Bureau of Economic Analysis, authors' calculations.

FIGURE 4
U.S. Core PCE Inflation



Source: Bureau of Economic Analysis, authors' calculations.

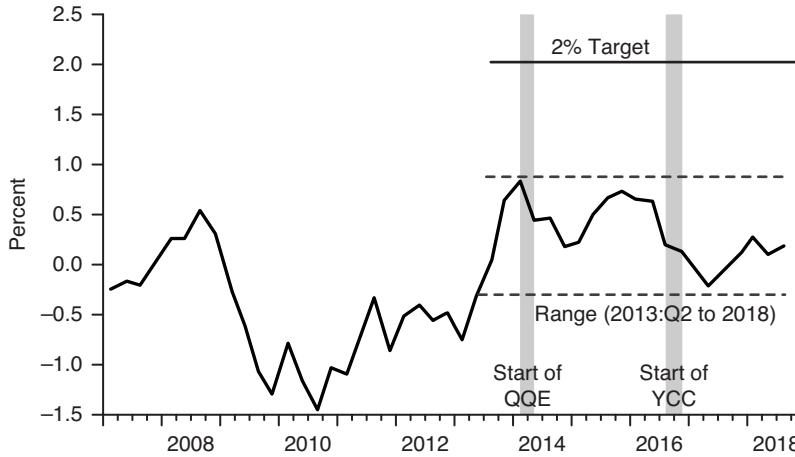
within a few months and a peak effect within a few quarters.[6] By contrast, the launch of QE3 in autumn 2012 (which was almost entirely unanticipated prior to late August) had no visible impact on nonfarm payrolls or real GDP growth in 2013–14.

Further evidence on the muted effectiveness of unconventional monetary stimulus can be obtained by considering the recent experiences of other major economies where conventional policy has been constrained by the ELB. For example, the Bank of Japan (BOJ) launched its quantitative and qualitative easing (QQE) program in April 2013 and augmented that program in September 2016 by initiating yield curve control (YCC).[7] Under QQE the BOJ's securities holdings have expanded by about ¥400 trillion, equivalent to roughly 80 percent of Japanese GDP. As shown in Figure 5, however, Japanese core-core inflation (excluding food and energy prices and the direct effects of the 2014 VAT hike) has remained far below the

[6]See the seminal contributions of Sims (1980), Christiano, Eichenbaum, and Evans (1999), and Romer and Romer (2004).

[7]See www.boj.or.jp/en/mopo/outline/qqe.htm.

FIGURE 5
Japanese Core-Core CPI Inflation
(Excluding Food, Energy, and VAT Effects)



Source: Japan Statistics Bureau, authors' calculations.

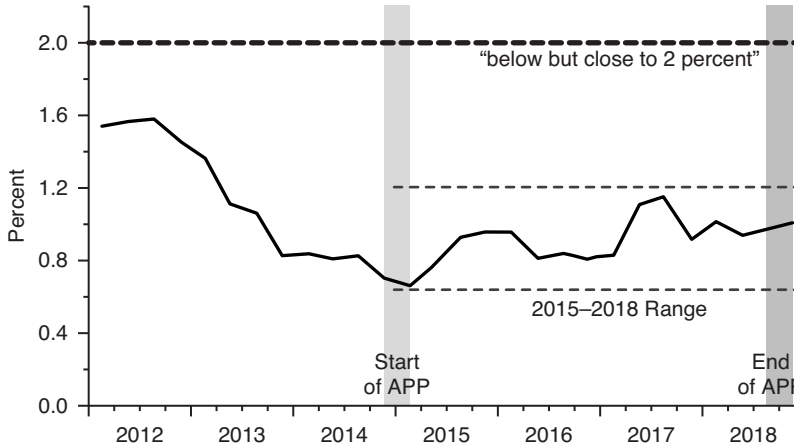
BOJ's 2 percent inflation target. Indeed, over the past year this indicator and other BOJ measures of underlying inflation in Japan have been mired close to zero.

The European Central Bank (ECB) announced its asset purchase program (APP) in late 2014 and initiated large-scale securities purchases—including government securities, corporate bonds, covered bonds, and asset-backed securities—in March 2015. Since that time, the ECB's asset purchases have totaled about 2.5 trillion euros, equivalent to about 15 percent of eurozone GDP. The ECB has specifically stated that this program was intended to "address the risks of too prolonged a period of low inflation."[8]

As shown in Figure 6, eurozone core inflation (i.e., the 12-month change in the harmonized index of consumer prices excluding food, energy, alcohol, and tobacco) has crept upwards to around 1.1 percent in 2018 (an increment of 0.3 percent from its level about five years ago) but remains far below the ECB's objective of keeping inflation "below but close to 2 percent over the medium run."

[8]See www.ecb.europa.eu/mopo/implement/omt/html/index.en.html.

FIGURE 6
Eurozone Core Inflation
(Excluding Food, Energy, Alcohol, and Tobacco)



Source: European Central Bank, authors' calculations.

Fundamental Design Principles

With an appropriate design, digital cash can fulfill the three basic functions of money, serving as a practically costless medium of exchange, a secure store of value, and a stable unit of account.[9]

Medium of Exchange

Digital cash should serve as legal tender, usable for all public and private payment transactions. In the case of fiduciary currency, increasing returns and network externalities provide a strong rationale for currency to be issued by a public authority, as emphasized by classical economists. The same essential reasoning holds for digital cash.

One potential means of issuing digital cash would be in the form of electronic tokens, analogous to paper cash and stored-value debit cards. Under a token-based approach, however, verification might well be time-consuming and inefficient (as with other uses of

[9]See Bordo and Levin (2018) for a comprehensive discussion of design principles for digital cash.

distributed ledger technology). Moreover, there would be no intrinsic limit on the size and scope of fraud, and hence hackers could potentially undermine the entire payments system.

Another potential approach would be for individuals and firms to have digital cash accounts at the central bank itself. Such an approach is reminiscent of an earlier era when some private individuals held accounts at the Bank of England. Nonetheless, it seems undesirable for the central bank to start competing directly with commercial banks in attracting deposits, especially in cases where the central bank also regulates and supervises those banks. Such an approach would also raise a host of concerns about privacy and bureaucratic inefficiencies and could pose risks to financial stability—for example, depositors shifting their funds from commercial banks to the central bank at the onset of a financial crisis; see Keister and Sanchez (2018).

Thus, our analysis indicates that digital cash should be provided through designated accounts held at supervised depository institutions, which would hold part or all of those funds in segregated reserve accounts at the central bank. This approach would foster competition among digital cash providers and protect the privacy of individual transactions while facilitating appropriate law enforcement. In effect, the provision of digital cash would be similar to that of many other public goods such as water, electricity, and transportation.

Under this approach, payment transaction can be transmitted instantaneously and securely at practically zero cost, simply debiting the payer's digital cash account and crediting the payee's digital cash account. The scope and scale of fraudulent transactions can be mitigated by straightforward and convenient methods such as two-step identity verification.

Of course, individuals and firms should remain free to hold funds at private financial institutions and to make payment transactions using private forms of payment or paper cash. However, once digital cash becomes convenient and ubiquitous, the demand for paper currency will rapidly diminish.

Store of Value

In an efficient monetary system, the medium of exchange should also serve as a secure store of value that bears the same rate of return as other risk-free assets—that is, the opportunity cost of holding money should be essentially zero, as in Friedman (1960). Indeed, this

feature is one of the fundamental reasons for public sector involvement in the provision of money, whether through issuance of central bank currency or official backing of privately issued forms of money. By contrast, any purely private form of money (i.e., not backed by the government) is intrinsically subject to default risk and hence cannot serve as a reliable medium of exchange or a stable unit of account.

Of course, paper cash pays no interest and hence is a deficient store of value under most circumstances. Under the FOMC's current inflation target of 2 percent, the real value of paper currency (i.e., its purchasing power in terms of consumer goods and services) is steadily declining over time. Moreover, this "inflation tax" is highly regressive, because paper currency is mostly used by ordinary families and small businesses, whereas wealthy individuals and large corporations can hold funds in highly liquid interest-bearing accounts (such as money market funds). And raising the inflation target to 4 or 5 percent would impose an even higher and more regressive inflation tax.

In contrast, digital cash accounts can bear interest at essentially the same rate as Treasury bills, thereby serving as a secure store of value. Such an arrangement is a natural extension of the current system in which the Federal Reserve pays interest on the reserves of commercial banks and issues interest-bearing liabilities to a much wider array of financial counterparties thru its reverse repo facility. In effect, digital cash accounts can be viewed as tightening the link between the interest that banks earn on their reserves and the interest that they pay to ordinary depositors.

In this framework, the interest rate on digital cash can serve as the Federal Reserve's primary monetary policy tool. During normal times, this interest rate would be positive. But in the face of a severe adverse shock, the Federal Reserve would be able to cut the digital cash interest rate below zero to foster economic recovery and preserve price stability; see Goodfriend (2000, 2016), Buiter (2009), and Agarwal and Kimball (2015). As discussed below, such a system would appropriately insulate ordinary households and small businesses from incurring negative rates on their digital cash accounts.

Unit of Account

Providing a stable unit of account facilitates the economic and financial decisions of individuals and firms. A digital cash system would do this by adjusting the digital cash interest rate.

Indeed, because the digital cash interest rate can be adjusted downward as needed, there will no longer be a compelling rationale for the central bank to target a positive average rate of inflation. Therefore, the monetary policy framework could ensure true price stability—that is, the real value of digital cash would remain stable over time as measured in terms of a general index of consumer prices.[10]

Of course, an abrupt change in the FOMC's inflation objective would likely be disruptive due to nominal rigidities in wage and price setting; see Taylor (1983) and Bordo et al. (2007). Consequently, the transition from a positive inflation target to a stable price level should be carefully planned and managed so that this transition is well understood by the public and fully incorporated into the plans of households and firms.

The Monetary Policy Framework

Digital cash would facilitate the systematic and transparent conduct of monetary policy, thereby facilitating the effectiveness of the monetary transmission mechanism and enhancing the central bank's accountability to elected officials and the public.

Transparency

To facilitate transparency and public accountability, the interest rate on digital cash would serve as the primary tool of monetary policy. In particular, policymakers would be able to push market interest rates below zero in response to a severe adverse shock, and hence the central bank would be able to provide an appropriate degree of monetary accommodation without resorting to QE.

Thus, the central bank's balance sheet would become very transparent. In particular, the central bank could hold short-term government securities in the same quantity as its liabilities of digital cash. Since QE would no longer be necessary, the size of the central bank's balance sheet would simply reflect the demand for digital cash, and the

[10]This design for digital cash embeds the most appealing features of the classical gold standard while avoiding its pitfalls. Indeed, the general price level was not stable during that era; see Bordo (1984). It also resonates with Alfred Marshall's tabular standard, Irving Fisher's compensated dollar, and Knut Wicksell's plan to use interest rate adjustments to foster price stability.

maturity composition of government debt held by the public would be determined by the fiscal authorities and not the central bank.

The central bank's operating procedures would be correspondingly transparent: It would engage in purchases and sales of Treasury securities to adjust the supply of digital cash in line with movements in demand for digital cash. The spread between the digital cash interest rate and interest rates on short-term government securities would be negligible due to practically costless arbitrage between these risk-free assets. With the obsolescence of paper currency, the central bank would no longer generate substantial seigniorage and would simply cover its expenses via miniscule fees on payment transactions.

Systematic Policy

The central bank's strategy for adjusting the digital cash interest rate can be expressed using a simple benchmark as follows:

$$i_t = \tilde{\pi}_t + r_t^* + \alpha(\tilde{p}_t - p^*) + \beta(p_t - p^*) + \delta(y_t - y_t^*).$$

This formulation is essentially a variant of the Taylor Rule; see Taylor (1993). However, this benchmark is oriented toward stabilizing the price level rather than the inflation rate. In particular, the central bank uses the digital cash interest rate (i_t) to keep the actual price level (p_t) stable at its target level (p^*). The digital cash interest rate also reacts to deviations in a core measure of the price level ($\tilde{p}_t$) and to deviations of real GDP from its potential ($y_t - y_t^*$).

As in the Taylor rule, this specification can be viewed as a benchmark for adjusting the real interest rate in response to fluctuations in economic activity and prices. In particular, the ex post real interest rate is given by the nominal interest rate (i_t) adjusted for core inflation ($\tilde{\pi}_t$). When the price level is on target and output is at potential, then the real interest rate is set at its equilibrium value (r_t^*).

Practical Steps

In light of these design principles, it's natural to ask whether digital cash is truly feasible in the United States, and if so, over what time frame? Rather than decades or centuries, our analysis indicates that the Federal Reserve could take the essential steps by 2020, although further refinements would surely take place in subsequent years. In particular, the Federal Reserve should (1) establish a real-time clearing and settlement system that facilitates efficient payments for

consumers and businesses, and (2) facilitate the establishment of safe and liquid bank accounts that accrue essentially the same rate of return as Treasury bills.

Real-Time Clearing and Settlement

As noted above, a key feature of digital cash is to serve as an *efficient medium of exchange*. Thus, a real-time clearing and settlement system is crucial for facilitating secure payments and eliminating counterparty risks by finalizing such transactions within minutes rather than hours or days.

A task force commissioned by the Federal Reserve concluded last year that "broad access to settlement services will help level the playing field and enhance competition among providers of faster payments services." That task force called on the Fed to "begin efforts immediately" on a real-time payment system that could be implemented "by 2020."[11]

While a two-year time frame might seem overly ambitious, the recent experience in Europe demonstrates that such a time frame is indeed practical. Following about nine months of consultations with financial institutions and other stakeholders, the European Central Bank reached a decision in June 2017 to establish a new system called Target Instant Payments Settlement (TIPS). The logistical details have been worked out over the past fifteen months, and the new system is coming online this month.[12]

Moreover, the ECB's new system embodies the principle that digital cash payments can be secure, rapid, and practically costless. TIPS will offer final and irrevocable settlements of instant payments in euros and will operate on a cost-recovery and not-for-profit basis. In particular, entry and account maintenance will be free of charges, and each payment transaction will be subject to a fee of 0.2 eurocents (0.002) or less.

In light of these considerations, the Federal Reserve has recently issued a *Federal Register* notice calling for public comments on the

[11]The Faster Payments Task Force was created in 2015 as a broad and inclusive group of stakeholders with representatives from financial institutions, payment providers, businesses, consumer groups, public agencies, and other experts. Its conclusions are posted at https://fedpaymentsimprovement.org/wp-content/uploads/faster-payments-task-force-final-report-part-two.pdf.

[12]See www.ecb.europa.eu/paym/target/tips/html/index.en.html.

possibility of developing a real-time interbank settlement service along with tools for performing real-time transfers between Federal Reserve accounts.[13] The comment period will close on December 14. Following its review of that public input, the Federal Reserve Board should move forward in carrying out the recommendations of its task force and expediting the establishment of a secure and efficient real-time payment system.

Interest-Bearing Digital Cash

Another key design principle is that digital cash should serve as a *secure store of value* that bears the same rate of return as other risk-free assets, thereby eliminating the opportunity cost of holding money. In effect, consumers and businesses should be able to receive essentially the same interest on checkable deposits and other current accounts that commercial banks receive on reserves held at the Federal Reserve—that is, the interest rate on reserves (IOR) less a very small margin to cover operating costs.

While interest-bearing digital cash might seem like a dramatic new development, in fact the Federal Reserve has already implemented measures that are essentially similar. A wide range of financial institutions (e.g., money market funds) can earn interest on overnight repo transactions with the Federal Reserve Bank of New York.[14] Moreover, the Federal Reserve Banks now have authority to maintain segregated deposit accounts for systemically important financial market utilities (FMUs) so that the customers of those FMUs may rest assured that their funds are secure, liquid, and interest-bearing.[15]

In a competitive banking system, it would be reasonable to expect that the interest rate on liquid deposits would roughly match or exceed the IOR. After all, commercial banks are only required to

[13]See www.federalreserve.gov/newsevents/pressreleases/other20181003a.htm.

[14]Information about the design of the Federal Reserve's reverse repo facility and the expanded range of counterparties is available at www.newyorkfed.org/markets/rrp_faq.html.

[15]For example, segregated reserve accounts at the Federal Reserve Bank of Chicago have been created to hold the funds of customers of the Chicago Mercantile Exchange (http://www.cmegroup.com/notices/clearing/2017/03/Chadv17-107.html) and the initial margin accounts of customers of ICE Clear Credit (www.theice.com/publicdocs/clear_credit/circulars/Circular_2017_015_FINAL.pdf).

hold a small fraction of their liquid deposits as reserves at the Federal Reserve (which accrue the IOR), and they can earn a higher return by lending out the rest of those funds or investing in Treasury securities and other safe assets. In fact, however, most checkable deposits earn little or no interest, and even short-term savings accounts accrue interest at a rate far below that of IOR. In effect, a substantial portion of banks' current profit margin is being earned by paying noncompetitive rates on the deposit accounts of American families and small businesses.

One simple way to foster a more competitive banking system would be to encourage the establishment of narrow banks. The business model of a narrow bank is remarkably simple and transparent, because such a bank holds 100 percent of its deposits as reserves at the Federal Reserve. Thus, such deposits can accrue interest at essentially the same rate as IOR (less a small margin to cover the bank's operating costs).

Narrow banks could significantly enhance the competitiveness of the banking system without displacing most conventional banks. After all, huge banks obtain the bulk of their funding from wholesale markets and earn profits from managing complex portfolios, while community banks specialize in "relationship banking" with small businesses and local residents.

It should be feasible for a narrow bank to operate under the same legal arrangements as as any other commercial bank, namely, a charter from a state banking agency or the Treasury Department. Moreover, it seems reasonable that a narrow bank would have no need for FDIC insurance or access to the Fed's discount window, since its deposits would be inherently safe and liquid. The only step that hinges on Fed approval is the creation of an account at a Federal Reserve Bank in which the narrow bank can hold its funds and accrue IOR.

In light of these considerations, the Federal Reserve should welcome the establishment of narrow banks. To the extent that some Fed officials have substantive concerns about such an approach, the Fed should initiate a transparent and inclusive consultative process similar to the approach that it has taken with respect to establishing a real-time payments system. In particular, the Fed would commission a broad and inclusive task force—with representatives from financial institutions, community groups, and other stakeholders—that would carefully consider the merits and potential pitfalls of

narrow banks. If that task force concludes that narrow banks would indeed be beneficial to the general public, then the Federal Reserve should move expeditiously to facilitate their creation and thereby facilitate the goal of ensuring that the medium of exchange also serves as a secure store of value.

Mitigating the ELB

Given the evident shortcomings of unconventional monetary policies, it is crucial to ensure that the Federal Reserve and other central banks have the ability to foster economic recovery and preserve price stability, even in the face of severe adverse shocks. Indeed, while a decade has passed since the onset of the financial crisis, there is no room for complacency; the global economy remains turbulent, and no one can accurately predict how many more years will pass before the next major downturn. Thus, a key priority is to take steps to mitigate or eliminate the ELB on nominal interest rates.

As noted above, one potential option for mitigating the ELB would be to raise the inflation target to around 4 or 5 percent or perhaps even higher. However, raising the inflation target to mitigate the ELB seems to illustrate the adage of "throwing out the baby with the bath water." After all, the Federal Reserve—like most other central banks—has a legal mandate that specifically refers to fostering stable prices, and it is difficult to see how such a mandate could be squared with returning to the levels of inflation that generated a public outcry in the 1970s. Such a marked departure from price stability would complicate the decisions and plans of ordinary families and businesses, perhaps leading to widespread adoption of inflation indexation clauses that would in turn undermine the central bank's ability to keep inflation stable. Moreover, concerns about excessive and volatile inflation would become the subject of election debates, and the inflation target would become a political football rather than a credible anchor.

A far superior plan is to promote the use of digital cash and accelerate the obsolescence of paper cash. It would be completely inappropriate to abolish paper currency; individuals and businesses should remain free to use it for legitimate purposes, though not for criminal activity or money laundering; see Rogoff (2016). But paper cash is inefficient and costly at every stage of retail use: supplying ATMs, maintaining cash registers, using armored cars for transport, and ensuring that no cash is lost or stolen at any point in this process.

By comparison, digital cash can be used instantly at practically no cost at all. Thus, as digital cash comes into widespread use, it seems reasonable to expect that paper cash will become practically extinct, just like typewriters and audio cassette tapes.

In addition, central banks should establish a graduated system of fees for transfers between paper cash and digital cash. Small transfers—say, up to $100 per week for an individual or $10,000 for a small business—would be completely exempt from such fees. Moderately larger transfers would be subject to a nominal fee (e.g., 2–3 percent), roughly similar to the size of withdrawal fees at many ATMs and cash service fees incurred by many small businesses. And the largest transfers (say, over $5,000) would be subject to an even larger fee (e.g., 5–10 percent). These arrangements would effectively curtail incentives for arbitrage between paper cash and digital cash, thereby eliminating the ELB, while ordinary consumers and small businesses would remain free to use paper cash if so desired.

Finally, the monetary system should appropriately insulate ordinary households and small businesses from incurring negative rates on moderate levels of digital cash balances. For example, an individual might hold funds in a single digital cash account, and moderate balances in that account (e.g., up to $5,000) could be exempt from negative rates, while balances exceeding that limit would be subject to the negative interest rate.[16] Of course, individuals and businesses would also be free to hold multiple digital cash accounts at various financial institution banks; in such instances, one of those accounts would need to be designated as the user's "primary" digital cash account, and the exemption would only apply to the funds held in that particular account.

With this design, the Federal Reserve would be able to effectively foster economic recovery and price stability without imposing implicit taxes or fees on the digital cash balances held by ordinary households and small businesses. After all, the crux of the rationale for cutting the digital cash interest rate below zero is to influence the incentives of wealthy investors and large financial firms—not to penalize moderate account balances that facilitate day-to-day payment transactions.

[16]In effect, the yield on digital cash accounts would be analogous to that of U.S. Treasury Inflation Protected Securities (TIPS), which provide compensation for positive inflation but never shrink in nominal value.

Financial Stability

During a financial crisis, the central bank can expand the stock of digital cash as needed to provide emergency liquidity to supervised financial institutions. Alternatively, the central bank could extend such emergency safeguards to another public agency such as a bank regulator or the deposit insurance fund. Appropriate legal safeguards will be necessary to ensure that the lender of last resort actions do not undermine the central bank's ability to carry out its commitment to price stability.

In the event of a financial crisis, the central bank would be able to reduce the digital cash interest rate below zero, thereby preventing runs from other financial assets into digital cash. In effect, a widening of risk spreads would be reflected by a corresponding drop in the risk-free interest rate, rather than a surge in private lending rates (which would remain close to normal levels). Moreover, this policy strategy generates a steep yield curve that facilitates the expansion of bank credit and fosters prudent risk-taking—precisely the opposite of QE and "lower for longer" forward guidance that encourage search-for-yield behavior. Thus, digital cash would foster a more rapid V-shaped recovery instead of the U-shaped recoveries seen in the United States and other advanced economies in recent years.

Conclusion

Although memories of the financial crisis are gradually receding, the global economy remains turbulent and unpredictable. Moreover, the "new normal" for the target federal funds rate is now expected to be around 3 percent—markedly lower than its level preceding that crisis—and hence the ELB is very likely to reemerge as a binding constraint on conventional monetary policy in coming years. And a clear lesson from recent experience is that unconventional monetary policy tools are complex, opaque, and ineffectual.

Therefore, an urgent priority for the Federal Reserve and other major central banks is to move ahead with the provision of digital cash as a means of mitigating the ELB. This approach will ensure that monetary policy will be systematic, transparent, and effective during normal times and in responding to severe adverse shocks.

Digital cash should be provided to the public through accounts at supervised financial institutions, which hold part or all of those funds in segregated reserve accounts at the central bank. In the near term,

the Federal Reserve can take practical steps in this direction by implementing a real-time payment system and by encouraging the establishment of narrow banks. Over time, as digital cash becomes ubiquitous, the Federal Reserve should foster the obsolescence of paper cash and establish a graduated system of fees that would limit arbitrage between digital cash and paper cash. These steps will strengthen the U.S. monetary system by providing a form of money that serves as a practically costless medium of exchange, a secure store of value, and a stable unit of account.

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What Have We Learned about Central Bank Balance Sheets and Monetary Policy?

Joseph E. Gagnon

In the aftermath of the Great Recession of 2008–09, central banks conducted large-scale purchases of long-term bonds and other unconventional financial assets to stimulate economic recoveries and raise inflation toward its targeted level. Dire predictions of runaway inflation and financial distortions did not come to pass. But recovery proved much slower than had been expected. This article argues that the main lesson is that central banks need to use their powers more aggressively if confronted with a similar situation in the future. Planning now can help central banks to be more prepared later. It is also a good time to make sure central banks have all the tools they need to confront the zero bound on nominal interest rates.

A Deeper Understanding of Monetary Policy

For decades monetary policy has been focused on the manipulation of short-term risk-free interest rates to guide economic growth and inflation. John Taylor (1993) characterized desirable interest

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rate policy in his famous rule. Lower interest rates stimulate growth and inflation, whereas higher interest rates are contractionary. Michael Woodford (2003) wrote an authoritative textbook summarizing the principles of monetary policy in terms of a short-term rate of interest.[1] However, it was long understood that the existence of paper currency with a fixed interest rate of zero would make it difficult (or impossible) for central banks to push short-term interest rates substantially below zero (Hicks 1937). Any attempt to do so would cause lenders to hold their wealth in risk-free paper currency rather than accept a lower rate of return in any other form.[2]

The zero bound on short-term interest rates led Paul Krugman (1998) to conclude that the only monetary route out of deflation in Japan required a commitment by the Bank of Japan to create far more inflation in the future than anyone expected at the time.[3] He referred to this policy as a "credible promise to be irresponsible," but he questioned how easy it would be to put into practice.

This focus on the short-term risk-free interest rate grew naturally out of standard texts on monetary policy in which the central bank issues money to buy bonds (Patinkin 1965). However, the textbooks typically are silent on the maturity of the bonds held by the central bank. John Maynard Keynes (1930) was an early proponent of the possibility of central banks buying long-term bonds to influence long-term interest rates.[4] James Tobin (1969) went further and considered the implications of conducting monetary policy over a range of assets, including productive capital (equity).

[1]Woodford stresses what he calls the "Taylor principle." For stability of prices, the central bank must raise the interest rate by more than any excess of inflation over its target.

[2]Michael Bordo and Andrew Levin (2019) call for fees on the use of paper currency in order to allow for negative interest rates on electronic currency. If set sufficiently high, such fees would allow central banks to set their policy rates at potentially large negative values to fight future recessions without resort to quantitative easing (Ball et al. 2016). However, no country has yet implemented such fees. I assume in this article that a lower bound on interest rates in the vicinity of zero will remain for the indefinite future.

[3]With nominal interest rates stuck near zero, an increase in expected future inflation would lower real interest rates, which should boost spending and support the eventual increase in inflation.

[4]I thank Philip Turner for pointing this out to me.

The power of monetary policy derives from the unique ability of central banks to create liabilities with an exogenous rate of return (typically zero) that must be accepted as payment for any other asset or commodity. To ease policy, a central bank creates paper currency or bank reserves to buy financial assets and push their prices upward. If a central bank limits its purchases to short-term risk-free bonds, it may indeed reach an upper bound on asset prices that corresponds to the lower bound on interest rates.[5] However, there is no fundamental reason to restrict central bank balance sheets to short-term risk-free assets. The central bank can push up the price of any bond with a yield above zero and can always push up the prices of real assets such as equity and real estate.[6] It can also push up the prices of assets in foreign currencies by depreciating the exchange rate.[7] All of these actions raise nominal wealth, stimulate growth, and support inflation.

Milton Friedman (1969) famously proposed another form of monetary policy, distributing currency to the general public by dropping it from a helicopter. No central bank has ever conducted policy in this way (even by means other than a helicopter). Indeed, it is not clear that central banks have the legal authority to do so. Transfers to the public are generally considered to be the domain of fiscal policy. Consider the following definitions of expansionary monetary and fiscal policy:

- A monetary expansion is the creation of money to buy assets with the goal of raising their prices and reducing their rates of return.
- A fiscal expansion is the sale of assets (bonds) to fund government spending, tax cuts, and transfers to the public.

[5]The rate of return on a bond moves inversely with its price.

[6]This assertion assumes a stable long-run expected inflation rate. If the policy action raises long-run expected inflation, it is possible that it may lower the price of nominal long-term bonds. But it would lower the real, inflation-adjusted, rate of return on bonds and it would raise the prices of real assets.

[7]Lars Svensson (2000) showed how massive purchases of foreign currencies to depreciate the exchange rate were a "foolproof way" of getting an economy out of deflation. However, this approach has a beggar-thy-neighbor property in that it reallocates aggregate demand across countries without increasing global demand.

Monetary and fiscal contractions are defined as the reverse of the above operations. From these definitions, it follows that Friedman's helicopter money drop is a combination of monetary and fiscal expansion. The focus of this article is on monetary policy, but the final section revisits the possibility of Friedman's monetary-fiscal helicopter drop.

The Experience of Quantitative Easing (QE)

When their short-term policy interest rates hit zero during and after the Great Recession of 2008–09,[8] several central banks began to buy longer-term bonds in large quantities and the Bank of Japan also stepped up its purchases of equity and real estate investment trusts. Dozens of studies confirm that QE bond buying is effective at lowering long-term interest rates (Gagnon 2016). Studies also show that QE bond purchases tend to boost stock prices and depreciate the exchange rate (Rogers, Scotti, and Wright 2014). The experience of Hong Kong in 1998 suggests that purchases of equity are also profoundly stimulative (Bayoumi and Gagnon 2018).

Recovery from the Great Recession was slower than expected in many countries. The current conventional wisdom is that the 2008–09 financial crisis was unusually severe and that recoveries after financial crises are slower than other recoveries (Reinhart and Rogoff 2014). However, it is also apparent that the Fed did not ease policy as much or as rapidly as it did in previous recessions.[9] Glenn Rudebusch (2018, Figure 1) shows that his "balanced approach" version of a Taylor-type policy rule called for a federal funds rate of −7 percent in 2009, far below the near-zero rate that prevailed. As discussed in Gagnon and Sack (2018), the first QE program in 2008–09 is now estimated to have had a stimulative effect equivalent to a cut in the federal funds rate of about 1.25 percentage points below its then-target range of 0 to 0.25 percent. All the QE programs

[8]Some central banks left their policy rates slightly above zero, whereas others later moved their policy rates slightly below zero. Switzerland has the lowest policy rate, −0.75 percent. It is not clear how much lower central banks can usefully set their policy rates. For simplicity, this article refers to the lower bound on nominal interest rates as zero, though in practice it may differ somewhat from zero.

[9]In a multicountry panel, Christina and David Romer (2017) show that macroeconomic policy is enormously important in ameliorating the effects of financial crises.

at their peak in late 2013 had an effect equivalent to a cut of about 2.5 or 3 percentage points below zero. In 2009, Fed staff estimated that QE purchases would have a slightly larger effect than they now believe, but even so, the first QE program was far smaller than staff models called for.[10]

Other central banks, notably in the eurozone and Japan, were even more reluctant to use QE despite large recessions and weak recoveries. They continue to suffer greater shortfalls of inflation below target than in the United States.

In light of the novelty of the QE programs and the uncertainty surrounding the magnitude of their stimulative impact and any potential adverse side effects, it is not surprising that the Fed and other central banks chose policy stances considerably weaker than optimal. Consequently, it is also not surprising that recovery from the recession proved to be slow. An unfortunate side effect of this timidity is that the weak recovery gave credence to the views of some skeptics who argue that QE has little or no lasting impact (Greenlaw et al. 2018). A careful assessment of the skeptics' argument finds that—even if some of the initial effects of QE were transitory and unique to the crisis period—there remains a substantial long-lasting component, as confirmed by later QE episodes in Japan and Europe (Gagnon 2018).

Side effects of QE have been essentially nonexistent. Inflation has not risen above target and financial markets have not been harmfully distorted, as some economists feared.[11] Exit from the policy has proved to be smooth so far. It is debatable whether the prolonged period of ultra-low interest rates and a large Fed balance sheet contributed to recent signs of excessive risk-taking in financial markets. However, the appropriate response to risky behavior in financial markets is to increase lending and capital standards (Brainard 2018).

[10]In the March 2009 FOMC transcript, Janet Yellen (then president of the Federal Reserve Bank of San Francisco) said that the staff's optimal control model called for a federal funds rate of −6 percent. The staff presentations at that meeting suggested that a QE program close to what was adopted would move policy about one-third of the way toward the optimal control policy (www.federalreserve.gov/monetarypolicy/fomchistorical2009.htm).

[11]See the "Open Letter to Ben Bernanke" signed by 23 academic and market economists in the *Wall Street Journal* Real Time Economics column on November 15, 2010.

It is not even clear whether tighter monetary policy would improve or harm financial stability (Chodorow-Reich 2014). Moreover, if more aggressive QE had allowed for a faster recovery, the Fed could have begun its process of policy normalization sooner, perhaps forestalling any undue increase in risky activity.[12]

How to Use QE Next Time

It now appears likely that the United States and many other major economies will encounter the zero bound on policy interest rates in most future recessions (Ball et al. 2016). Yet, central banks have not conducted rigorous assessments of the optimal approach to the zero bound, in general, and QE, in particular.

The initial QE programs were announced as large one-time purchases after policy interest rates had reached a range near zero. In the United States, the first two programs were carried out without any material changes over spans of 7 to 12 months. The final U.S. program and the programs later adopted in Japan and the eurozone were structured as monthly paces of purchases that would proceed until specified economic conditions were reached. Both the one-time programs and the monthly purchase programs represented dramatic departures from the conventional policy framework in which the central bank meets regularly to review economic conditions and to set the policy interest rate accordingly. The one-time programs were like a large change in the policy rate that is not reassessed for several quarters. The flow programs were like a sequence of tiny monthly changes in the policy rate in a preset direction.

Gagnon and Sack (2018) propose an approach to QE that closely mimics the conventional policy rate-setting process. They propose that QE purchases of long-term bonds should start immediately after short-term interest rates hit the zero bound.[13] Based on central tendency estimates for several countries, they suggest that a QE purchase equivalent to 1.5 percent of GDP has a stimulative effect

[12]Lars Svensson (2016) shows that even in the absence of macroprudential tools such as capital standards, using monetary policy to fight financial excesses imposes far higher costs than benefits.

[13]Instead of stopping with an interest rate on reserves of 0.25 percent, the Fed should cut the interest rates it controls (and its target for the federal funds rate) to something slightly below zero, perhaps −0.5 percent. George Selgin (2018) argues that the Fed should not have left the rate of interest on excess reserves above zero after 2008.

roughly equal to that of a 0.25 percentage point cut in the policy rate. If the central bank decides that additional monetary stimulus is desired, it should proceed with QE purchases exactly as it would normally do with interest rate cuts.

Under the Gagnon-Sack proposal, forward guidance would not take on any special role at the zero bound. The central bank should provide guidance on future QE purchases in the same way that it provides guidance on future settings of the policy rate. The seamless transition at the zero bound would make communication easier. Conducting QE purchases would reinforce the message that the policy rate would remain at least slightly below zero for a long time, allowing longer-term interest rates also to fall slightly below zero.

Just as most interest rate moves occur in steps of 0.25 and 0.50 percentage points, most QE moves would consist of purchases of 1.5 percent or 3 percent of GDP. However, when faced with a particularly sharp deterioration in the economic outlook, as in early 2009, the central bank would be free to announce even larger QE purchases. As in the Fed's first QE program, future large programs might take several months to implement and might overlap with subsequent monetary policy meetings, but this is not a material drawback. Research shows that most of the impact of QE purchases occurs at announcement. Any future revisions to the policy stance could be added to, or subtracted from, the target for ongoing purchases.

When it is time to tighten monetary conditions after an episode at the zero bound, the current approach of the Federal Reserve and other central banks is to raise the short-term policy interest rate before allowing the QE assets to run off. This choice makes sense for two reasons: First, there is no comparable upward constraint on the policy rate, and policymakers may be more comfortable using the instrument they know best. Second, it is useful to establish the precedent of holding on to QE assets for a long time because the potency of QE depends importantly on how long markets expect the QE assets to be held. A QE purchase that was expected to be sold off soon would have little effect on bond yields or other asset prices.

Other Potential Changes to the Policy Framework

The experience of Japan shows that it is possible to drive long-term bond yields to, or even slightly below, zero. It is likely that further QE bond purchases at that point would have little stimulative impact.

Three options should be pursued to make sure the Fed does not run out of policy ammunition.

First, the Fed ought to raise its inflation target, either directly or indirectly by switching to a nominal GDP (NGDP) growth target of 5 percent (which would imply an inflation target of 3 percent as long as potential real growth is 2 percent).[14] This would push interest rates a bit further away from zero on average, creating more room before the Fed encounters the zero bound in a future recession. In order to further boost monetary potency in the event of a severe recession, the NGDP growth target ought to switch to a level target rising at 5 percent whenever the short-term policy rate hits zero. The central bank would commit to keeping its policy rate near zero until NGDP returns to the specified rising path. In other words, any shortfall of NGDP growth during the recession would be made up later. A credible level target would lower the real long-term interest rate in zero bound episodes both by extending the period of zero short-term rates and by increasing expected inflation over a medium-term horizon.[15] The Fed should always aim to achieve its target within a three-year horizon and it should cross-validate its forecasts with those of the private sector. The Fed should also use QE as needed when at the zero bound to achieve its goals in a timely manner.

Second, the Fed should be granted the power to buy any financial asset and it should make its default portfolio equal to the market portfolio of financial assets.[16] Adoption of a market-based standard would avoid concerns of credit allocation either toward the government or toward specific private sectors or firms. Conducting monetary policy through a wide range of assets would maximize the channels through which policy could influence the economy and minimize the possibility of policy being blocked by a fixed limit such as the zero bound on interest rates.

Third, the Fed should be given authority to make fiscal transfers (helicopter money) under strict rules and conditionality. Transfers

[14]For a discussion of the benefits of a higher inflation target, see Ball et al. (2016). For discussions of the benefits of nominal GDP targeting, see Beckworth (2017) and Sumner (2012).

[15]For similar reasons, former Fed chair Ben Bernanke (2017) recommended adopting a rising price level target during zero bound episodes.

[16]Most other central banks are granted the ability to purchase a wide range of financial assets, though they historically focused on government bonds and loans to banks.

should occur (1) only when short-term interest rates are constrained by the zero bound, (2) only when employment and inflation (or NGDP) are falling short of target, (3) only if the Secretary of the Treasury approves, and (4) only when using a distribution formula set in advance by Congress. The amount and timing of transfers would be determined by the Federal Open Market Committee in pursuit of its statutory mandate. The Treasury Department would transfer an equal amount of Treasury securities to the Federal Reserve to back the transfer. The main reasons for granting such power to the Fed, as opposed to using normal fiscal procedures, are that (1) the expertise for macroeconomic stabilization is primarily lodged with the Federal Reserve System and not with Congress or the Treasury Department, and (2) the Fed can act far more expeditiously than the Congress.

Conclusion

In the aftermath of the Great Recession, monetary policy was wrenched out of the narrow box of short-term interest rate management that had confined it for decades. Central bankers were forced to consider a broader and more fundamental view of monetary policy that operates on a wider range of instruments and requires large increases in their balance sheets. It is not surprising that they used these new tools timidly and the world suffered a slower recovery than was necessary. It is imperative that central bankers prepare themselves with improved policy frameworks and a clearer understanding of the tools at their disposal in order to do a better job in the next recession. It would also be useful for legislatures to grant central banks, especially the Fed, more tools to achieve their goals at the zero bound on nominal interest rates.

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The Financial Stability Case for a Nominal GDP Target

David Beckworth

Ten years after the financial crisis there is a new appreciation for the role household debt and financial fragility play in the business cycle. Though some economists recognized their importance going into the crisis, many observers did not and were blindsided by the severity of the Great Recession. Motivated by this experience, a spate of research over the past decade has refocused attention on the impact household balance sheets and the financial system have on the economy.

One line of this research has focused on household finance and how it contributed to the economic downturn in the United States (Mian and Sufi 2010, 2014; Mian, Rao, and Sufi 2013). It documents how the buildup of household debt, especially mortgage debt, during the housing boom made households susceptible to the decline in housing prices starting in 2006. This decline precipitated deleveraging by households and, in turn, curtailed consumer spending and economic growth.[1] Another vein of this research has looked at the role the financial crisis played in the U.S. economic slowdown (Brunnermeier 2009; Gorton 2012; Ricks 2016; Bernanke 2018).

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[1]Cross-country studies similarly find that those countries with rising household debt to GDP ratios generally experience slower economic growth over the medium to long-term horizons (Mian, Sufi, and Verner 2017; Lombardi, Mohanty, and Shim 2017).

It shows how a systemic run on institutional money assets caused a collapse in wholesale funding and triggered a severe credit crunch. In turn, this breakdown in financial intermediation caused economic activity to contract.[2]

While the household balance sheet and financial panic views are distinct, they are also interrelated: household deleveraging affected the health of financial firms during the crisis while the reduction in credit supply exacerbated household financial problems. Along these lines, Gertler and Gilchrist (2018) and Aikman et al. (2018) show both factors were jointly important to the emergence of the Great Recession.[3] Jordà, Schularick, and Taylor (2013, 2015, 2016), relatedly, in their cross-country studies find countries with high household debt levels tend to have a higher incidence of financial crises. Highly leveraged household sectors and financial crises, in other words, are often a jointly determined process.

This new appreciation for household debt and financial fragility can be seen from a broader perspective as the long-time coming consequence of the advanced economies credit regime that emerged in the 1980s. Jordà, Schularick, and Taylor (2017) show that private sector credit growth relative to GDP accelerated during that decade, creating a "financial hockey stick" pattern of leverage for advanced economies. They show this development has dampened business cycle volatility overall while making advanced economies more susceptible to spectacular financial crashes.

This renewed interest in household balance sheets and financial system stability has led to several different policy recommendations. First, the IMF, BIS, and policymakers in many advanced economies have called for macroprudential regulation. This approach focuses on the stability of the entire financial system and works by adjusting buffers—such as countercyclical capital requirements and caps on loan to value ratios—to respond to aggregate financial shocks.

This approach, however, is not without its challenges. It is hard to know what is a true financial vulnerability, what are the appropriate

[2]Cross-country analysis similarly finds that those countries with greater financial vulnerabilities leading up to the crisis experienced larger economic losses after the crisis (IMF 2018).

[3]Bernanke (2018) makes the case that the severity of the Great Recession was mostly due to the financial panic.

indicators to follow, and how to define financial stability.[4] In addition to these knowledge problems, macroprudential goals may conflict with other policy goals and be subject to rent seeking by affected parties.[5] For these reasons, macroprudential regulations, which have been implemented to varying degrees in different countries, are not yet fulfilling all of their desired goals (IMF 2018; BIS 2018).

A second policy recommendation put forth by some observers is the need for state-contingent debt contracts (Shiller 2008; Mian and Sufi 2014; Eberly and Krishnamurthy 2014; Piskorski and Seru 2018). These are financial contracts whose payouts are contingent on certain economic outcomes. In this context, the push has been for mortgages whose principal and payments are indexed to local economic conditions. A weakening local economy would lower the real mortgage burden on households while a booming one would raise it. Such mortgages would resemble equity more than debt and lead to better risk sharing between debtors and creditors. In turn, this improved distribution of risk should improve the stability of the financial system. Shiller (2004), more generally, shows how these and other state-contingent contracts could radically transform our world into a more equitable and flourishing place.

Some progress has been made on this front with income-contingent student loans, contingent convertible corporate bonds, and a few state-contingent mortgages.[6] Most debt, however, remains written in fixed nominal terms. The dearth of contingent debt contracts suggests that the cost of writing and enforcing them is prohibitively expensive. For now, then, state-contingent contracts do not provide a practical solution to the household debt and financial stability concerns of advanced economies.

A third policy recommendation that addresses these concerns is to use monetary policy to create better risk sharing between debtors

[4]For more on the knowledge problem inherent to macroprudential regulations see Salter (2014).

[5]The recent delisting of Prudential as a significantly important financial institution (SIFI) by the U.S. Financial Stability Oversight Council is seen by some as an example of rent seeking.

[6]Companies like Unison, Patch, and Point have begun offering state contingent-like mortgages but remain a small part of the mortgage-origination market due, in part, to government-sponsored enterprises (GSEs) subsidizing traditional mortgages. There has also been some limited use of state-contingent debt contracts by sovereigns (see Anthony et al. 2017).

and creditors. Specifically, a monetary regime that targets the growth path of nominal GDP (NGDP) can be shown to reproduce the distribution of risk that would exist if there were widespread use of state-contingent debt securities (Koenig 2013; Sheedy 2014; Azariadis et al. 2016; Bullard and DiCecio 2018). The basic idea is that the countercyclical inflation created by an NGDP target will cause real debt burdens to change in a procyclical manner. As a result, debtors will benefit during recessions and creditors will benefit during booms. Fixed nominal-priced loans will act more like equity than debt and therefore promote financial stability.

This policy recommendation has the potential to be the most tractable of the above three proposals since it only requires a NGDP-targeting monetary regime. While switching to such a monetary regime is a nontrivial task, it would accomplish the same goals of state-contingent debt contracts and complement the efforts of macroprudential regulations. However, of the three proposals this one has received the least attention. This may be due to the fact that the recent work on this proposal been largely theoretical since no country explicitly targets NGDP. This policy proposal, consequently, is ripe for further attention and development.

This article attempts to shed more light on this proposal by providing the first empirical assessment of it. It does so by exploiting an implication of the theory: those countries whose NGDP stayed closest to its expected precrisis growth path during the crisis should have experienced the least financial instability. Put differently, some countries experienced more stability in aggregate nominal spending than others and these differences should be systematically related to financial stability if the theory is true. So even though no countries were targeting NGDP during the crisis, there is still a way to test the theory.

This article uses this understanding to provide an empirical test of the third policy proposal. It does so by outlining a method for estimating the expected growth path of NGDP for advanced economies and then seeing whether the gap between it and actual NGDP is systematically related to various measures of financial stability. This exercise is only a first look and is not the final word, but the results indicate more attention should be given to this third proposal. The findings strongly suggest that a stable NGDP growth path supports financial stability. These findings, therefore, lend support to the existing arguments for why advanced economies should consider adopting an NGDP level target.

In the sections that follow, the article further outlines the arguments of Koenig (2013), Sheedy (2014), Azariadis et al. (2016), and Bullard and DiCecio (2018). It then derives the expected growth path of NGDP for 21 advanced economies using IMF data and the "sticky forecast" approach of Beckworth (2018). Next, the article uses this measure to create an NGDP gap that is used in some scatterplots, a panel vector autoregression, and a panel local projection model to determine the relationship between the NGDP gap and various economic variables. The article then concludes with some policy considerations.

Better Risk Sharing through NGDP Targeting

The key insight of Koenig (2013), Sheedy (2014), Azariadis et al. (2016), and Bullard and DiCecio (2018) is that in a world of incomplete markets where there is nonstate contingent nominal contracting, an NGDP target can reproduce the risk distribution that would occur if there were complete markets and state contingent nominal debt contracting.[7] An NGDP target, in other words, can make up for the lack of insurance against future risks that could affect debtors' ability to repay their debts. Conversely, an NGDP target can also make up for the lack of insurance against potential returns creditors might miss out on because their funds are locked up in fixed-price nominal loans. Bullard and DiCecio (2018) show that this result holds even when the modeled heterogeneity among debtors and creditors approximates that of the actual income, financial wealth, and consumption inequality in the United States. They note this makes NGDP targeting "monetary policy for the masses."

The intuition behind these formal findings is that debtors and creditors who have committed to fix-nominal debt contracts and therefore to fixed money payments can be subject to both price level and real income shocks. The former shocks have long been understood and generally seen as bolstering the case for a price-level or inflation target. Most famously, Irving Fisher (1933) made the case for price level stability as a way to avoid unexpected deflation and a rise in real debt burdens that could trigger a cascade of loan defaults. As Koenig (2013) notes, however, Fisher's "debt deflation" scenario

[7]The ideas in these formal papers date back to Bailey (1837: 111–33) as shown by Selgin (2018: 57–70).

is incomplete because it only looks at price level shocks. Debtors may also face financial stress from negative real income shocks. Both types of shocks make it harder for debtors to service fixed money payments since both shocks lower nominal income flows relative to expectations. In both cases, the debtor is bearing the additional risk of these negative shocks relative to the creditor.

These two scenarios are illustrated in Table 1 as (1) and (2), where Δp_t, Δy_t, and $\Delta(py)_t$ represent changes in the log of the price level, real income, and nominal income. Note, that in general, any combination of these shocks that *lowers* nominal income relative to expectations puts a strain on debtors. It follows, then, that stabilizing $\Delta(py)_t$ via an NGDP target serves a useful insurance function for debtors. For a central bank, that means allowing changes in price level to offset real income shocks so that actual nominal income equals expected nominal income. That is, in order for the following nominal income equality to hold

$$\Delta(py)_t = \Delta(py)_t^{E_{t-1}}, \tag{1}$$

it must be the case that innovations to real income be offset by innovations to the price level:

$$(\Delta y_t - \Delta y_t^{E_{t-1}}) = -(\Delta p_t - \Delta p_t^{E_{t-1}}) \tag{2}$$

or, equivalently:

$$\Delta p_t = \Delta p_t^{E_{t-1}} - (\Delta y_t - \Delta y_t^{E_{t-1}}) \tag{3}$$

TABLE 1
Risk Bearing by Household Type

Household Type	Bears More Risk If		
Debtor	(1) $\Delta p_t < \Delta p_t^{E_{t-1}}$ or (2) $\Delta y_t < \Delta y_t^{E_{t-1}}$	➡	$\Delta(py)_t < \Delta(py)_t^{E_{t-1}}$
Creditor	(3) $\Delta p_t > \Delta p_t^{E_{t-1}}$ or (4) $\Delta y_t > \Delta y_t^{E_{t-1}}$	➡	$\Delta(py)_t > \Delta(py)_t^{E_{t-1}}$

Another way to understand equation (3) is that under an NGDP target a negative real income shock leads to an unexpectedly higher price level and, for a given stock of fixed-price nominal debt, an unanticipated lower real debt burden for the debtor. The creditor, consequently, receives a lower real debt payment than expected and shares in the real income loss. In short, the risk of a real income loss is shared more evenly between the debtor and creditor under an NGDP target than under a price stability target.

Equation (3) also implies that under an NGDP target a positive real income shock will lead to an unexpectedly lower price level and, for a given stock of fixed-price nominal debt, an unanticipated higher real debt payment from the debtor to the creditor. This feature can be seen as providing insurance to a creditor against having their funds locked up in a fixed nominal loan with a constant yield while real earnings in the rest of the economy rise due to the positive real income shock.

Imagine, for example, there is a positive total factor productivity (TFP) shock that raises real returns in the economy. If a creditor knew this productivity innovation was going to occur ex-ante, he would have required an equivalent risk-adjusted return on a loan to a debtor. But the creditor cannot know this outcome ex-ante since it is a shock. Under a price stability target, the creditor bears this risk and would miss out on the gain from the TFP shock. An NGDP target, on the other hand, forces the debtor to share some of the "windfall gain" with the creditor through a higher real debt payment. Again, risk is shared more evenly between the debtor and creditor under the NGDP target and therefore mimics a world of state-contingent debt contracts.

Finally, if there are no real income shocks then an NGDP target effectively defaults to a price stability target so that $\Delta p_t = \Delta p_t^{E_{t-1}}$.[8] An NGDP target, consequently, also avoids the "bad" price level surprises depicted in scenarios (1) and (3) in Table 1.[9]

In practice, a central bank targeting NGDP does not need to manually adjust the price level to offset real income shocks. Instead, the

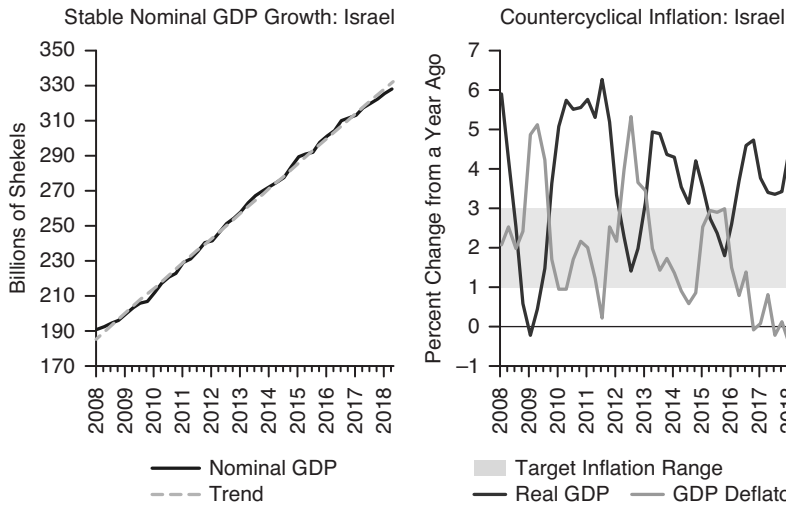
[8]This can be seen in equation (3) by noting that if there are no real income shocks then $\Delta y_t = \Delta y_t^{E_{t-1}}$ and $\Delta p_t = \Delta p_t^{E_{t-1}}$.

[9]The "bad" price level surprises should be distinguished from the "good" price level surprises that an NGDP target creates when there are real income shocks. As noted above, in the latter case these price level surprises act as a form of insurance.

central bank simply aims to keep aggregate nominal spending on its targeted growth path and the price level will by default adjust to the real income shocks. The insurance benefits from the countercyclical inflation are therefore produced automatically (Beckworth 2017).

No central bank has ever attempted a NGDP target, but the Bank of Israel (BoI) has unintentionally provided an example of what such a monetary regime might look like. The BoI officially targets an inflation range of 1–3 percent, but as Figure 1 shows, NGDP in Israel has been growing on a fairly stable trend since 2008. As a consequence, real income shocks have led to almost mirror opposite movements in the inflation rate as measured by the GDP deflator. This inverse relationship is not perfect, but it is strong enough that the GDP deflator inflation has been allowed to temporarily move outside the inflation target range when there have been large real income shocks. For example, in 2009 during the Great Recession the inflation rate just topped 5 percent. Despite this inflation flexibility, inflation on average over the entire period in Figure 1 has been near the center of its targeted range at a rate of 1.9 percent. An explicit NGDP target would arguably result in a similar outcome.

FIGURE 1
Stable NGDP Growth and Countercyclical Inflation in Israel



Measuring NGDP Expectations

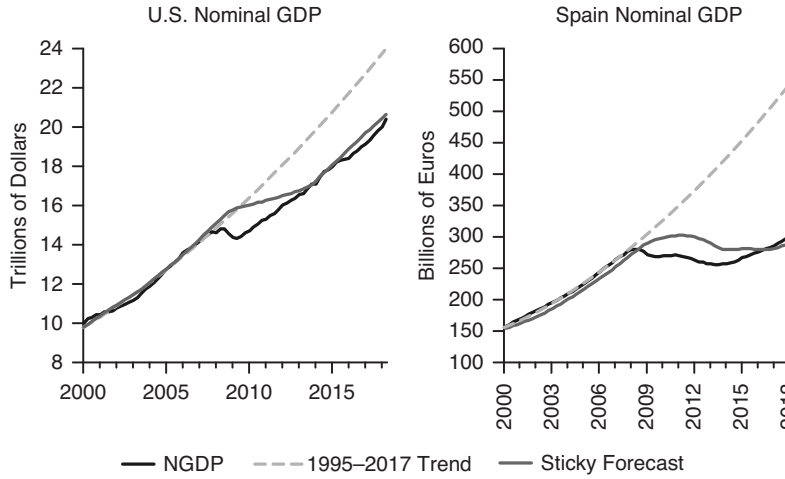
The main objective of this paper is to empirically assess the policy proposal that NGDP targeting will result in better risk sharing between debtors and creditors. An obvious challenge to doing so is that no country has targeted NGDP so there is no track record to evaluate.[10]

There is, however, an indirect way to test this proposal by exploiting an implication of the theory. It predicts that those countries whose NGDP stayed closest to its expected precrisis growth path should have experienced the least financial instability during the crisis. Put differently, some countries experienced more stability in aggregate nominal spending than others during the crisis and these differences should be systematically related to financial stability if the theory is true. A cross-country sample over this period of NGDP deviations from expected growth paths should reveal whether this prediction is borne out in the data.

This possibility raises another challenge: how best to measure the expected growth path of NGDP? One wants to avoid using simple, naïve precrisis trends since expectations and nominal contracting do eventually adjust. Figure 2 illustrates the problem with such trends for the United States and Spain. If they were taken seriously, then there would be a 15 percent shortfall of aggregate nominal expenditures in the United States and a 45 percent shortfall in Spain as of 2018:Q2. Figure 2 reports another measure, the "sticky forecast" path of NGDP outlined in Beckworth (2018) and it shows a gradual adjustment so that the expected path of NGDP and actual NGDP eventually converge. This measure is more consistent with the notion of expectations and nominal contracting eventually adjusting to sustained changes in NGDP. This sticky forecast is used in this paper as the expected growth path of NGDP for 21 advanced economies and its motivation and construction is outlined below.

[10]Niskanen (2001) and Hendrickson (2012) make the case that the Fed was effectively targeting a stable growth path for nominal demand during the post–Paul Volcker period up until the early 2000s. This period of stable nominal demand growth and relative financial stability lends support to the arguments of this article.

FIGURE 2
Simple NGDP Trends versus Sticky Forecast NGDP Paths



Sticky Forecast Path for NGDP

The idea behind the sticky forecast path for NGDP is twofold. First, the public makes many economic decisions based on a forecast of their nominal incomes. For example, households may take out a 30-year mortgage based on an implicit forecast of their nominal income over this horizon. The actual realization of nominal income may turn out to be very different than expected, but the households may not be able to quickly adjust their plans given sticky debt contracts and other commitments that constrain them. Therefore, the consequences of previous forecasts are often binding on them and slow to change even if their nominal income forecasts have been updated. Second, in addition to these old forecasts and decisions whose influence lingers, new forecasts and new decisions are being made each quarter for subsequent periods that will also have lingering effects. Together, this means future periods have many overlapping and different forecasts applied to them that only gradually adjust.

To capture this sticky forecast idea, a five-year forecast is created that gradually updates over time. Five years are chosen since it is assumed that all constraints created by decisions based on the

forecast can be fully unwound within five years. The data for this exercise come from the IMF's World Economic Outlook (WEO) forecast database. Every spring and fall there are WEO forecasts published for member countries that extend six years out. These biannual forecasts are interpolated to a quarterly frequency and used here to construct a sequence of five-year overlapping forecasts for every period between 2000:Q1 to 2018:Q2. This process is done for 21 advanced economies: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Israel, Italy, Japan, Netherlands, New Zealand, Portugal, South Korea, Spain, Sweden, Switzerland, United Kingdom, and the United States.[11]

The exact steps are as follows. First, for every quarter beginning in 1995, a five-year forecast (20 quarters) is created using the IMF's forecasts of NGDP growth.[12] Second, for a given starting period, these NGDP growth forecasts are then used to create a 20-quarter forecast path of the NGDP level in national currency form. These forecasts are created for every period up to 2008:Q2.

Third, the next step is to recognize that starting with 2000:Q1 there are 20 overlapping NGDP level forecasts in national currency for every quarter. All of these 20 forecasts are averaged into one NGDP level value for each period as follows:

$$NGDP_t^{sticky\ forecast} = \frac{\sum_{i=1}^{20} NGDP_{t-i}^{IMF\ forecast\ (t)}}{20}. \tag{4}$$

This process is repeated for every forecasted period so that a new NGDP level forecast time series is created. This new time series is used as the sticky forecast NGDP growth path. Figure 3 shows the actual and sticky forecast paths for NGDP in the 21 advanced economies in their national currency. There is a diverse set of NGDP experiences in Figure 3, but it is misleading to compare across countries the actual and sticky forecast NGDP levels since absolute size matters. This paper, consequently, looks at the percentage point difference between the actual and sticky forecast NGDP levels, called hereafter the "NGDP Gap."

[11]For South Korea and Japan, the forecast is set at 2.5 years since these two countries' forecasts were found to converge much faster.

[12]The IMF provides forecasts for real GDP growth and inflation. These are combined to create an NGDP growth forecast.

FIGURE 3
Actual and Sticky Forecast Paths for NGDP
(In National Currency)

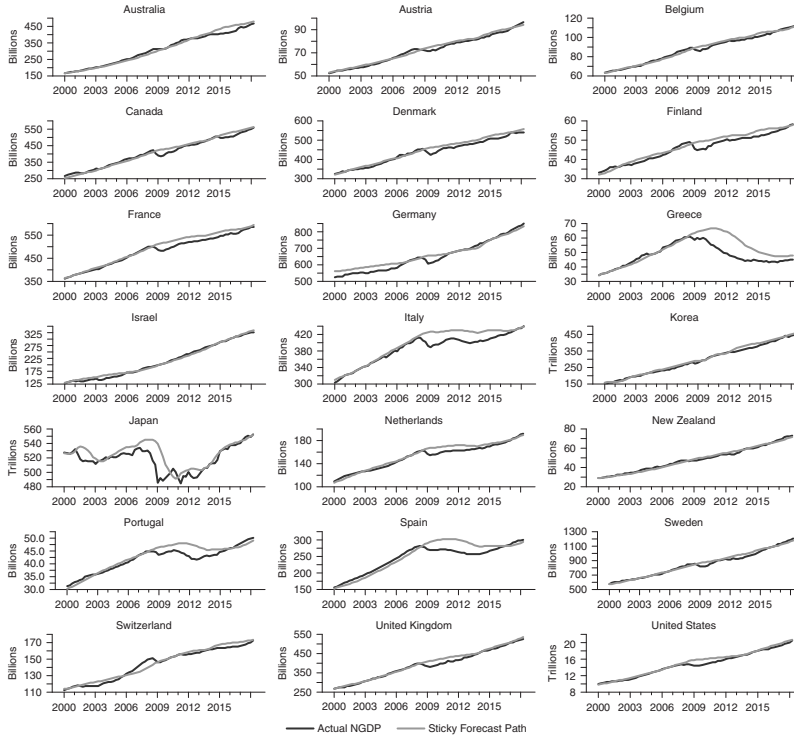
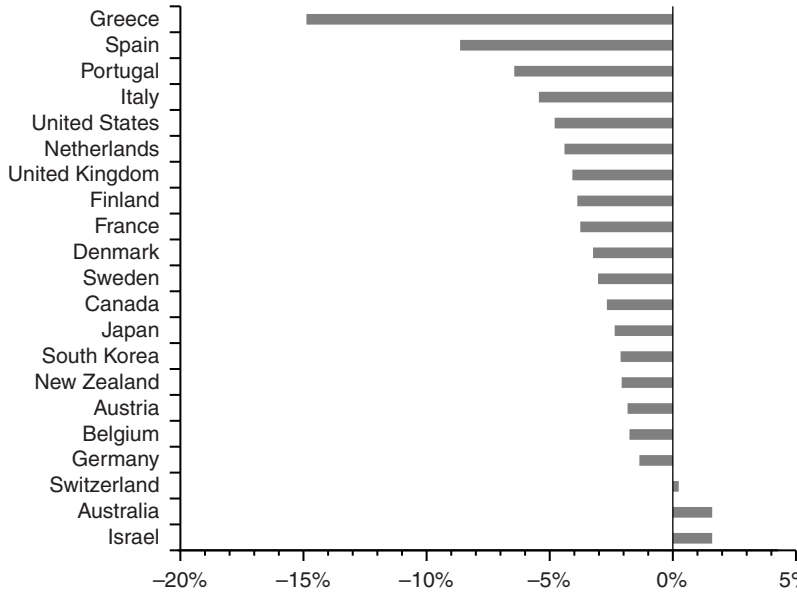


Figure 4 reports the average NGDP gap for the crisis years of 2008:Q1–2013:Q4 ranked by size. Most countries had a negative NGDP gap during this time, indicating NGDP was on average below expected values in most advanced economies. Greece had the largest average NGDP gap at −14.9 percent, followed by Spain at −8.7 percent and Portugal at −6.5 percent. The best performers turned out to be Israel and Australia both with an NGDP gap of 1.6 percent followed by Switzerland at 0.2 percent. The risk sharing theory of NGDP outlined by Koenig (2013), Sheedy (2014), Azariadis et al. (2016), and Bullard and DiCecio (2018) implies these NGDP Gap differences among the 21 countries should be systematically related to financial stability. This claim is tested in the next section.

FIGURE 4
Average NGDP Gap
(2008:Q1–2013:Q4)



Note: The NGDP Gap is the percentage point difference between the actual and sticky forecast paths for NGDP.

Empirical Evidence for NGDP and Financial Stability

This section gets to the main objective of this article: to empirically assess the policy proposal to use NGDP as a way to improve financial stability. As noted earlier, it does so by exploiting an implication of the theory: those countries whose NGDP stayed closest to its expected precrisis growth path—and therefore kept risk more evenly spread between debtors and creditors—should have experienced the least financial instability. This section of the article tests this claim in two parts. First, it looks at series of scatterplots to see if there is any systematic relationship between the NGDP gap and measures of financial stability. Second, it then uses the same variables in a panel vector autoregression (VAR) and panel local projection model to better test for causality.

Scatterplot Analysis

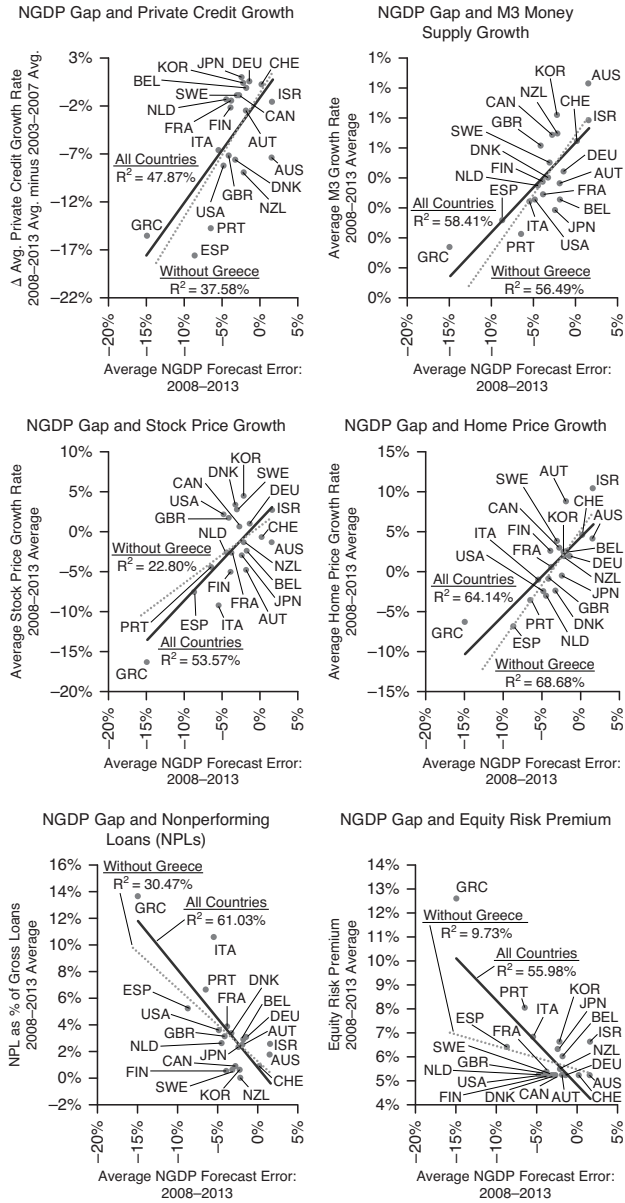
As a first look at the potential relationship between NGDP and financial stability, this section plots in Figure 5 the average NGDP gap over the crisis period of 2008:Q1–2013:Q4 against six financial measures over the same period: private credit growth, M3 money supply growth, stock price growth, home price growth, the nonperforming loan (NPL) rate, and the equity risk premium. Details on the sources of these measures are found in the data appendix. To be clear, these scatterplots are not intended to establish causality. Instead, they are provided to establish whether there is any systematic relationship between NGDP forecasting errors and the financial variables.

One issue is whether to treat Greece as a legitimate observation or an outlier given the severity of its experience during this time. On one hand, Greece can be viewed as part of the same data-generating process as other countries but it just happened to receive the largest "treatment" of NGDP forecasting errors. In this case, including Greece is important since its absence could result in biased estimates. On the other hand, maybe Greece does come from a different data-generating process and should be considered an outlier. To account for this possibility, the scatterplots are shown with fitted lines and R^2 for the full sample and for the sample excluding Greece.

The first scatterplot in the figure shows the change in the average year-over-year growth rate of credit to the private nonfinancial sector (PNFS) against the NGDP gap. The change is the difference between the average PNFS credit growth rate in 2003:Q1–2007:Q4 and in 2008:Q1–2013:Q4. That is, the change in the average credit growth rate between the boom and crisis years. The first scatterplot shows there is a fairly strong and positive relationship with an R^2 of 48 percent when all countries are included. Without Greece, the R^2 is still a robust 38 percent. These results mean the larger the decline in the NGDP gap, the greater the decline in the average growth rate of PNFS credit during the crisis years.

The second scatterplot reveals a similar positive relationship for the year-over-year M3 money supply growth rate. Here the R^2 is 58 percent for the full sample and 56 percent without Greece. Here too, then, the figure indicates a strong positive relationship between the NGDP gap and the growth in the M3 money supply.

FIGURE 5
NGDP Gap and Financial Conditions
(2008:Q1–2013:Q4)



Note: Data sources listed in the Appendix.

The third scatterplot displays the relationship between the year-over-year growth rate in stock prices and the NGDP gap. Here again, there is a strong positive relationship between the size of the NGDP gap and the growth in stock prices in the full sample with an R^2 of 54 percent. The relationship weakens a bit, but remains nontrivial in size with an R^2 of 23 percent in the absence of Greece. In general, the larger the decline in the NGPD gap the greater the decline in this asset price.

The fourth scatterplot shows the relationship between the year-over-year growth in home prices and the NGDP gap. This relationship is also a strong positive one with an R^2 of 64 percent for the full sample. Excluding Greece actually leads to a stronger fit with an R^2 of 69 percent. This is another asset price that is strongly related to the NGDP gap during the crisis.

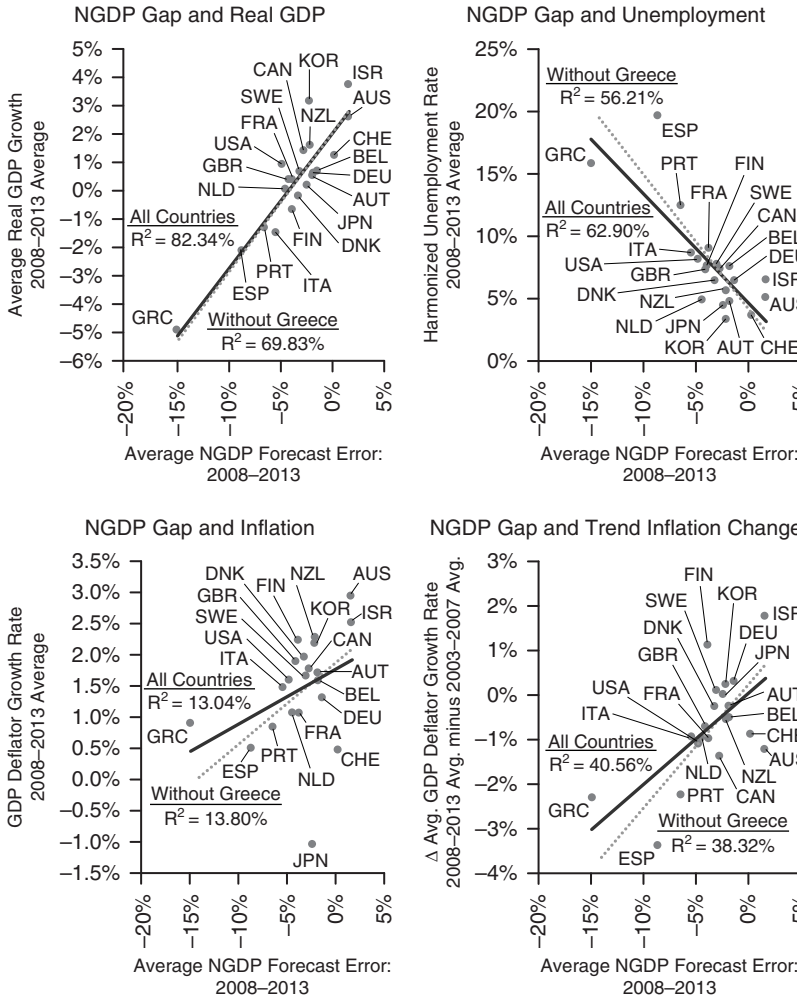
The fifth scatterplot reveals the relationship between nonperforming loans as a percent of gross loans against the NGDP gap. Now there is a strong negative relationship, indicating that as the NGDP gap declines the rate of nonperforming loans increases. The R^2 here is 61 percent for the full sample and 30 percent excluding Greece. Nonperforming loans also appear to be robustly related to the NGDP gap.

Finally, the sixth scatterplot displays the relationship between the equity risk premium and the NGDP gap. Here, there is a strong negative relationship for the full sample with an R^2 of 56 percent, indicating that as the NGDP gap gets larger the equity risk premium rises. The R^2, however, shrinks to 10 percent when Greece is excluded. This may be the one case where Greece is an outlier.

Figure 6 shows the NGDP gap was also systematically related to year-over-year real GDP growth and the unemployment rate during this time. It was less related, however, to the year-on-year inflation rate. There is a stronger fit, though, between the NGDP gap and the change in trend inflation between the 2008–2013 and 2003–2007 periods.

These scatterplots, therefore, indicate that in most cases there was a strong systematic relationship between the NGDP gap and financial and economic instability. Moreover, since most countries experienced persistent NGDP forecast errors during this period, one can view macroeconomic policy as failing to provide on a sustained basis sufficient nominal demand growth and therefore was an exogenous

FIGURE 6
NGDP Gap and Macroeconomic Indicators
(2008:Q1–2013:Q4)



Note: Data sources listed in the Appendix.

contributor to this relationship. Put differently, it seems plausible that a meaningful portion of causality flowed from NGDP forecast errors to financial variables in these scatterplots. Still, the scatterplots only establish a relationship. The next section attempts to establish causality.

Panel VAR

To better tease out causality, this section estimates a panel vector autoregression. A VAR is an estimated system of endogenous variables that provides a dynamic forecast. The forecast can be used to identify nonforecasted movements or innovations to variables in the system. These innovations coupled with identification restrictions on the data create exogenously identified shocks to variables of interest. Here, that variable of interest is the NGDP gap.

The VAR is estimated on the data for all 21 countries using quarterly data over the entire sample of 2000:Q1 to 2018:Q2. This larger sample is used to avoid degrees of freedom problems that arise using the shorter sample period of the crisis. Moreover, the theory applies to boom periods as much as it does to bust periods since any deviation of NGDP from its expected growth path should affect the distribution of risk between debtors and creditors.

Since this is panel data, a panel VAR is estimated that controls for individual country fixed-effects. This feature means unobserved country-specific heterogeneity that is fixed over the sample will not affect the estimates. Greece, therefore, should not be a problem for these estimates.

A parsimonious panel VAR is estimated that has three core macroeconomic variables—the NGDP gap, real GDP growth, and the unemployment rate—and a financial variable as its endogenous variables:

$$z_{i,t} = ((py)_{i,t}^{gap},\ \Delta y_{i,t},\ u_{i,t},\ f_{i,t})'. \tag{5}$$

Here, $z_{i,t}$ is the vector of endogenous variables, $(py)_{i,t}^{gap}$ is the NGDP gap, $\Delta y_{i,t}$ is the year-over-year growth rate in real GDP, $u_{i,t}$ is the unemployment rate, and $f_{i,t}$ is one of the six financial variables. The subscripts i and t and represent country i and time period t. This model is estimated six times with a separate financial variable filling the $f_{i,t}$ slot each time. The model is also estimated an additional time with inflation filling the $f_{i,t}$ slot.[13] Four lags are used in the estimated model and a Choleski identification scheme is imposed on the data.

[13]The impulse response functions (IRFs) of the core macroeconomic variables do not materially change with the change in the financial variables.

Given the ordering of the variables, the Choleski identification means the $(py)_{i,t}^{gap}$ shock is exogenous to all other variables in the short-run. This allows for impulse response functions (IRFs), which show the typical dynamic response of the variables in the VAR to an exogenous shock to the NGDP gap. The shock to the NGDP gap is set to a negative 1 unit shock. The resulting IRFs are reported in Figure 7.

The top row of Figure 7 shows the IRFs for the credit to the private nonfinancial sector and the M3 money supply both in year-over-year growth rate form. The negative 1 unit shock to the NGDP gap causes both to respond in a similar fashion: they slowly decline for nine quarters and then slowly begin recovering. They are still recovering 14 quarters after the shock. The maximum decline in the private credit growth rate is 0.94 percent and for the M3 growth rate it is 0.89 percent.

The second row of Figure 7 reveals the IRFs for stock and home price year-over-year growth rates. The stock price growth rate declines through three quarters and hits a peak decline of 3.9 percent. The home price growth rate stays depressed over the entire IRF and averages a 0.58 percent decline.

The third row of Figure 7 displays the IRFs for the nonperforming loan rate and the equity risk premium. They both slowly rise over the entire IRF. The nonperforming loan rate tops out at 0.49 percent and the equity risk premium reaches 0.57 percent. Unlike the scatterplots, the equity risk premium remains significant in the IRFs.

The last two rows of Figure 7 show the response of the macroeconomic variables. The real GDP growth rate declines to about −1 percent through quarter four and then recovers relatively quickly. The unemployment rate, on the other hand, rises through quarter eight, peaking with a 0.57 percent gain, and begins a slow recovery. The inflation IRF indicates there is no link between it and the NGDP gap shock. This is consistent with the weak relationship in scatterplots and may reflect the successful anchoring of inflation by central banks. Finally, the NGDP gap is shown to start recovering in quarter three from its own shock.

The panel VAR IRFs, therefore, collectively point to a strong causal role for NGDP shocks in creating financial and economic instability. These findings, therefore, provide empirical support for the proposal to use NGDP targeting as a means to deal with concerns over household debt and financial volatility.

FIGURE 7
Panel VAR IRF from Negative Unit Shock to the NGDP Gap
(2000:Q1–2018:Q2)

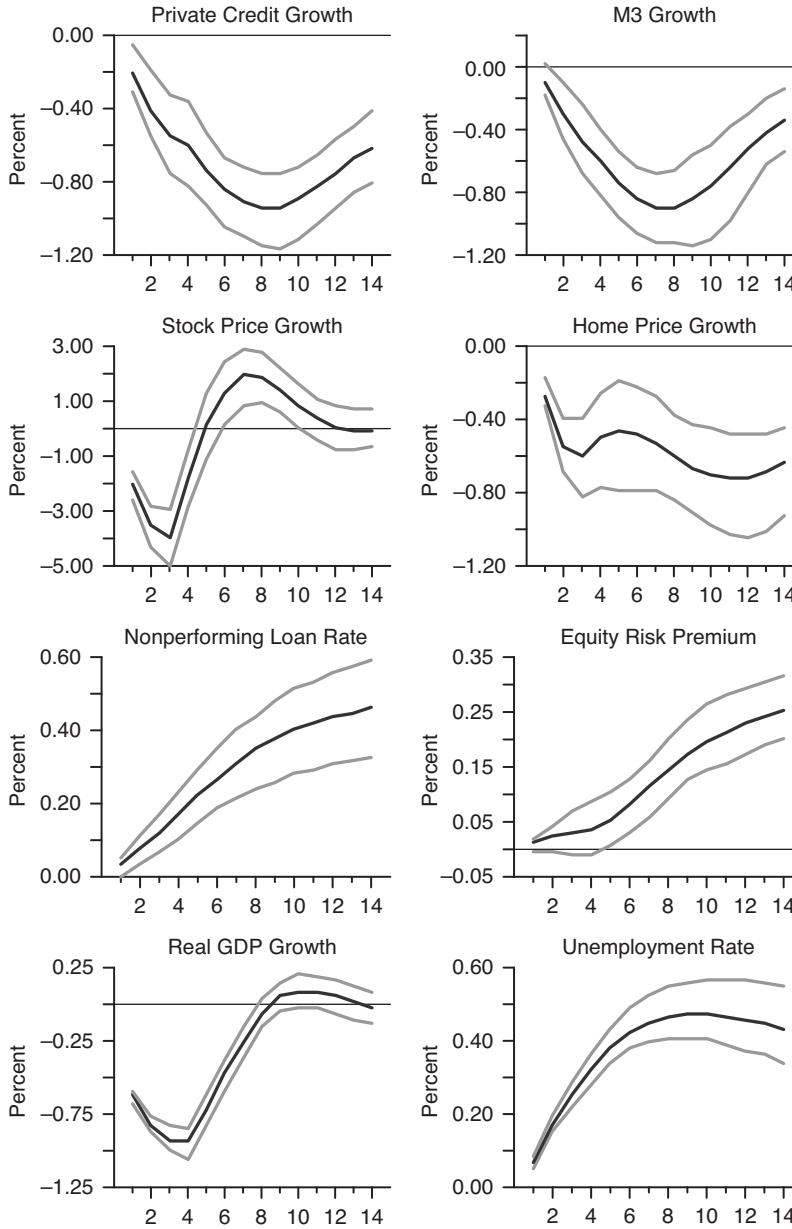
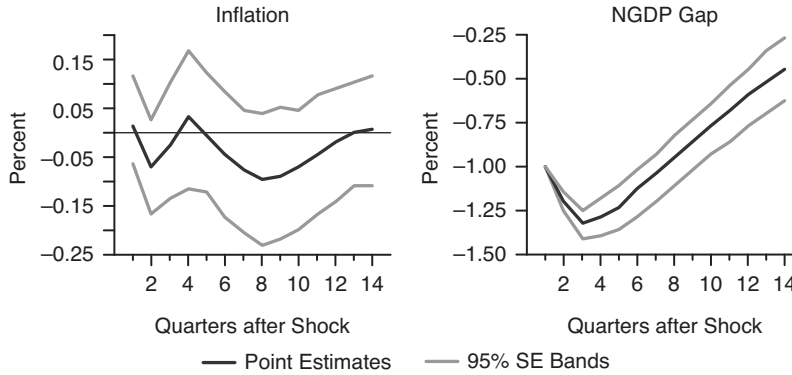


FIGURE 7
Panel VAR IRF from Negative Unit Shock to the NGDP Gap
(2000:Q1–2018:Q2) (*Continued*)



Note: The impulse response functions (IRFs) are based on an estimated fixed effect panel VAR model of the 21 advanced-economy countries noted in the text.

Panel Local Projection Model

One criticism of the Panel VAR is that it applies some structure to the data via the Choleski identification scheme. The data is therefore not strictly "speaking for itself." As a cross check, then, this section reports IRFs from Jordà's (2005) local projection method that are not subject to this critique. Moreover, the local projection method allows for nonlinearities and provides a more direct estimate of dynamic causal effects. In addition, the local projection like the VAR is applied using panel data and fixed effects so that unobserved country-specific heterogeneity is controlled for in the regressions. Greece, therefore, should not be a problem for these estimates.

The panel local projection approach entails estimating h regressions of the form,

$$(6)\quad f_{i,t+h} = \alpha + \beta_h (py)^{gap}_{i,t} + \sum_{j=1}^{J} \gamma_{j,h} (py)^{gap}_{i,t-j} + \sum_{j=1}^{J} \theta_{j,h} \Delta y_{i,t-j}$$

$$+ \sum_{j=1}^{J} \pi_{j,h} u_{i,t-j} + \sum_{j=1}^{J} \rho_{j,h} f_{i,t-j} + \beta_{i,h} D_i + \epsilon_{i,t,h}$$

where h is the number of quarters ahead, j is the number of lags, $\beta_{i,h}D_i$ are country fixed effects, and γ,θ,π,ρ are parameter estimates on the same lagged control variables used in the panel VAR. Like before, the f_i represents a placeholder for the financial and inflation variables.[14] Also like before, four lags are used for J.

This panel local projection regression is estimated for all the variables for $h = 0,\ldots,14$. That is, regressions at each h horizon are estimated with the parameter of interest being β_h. This parameter estimates the direct effect of the NGDP gap at time t on the other variables at time $t + h$. Unlike the panel VAR, the local projection regression imposes no structure on the data and allows the data to speak for itself.

The lagged control variables are included to help keep β_h estimates unbiased. However, in the regressions with small h there may still be some simultaneity bias. But as h gets larger it is harder to argue endogeneity is a problem.[15]

The local projection IRFs are created by plotting the point estimates for β_h and the accompanying 95 percent clustered standard error (SE) bands. These IRFs are reported in Figure 8 for all the variables following a negative 1-unit shock to the NGDP gap.

Figure 8 reveals the local projections IRFs are very similar to the Panel VAR IRFs. The top row of Figure 8 shows the IRFs for the credit to the private nonfinancial sector growth rate and the M3 money supply growth rate similarly decline for nine quarters before slowly recovering. The magnitudes are also similar with a maximum decline in the private credit growth rate of 0.93 percent and a decline in the M3 growth rate of 0.78 percent.

The second row of Figure 8 also shows similar IRFs for stock and home price growth rates. The stock price growth rate declines through three quarters and hits a peak decline of 3.6 percent. The home price growth rate also stays depressed over the entire IRF and averages a 0.83 percent decline.

[14]Here, f_i also serves as placeholder for the core macroeconomic variables when they are run as the dependent variable. When this happens, the ρ control variables fall away since the lagged macroeconomic variables are provided in the γ,θ, and π control variables.

[15]It seems implausible, for example, that the NGDP gap shock at period t—which itself is a forecast error—is caused by the year-on-year growth rate of stock prices 14 quarters in the future.

FIGURE 8
Local Projection IRF from
Negative Unit Shock to the NGDP Gap
(2000:Q1–2018:Q2)

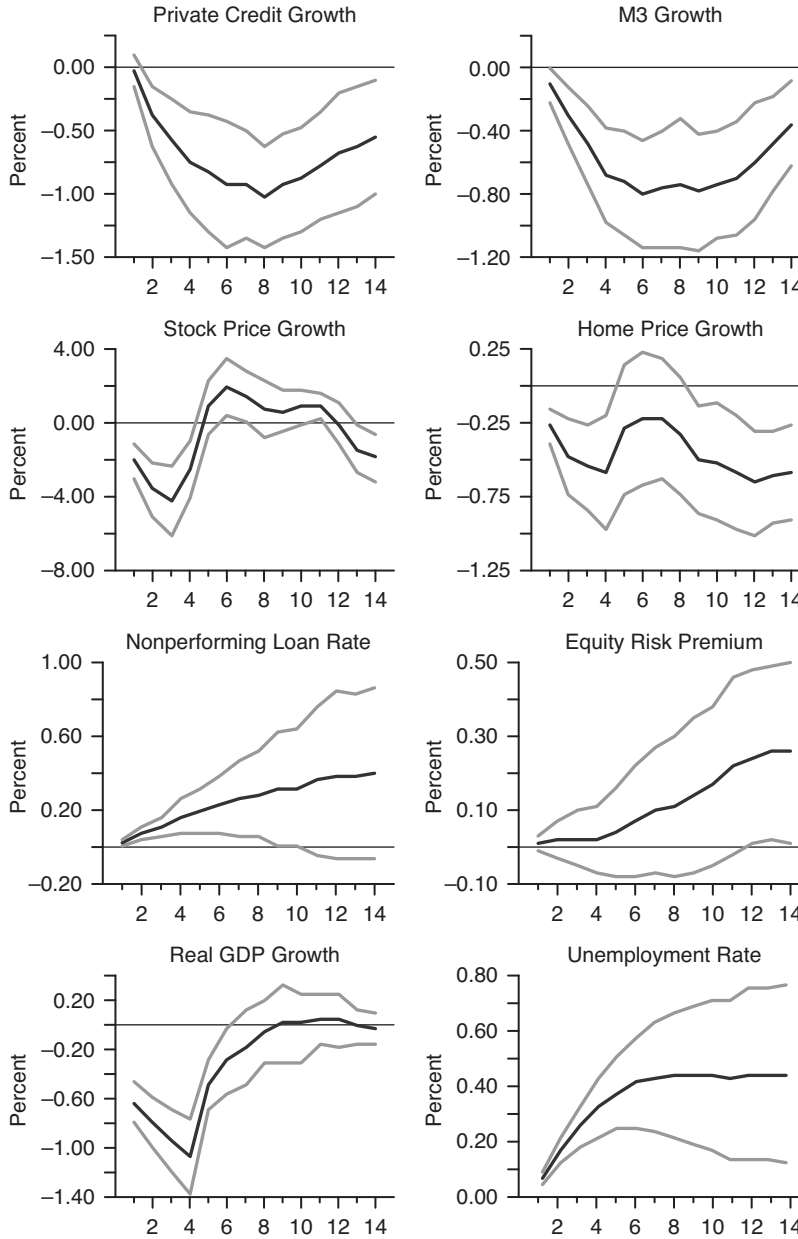
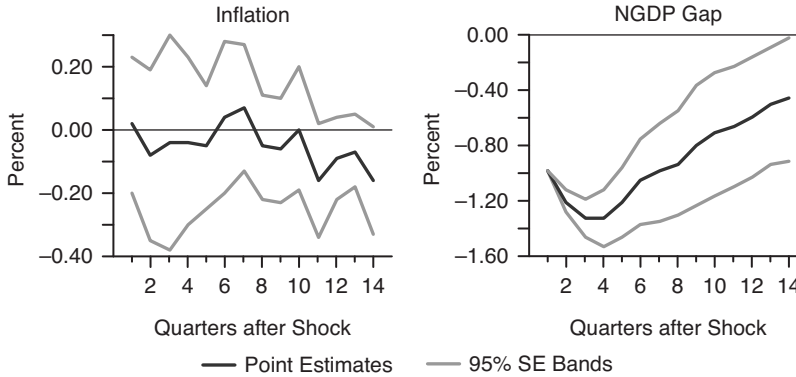


FIGURE 8
Local Projection IRF from
Negative Unit Shock to the NGDP Gap
(2000:Q1–2018:Q2) (*Continued*)



Note: The impulse response functions (IRFs) are based on an estimated fixed effect panel VAR model of the 21 advanced-economy countries noted in the text.

The third row of Figure 8 displays the IRFs for the nonperforming loan rate and the equity risk premium. The point estimates are again very similar to the panel VAR IRFs, though the standard error bands are much larger for the local projection IRFs.

The fourth row reveals very similar IRFs for the macroeconomic variables. Real GDP growth and the unemployment rate change by similar amounts, inflation remains insignificant, and the NGDP gap recovers rather briskly.

The local projection IRFs, therefore, tell the same story as the Panel VAR IRFs: a negative NGDP gap shock appears to causally affect the financial and macroeconomic variables in an adverse manner. Only inflation is left unscathed. Once again, then, the evidence points to a strong causal role for NGDP in promoting financial and economic stability.

Conclusion

NGDP level targeting (NGDPLT) has received increased attention over the past decade for various reasons. Some see it as the next step in the evolution of monetary policy regimes since it avoids much

of the confusion inherent to inflation targeting (Frankel 2012; Beckworth 2014; Sumner 2011, 2014; Garin, Lester, and Sims 2016). Others have made the case for NGDPLT based on the desirable commitment properties its creates in the face of a zero lower bound (ZLB) environment (Woodford 2012; Summers 2018). NGDPLT can similarly be seen as a velocity-adjusted money supply target that is effective in escaping the ZLB (Belongia and Ireland 2015, 2017). Finally, some see NGDPLT as a workaround to the knowledge problem in monetary policy. There is no need to have real-time knowledge of natural-rate variables in this framework (McCallum 2011; Beckworth 2017; Beckworth and Hendrickson 2019).

These more traditional cases being made for NGDPLT can now be bolstered by the risk-sharing argument for it. That is, a monetary regime that targets the growth path of NGDP can be shown to reproduce the distribution of risk that would exist if there were widespread use of state-contingent debt securities (Koenig 2013; Sheedy 2014; Azariadis et al., 2016, Bullard and DiCecio 2018). The idea behind this view is that the countercyclical inflation created by an NGDPLT will cause real debt burdens to change in a procyclical manner. This tendency, in turn, will cause debtors to benefit during recessions and creditors to benefit during booms. Put differently, an NGDPLT will cause fixed nominal-priced loans to act more like equity than debt.

This article provided an indirect empirical assessment of this risk-sharing view of NGDP. It did so by first constructing an NGDP gap measure and checking whether it was systematically related to various measures of financial stability. The paper then used a panel VAR and a panel local projection model to determine if causality ran from NGDP shocks to financial stability. The results from these empirical exercises strongly suggest that there is a meaningful causal role for NGDP in promoting financial and economic stability.

These findings are only a first look at the NGDP–financial stability relationship. Hopefully, they will spur further research on this issue and help inform the discussion at the Federal Reserve and elsewhere on the best monetary policy regime for advanced economies.

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Appendix: Data Sources

Data	Source	Comments
Private Credit	Bank for International Settlements (BIS)	Category: Credit to the nonfinancial private sector.
M3 Money Supply	Various central bank websites, OECD, and the Center for Financial Stability (CFS)	Most data were found on central bank websites. For the U.S., the Divisia M3 measure from the CFS was used.
Stock Price	St. Louis Fed, FRED dataset	"Total Share Price" for each country was found on FRED. Data originally comes from the OECD.
Home Price	BIS, FRED dataset	Category: Residential property price index.
Nonperforming Loans	World Bank, International Monetary Fund (IMF), and Financial Stability Institute	Category: Nonperforming loans as a % of gross loans. Data is annual frequency so it was interpolated to a quarterly frequency.
Equity Risk Premium (ERP)	NYU Professor Aswath Damodaran's personal webpage: http://pages.stern.nyu.edu/~adamodar/	Compiled a cross-county time series of ERP by downloading Professor Damodran's archived past annual estimates of ERP for various countries and interpolating to a quarterly frequency.
NGDP	FRED dataset	Original Sources: Eurostat, OECD, and BEA.
NGDP Forecasts	IMF *World Economic Outlook*	Combined biannual forecasts of real GDP growth and inflation to get NGDP growth forecasts. These forecasts were then interpolated to a quarterly frequency.
Real GDP	FRED dataset	Original Sources: Eurostat, OECD, and BEA.
GDP Deflator	FRED dataset	Original Sources: Eurostat, OECD, and BEA.
Harmonized Unemployment Rate	FRED dataset	Original Source: OECD.

Ten Lessons from the Economic Crisis of 2008

Scott B. Sumner

During the 1930s, the Great Depression was largely viewed as resulting from a series of financial crises, both domestic and international. Thirty years later, Friedman and Schwartz (1963) reevaluated this period, and discovered that the key problem was an excessively tight monetary policy. The high unemployment, falling incomes, and debt defaults were primarily symptoms of that policy failure, not the fundamental cause of the Great Depression.

In this article, I attempt a similar reevaluation of the Great Recession, focusing on two areas. First, how do we correctly diagnose the nature of a macroeconomic crisis? Second, what policy mistakes were made, and how can we do better next time?

The Real Problem Was Nominal

An important lesson of the Great Recession is the need to correctly diagnose the nature of macroeconomic problems in real time. Throughout history, many macroeconomic problems are seen as "real" problems when they are occurring, and are later diagnosed as nominal problems—too much or too little nominal spending, also known as "aggregate demand."

I have already mentioned the Great Depression, but the same initial misdiagnosis occurred during the Great Inflation of 1965–81,

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which at the time was attributed to real factors, including labor unions, oil shocks, poor harvests, and budget deficits, and only later attributed to monetary policy failures that allowed inflation to climb from less than 2 percent to more than 10 percent.

Whenever there is a dramatic rise or fall in nominal spending, it is almost always a failure of monetary policy. Thus in 2008–09, the rate of growth of nominal GDP fell from the roughly 5.4 percent trend rate of the previous 17 years, to −3 percent. This led to sharply higher unemployment, and dramatically worsened a financial crisis that had already begun in the previous year.

At the time, the consensus of the economics profession was that monetary policy was roughly appropriate. This mistake was driven by two examples of what I call *reasoning from a price change*. The phrase refers to the common error of drawing implications from the change in a price without first considering whether the change was driven by supply-side or demand-side factors. Thus, someone might expect high oil prices to lead to less oil consumption, without first considering whether the higher oil prices were caused by less oil supply or more oil demand. If prices were driven up by more demand for oil, then the economy would see more consumption.

Unfortunately, reasoning from a price change is especially common in the field of macroeconomics. During mid-2008, inflation rose well above the Fed's (implicit) 2 percent target.[1] At the time, the Fed interpreted the high inflation as an indication that the economy was in danger of overheating. In mid-September 2008, for example, the FOMC cited the fear of high inflation as a reason not to cut interest rates in the first policy meeting after Lehman failed. In fact, the economy was already nine months into the worst recession since the 1930s, and the actual problem was too little nominal spending, not too much. Instead of focusing on an unreliable indicator such as the inflation rate, the Fed should have looked at nominal GDP (NGDP) growth, which slowed sharply in the first half of 2008, even as inflation was rising.

Another common type of reasoning from a price change occurs when policymakers and pundits wrongly assume that the level of

[1]The Fed explicitly adopted a 2 percent inflation target in 2012, using the PCE index, but even by 2008, policymakers were implicitly aiming for roughly 2 percent inflation.

interest rates is a good indicator of the stance of monetary policy. Interest rates did gradually decline throughout 2008, and this was widely viewed as an indication that monetary policy was easing. More recent studies indicate, however, that the natural rate of interest was falling even more rapidly, which meant that policy was effectively tightening.[2]

Even before the Fed was created in 1913, interest rates often moved up and down with the business cycle. Thus the Fed is obviously not the only factor determining the level of interest rates. People get confused on this point because on a day-to-day basis the Fed often targets the overnight rate on interbank loans, the fed funds rate. What they miss is that the Fed tends to accommodate movements in the business cycle, so while a falling fed funds rate might indicate monetary easing, it also might indicate a weakening economy, with Fed rate cuts merely reflecting the economic slump. This is especially problematic if the Fed doesn't fully accommodate the fall in the natural rate of interest, as in 2008. In that case, policy was actually tightening even while the public and many policymakers assumed it was easing.[3]

Another mistake was to focus on some very real economic problems that accompanied the Great Recession, and assume that those problems had caused the recession. Two that stand out were the housing bubble and bust, and the subsequent banking crisis.

The housing boom of 2000–06 is often seen as a root cause of the recession. But why would a housing boom in 2000-06 cause GDP to plunge in 2008–09? One answer is that housing construction was far too high, at unsustainable levels. But housing construction during the boom was not at unusual levels relative to the U.S. population. Furthermore, housing construction fell by more than 50 percent between January 2006 and April 2008, and yet unemployment barely changed, edging up from 4.7 to 5.0 percent. Only when

[2]See www.frbsf.org/economic-research/publications/economic-letter/2015/october/gradual-return-to-normal-natural-rate-of-interest.

[3]While the stance of monetary policy can be defined in a variety of ways, in my view the most *useful* definition is relative to the goals of the central bank. Thus "tight money" is policy that results in the economy falling short of the Fed's inflation and employment goals, while "easy money" is a policy that leads to excessive spending and an overshoot of the policy goals.

nominal GDP plunged in the second half of 2008 did unemployment soar to much higher levels.

Others point to the excessive rise in home prices, which they believe made a crash inevitable. But Canada, the United Kingdom, Australia, and New Zealand all had similar home price run-ups during 2000–06, and in those economies housing prices did not crash, except for a brief dip during the global recession of 2008–09. Furthermore, home prices have again soared in many of the same U.S. housing markets that saw a boom in 2000–06. Does that mean another Great Recession is inevitable?[4]

The housing slump of 2006–09 should be seen as an exogenous shock that initially did little damage to the broader economy and then became much worse during the Great Recession of 2008–09, indeed as a result of the Great Recession. The conventional view that housing caused the recession was analogous to someone assuming they had a mild cold that kept getting worse, whereas they actually had a mild cold that eventually turned into pneumonia, a very different illness.

The preceding medical analogy applies equally well to the banking crisis. Initially, the banking problems were an exogenous shock related to defaults on subprime mortgages. Later, when excessively tight monetary policy caused NGDP to plunge, the banking crisis predictably got much worse. Furthermore, the nature of the crisis changed. Most of the banks that failed during the Great Recession were brought down by bad commercial loans, a side effect of the recession itself, not a cause.

Interestingly, the wave of bank failures during the 1980s was also associated with bad commercial loans, often to property developers. And that wave of bank (and S&L) failures was also associated with a sharp slowdown in NGDP growth. However, there is one important difference. The NGDP slowdown of the 1980s was a needed adjustment to bring down inflation, whereas the NGDP plunge of 2008–09 was entirely unnecessary, as the inflation spike of mid-2008 was a temporary phenomenon related to the extraordinary surge in oil prices (to a peak of $147 per barrel).

[4]See Erdmann (2019) for an excellent discussion of misconceptions about the housing bubble.

Policy Lessons from the Great Recession

In my view, the most important policy lessons of the Great Recession related to monetary policy. But first I'd like to consider a few other areas where policy was misguided. In the spring of 2008, the Bush administration implemented a policy of fiscal stimulus, in the form of tax rebates to each household. There is some evidence that households spent a portion of this windfall on consumption. Nonetheless, many experts overestimated the impact of the tax cut, by ignoring *monetary offset*.

When a central bank is targeting inflation, fiscal stimulus in the form of a tax rebate has virtually no long-run effect on nominal spending. Any increase caused by the tax cut will be offset by tighter Fed policy, aimed at keeping inflation on target. The Fed did notice that the tax cuts were boosting spending slightly in the spring of 2008, but reacted by refusing to cut interest rates between April and October, despite a weakening economy. Thus the fiscal stimulus ended up being a failure; after a slight rise in the second quarter, GDP fell sharply in the second half of 2008.

The opposite occurred in 2013. In late 2012, Congress adopted a policy of fiscal austerity. Tax cuts expired and spending was reduced, beginning in January 2013. A letter signed by 350 Keynesian economists warned that this fiscal austerity risked triggering another recession.[5] And yet, even as the budget deficit plunged from roughly $1,050 billion in calendar year 2012 to $550 billion in calendar year 2013, growth gradually picked up. By the end of 2013, 12-month real GDP growth was running well ahead of year earlier levels, despite the dramatic reduction in the budget deficit.[6]

Why did fiscal austerity fail to depress the economy? The Fed anticipated the fiscal austerity of 2013 and adopted some extraordinary monetary stimulus (QE3 and forward guidance) at the end of 2012. This monetary stimulus offset the impact of the fiscal tightening. This is not to say that tax changes cannot impact the economy, rather that to be effective, tax changes need to focus on

[5]See www.huffingtonpost.com/2012/11/14/350-economists-urge-against-austerity_n_2130019.html?ref=topbar.

[6]Four-quarter real GDP growth increased from 1.5 percent in late 2012 to 2.6 percent in late 2013.

the supply side, changing the incentive to work, save, and invest. A policy of simply shoveling out more money to the public through tax rebates and transfers will generally be offset by monetary policy, and do little to spur the economy.

Another policy lesson is the need to reduce moral hazard in the banking system. Federal policies such as FDIC (deposit insurance), "too big to fail," and the GSEs (Fannie Mae and Freddie Mac), end up subsidizing risk taking. Thus, banks have an incentive to take socially excessive risks, knowing that taxpayers are absorbing a portion of that risk. If we must have federally insured bank deposits, it makes sense for those funds to be invested in relatively safe assets, and riskier lending to be done with noninsured funds. Unfortunately, there are major political hurdles to achieving this sort of banking reform.

The single most important lesson of the Great Recession is the importance of a stable monetary regime. In my view, inflation targeting is not the most reliable guide to monetary policy. Rather than target the rate of inflation, the Fed should target the level of NGDP, perhaps along a path growing at roughly 4 percent per year (see Sumner 2017). Such a policy would lead to some year-to-year variation in the inflation rate.

However, as George Selgin (2018a) and others have pointed out, some fluctuation in inflation is actually appropriate, and helps to stabilize the overall economy. NGDP represents the funds available to pay wages, and also to repay nominal debt. When NGDP growth falls sharply, the result is almost inevitably higher unemployment and more debt defaults.

The advantages of level targeting are less well understood. Under current policy the Fed lets, "bygones be bygones." Thus, if they miss their 2 percent inflation target for a few years in a row, they do not attempt to get back on the old 2 percent trend line. Rather they start a new 2 percent inflation target, from the current position of the economy. This sort of "growth rate targeting" is especially ineffective during major shocks such as 2008–09. It makes monetary policy much less effective once interest rates fall to near zero, and cannot be reduced much further.

Paul Krugman (1998) has argued that at zero nominal interest rates, monetary policy injections will not boost the economy if they are expected to be temporary (see Beckworth 2017). One way to make monetary policy more effective at the zero bound is to adopt

level targeting. This is one reason why NGDP level targeting has gained increasing adherents on both the left and the right, in the years since the Great Recession. It is rightly seen as a way of credibly promising to do whatever it takes to get the economy back to the old trend line after a major shock.

The greatest advantage of level targeting is not that it eventually gets the economy back on the original trend line for NGDP, but rather that it tends to minimize short-term deviations from that trend line. Imagine a major real estate project that was under construction during late 2008, when the recession got much worse. Now think about the conditions on which the developer might cancel the project. Clearly, if the Fed committed to getting nominal spending back up to the original trend line as soon as possible, the developer would be less likely to cancel the project than if the central bank accepted the decline as permanent, and started aiming for a new and lower trend line. Unfortunately, in 2009 the Fed did the latter, taking the decline in 2008–09 as permanent and aiming for growth along a new and much lower trend line.

Getting the right target for monetary policy is the most important lesson of 2008–09, but it is not the only lesson for monetary policy. After all, even with the Fed's current flawed regime, which features flexible inflation targeting (2 percent inflation plus high employment), the Fed fell well short of its goals during 2008–09. This points to three additional lessons:

1. Do whatever it takes to equate the policy target and the economic forecast.
2. Be guided by market forecasts, not internal Fed forecasts.
3. Do not pay interest on bank reserves during a slump.

Lars Svensson (2003) advocated a policy of "targeting the forecast," which meant setting monetary policy at a position where the expected growth in the nominal variable being targeted (inflation or NGDP) was equal to the policy goal. Under this approach, policy would have had to become much more expansionary in late 2008.

There is one popular misconception about a policy where the central bank does "whatever it takes" to hit its policy target. Some fear that this would lead to frequent use of extraordinary initiatives such as quantitative easing and negative interest on reserves, which might have unfortunate side effects on the economy. In fact, the exact opposite is true. These extraordinary policy initiatives tend to occur

precisely because *policy has previously been too tight*, causing NGDP growth to fall to very low levels. When monetary policy is aggressive enough to keep NGDP growth along a trend line of 4 percent or more, nominal interest rates do not need to fall to zero to maintain a healthy economy. The one major developed country that avoided the Great Recession (Australia) did not do so by cutting rates to lower levels than other countries; indeed, rates never fell to zero in Australia.

A comparison of the United States and the eurozone provides an almost perfect case study of this misconception. During the early years of the Great Recession, European Central Bank (ECB) officials believed that Ben Bernanke's Fed was pursuing too much monetary stimulus, which would lead to high inflation. The high inflation never arrived. In contrast, the ECB initially adopted a tighter policy, not cutting rates as sharply and not doing QE. On two occasions in 2011, the ECB raised rates prematurely, and the eurozone plunged into a double-dip recession. This made conditions in the eurozone so dire that the ECB was eventually forced to do an extraordinary monetary stimulus, and ended up doing *even more extreme policies than the Fed*.

Today, the Fed is steadily raising rates, while the ECB combines QE with negative interest on bank reserves, a more radical policy mix than anything done by Ben Bernanke during his years as chair of the Fed. The lesson is simple. Doing whatever it takes to maintain adequate NGDP growth will allow central banks to avoid the sort of extraordinary policy steps seen recently in Europe and Japan. These radical steps are a signal that central banks have inappropriately allowed NGDP growth to fall to excessively low levels.

While Svensson recommended that central banks target their own internal forecast of inflation, the events of 2008 suggest that the market forecast is more reliable. Earlier I referred to a meeting in mid-September 2008, right after Lehman failed, where the Fed refused to cut interest rates below 2 percent despite a weakening economy. The Fed statement cited a risk of high inflation, and indeed inflation had been relatively high during the previous 12 months. But on the day of the meeting, financial market

[7]This was the TIPS spread, the difference between the yield on conventional 5-year T-notes and inflation indexed 5-year T-notes.

indicators suggested an inflation rate of only 1.23 percent over the following 5 years.[7] The Fed was driving by looking in the rear view mirror, whereas it should have been using market forecasts to look ahead down the road (see Sumner 2016).

In my view, the federal government should set up and subsidize trading in a NGDP prediction market, as the market forecast of NGDP growth is the single most important indicator of the stance of monetary policy. The Mercatus Center has worked with Hypermind to set up just such an experimental market, as a demonstration project.

Soon after the Fed mistakenly refused to cut rates in September 2008, they made an even more serious error, instituting a policy of paying interest on bank reserves in October 2008 (see Selgin 2018b; Beckworth 2018). Paying interest on bank reserves has the effect of increasing the demand for base money, which is the type of money directly created by the Fed. While an increase in the money supply is expansionary, an increase in money demand is contractionary. The Fed was essentially paying banks to sit on the money being injected into the economy in the various QE programs, which negated or "sterilized" the effect.

Defenders of interest on reserves point to the fact that the rate was cut to only 0.25 percent in mid-December 2008. However, this misses two important points: (1) the worst of the slump had already occurred by the end of 2008, and (2) even a rate of 0.25 percent is contractionary at a time when alternative investments such as T-bills were paying even lower interest rates. Paying interest on reserves was not the only Fed error, but it was an important mistake.

Summary

To summarize, there are 10 key lessons to be learned from the events of 2008:

1. Unstable NGDP represents a failure of monetary policy.
2. Never reason from a price change; focus on NGDP growth, not inflation and interest rates.
3. Don't confuse the symptoms of falling NGDP (falling asset prices and banking distress) with the *cause* of falling NGDP (overly tight money).
4. Don't try to predict asset price bubbles; markets are smarter than policymakers.

5. Demand-side fiscal stimulus is relatively ineffective; any tax cuts should focus on supply-side effects.
6. The federal government needs to reduce moral hazard in the financial system by scaling back taxpayer protections on risky loans.
7. Set a target path for the *level* of NGDP, perhaps growing at 4 percent per year.
8. Do whatever it takes to equate the forecast of NGDP growth with the policy target.
9. Rely on market forecasts of nominal variables such as inflation and NGDP, not internal Fed forecasts.
10. Do not pay interest on bank reserves during an economic slump.

Long-term interest rates have been on a downward trend since 1981. Many experts now believe that it is highly likely that the United States will again experience near zero interest rates during the next recession. Thus, it is important that we learn the correct lessons from the Great Recession. The most important lesson is that monetary policy is always capable of maintaining adequate NGDP growth, and the Fed must continually do whatever it takes to insure that expected future NGDP growth is adequate to meet the Fed's policy target.

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Should the Fed Be Constrained?

Jeffrey Frankel

To what extent should the central bank be constrained, rather than allowed full discretion in setting monetary policy? Should the constraint be legislated rules telling the monetary authorities to target a nominal variable like the price of gold, M1, or the inflation rate? Or some sort of Taylor Rule that requires it to set interest rates according to a formula? Even if the Fed continues to retain its cherished independence from the rest of the government, should it constrain itself by adopting inflation targeting or a Taylor rule?

Even forward guidance constitutes a form of self-constraint, though admittedly of a weaker sort. Some make a distinction between "Odyssean guidance," in which the central bank intends to "tie its hands" in the interest of moving expectations, versus "Delphic guidance" that aims only to reveal its honest forecast in the interest of transparency (Campbell et al. 2012). But in either case, if the economy evolves in a way that was not anticipated, the ex ante pronouncement may act ex post as a constraint on policy decisions in ways that intervening events have rendered unwelcome.

I am increasingly convinced that the constraint must be very loose. Central bankers chronically end up unable to fulfill commitments to nominal targets, rules, or even their own forward guidance. The reason, in most cases, is not that they are insincere, but rather that

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unforeseen shocks come along after the policy is set. These shocks can make it highly undesirable to stick with the target or, in some cases, can make it impossible.

Satisfying Constraints Is Harder than It Sounds

Consider a selection of possible examples, out of many, where central banks were unable to fulfill commitments. Start with nominal targets, such as fixing the price of gold, the exchange rate, the money growth rate, or the inflation rate.

When Milton Friedman (1948) argued for rules over discretion, the rule that he had in mind was a fixed rate of growth of the money supply. He temporarily won the debate in 1980. But the Fed was forced to abandon its experiment with monetarism in 1982, because of a big increase in the demand for money. Velocity shocks render money targets unworkable.

To take an example from abroad, the Bundesbank continued to pay lip service to M1 targets until the end of its life, but usually missed its targets. The same is true of other countries today that still cite the money supply when the IMF requires them to declare their nominal anchor. Late in his life Friedman admitted that he had overestimated the stability of the money demand function.

Consider, second, inflation targeting (IT) (e.g., Svensson 1999). Inflation targeters also chronically miss their targets. Traditionally they would miss on the upside, failing to bring inflation down as much as promised. But since the 2008 crisis, advanced countries have missed their targets on the downside, failing to bring inflation up as much as promised. The United States undershot its inflation target for 10 years following the Great Recession, despite quadrupling the monetary base and—eventually—reattaining full employment. Japan made an all-out commitment in 2013 to raising its inflation rate to 2 percent. This was the centerpiece of Abenomics, the platform on which the new government had come to office. Yet five years later, Japan still hasn't even achieved 1 percent inflation.

Price level targeting has been proposed as an alternative to inflation targeting, but would be even less credible. It is true that in a deflationary episode such as 2008–09, a price level target cleverly gets expectations working in a more powerful way, if one assumes that the targets are believed. (The price level target requires that the central bank makes up for misses, while an inflation target

lets bygones be bygones.) But why should the public believe such a target?

The same is true for proposals to set an inflation target of 4 percent rather than 2 percent (Blanchard, Dell'Ariccia, and Mauro 2010). Following a period when central banks have been unable to achieve modest targets like 2 percent inflation, why should the public find the proclamation of a more aggressive target credible?

One is reminded of a diet plan that targets losing 1 pound the first week, 2 pounds the second week, etc., with a stipulation that if the participant fails to lose weight the first week, then he is supposed to lose 3 pounds the second week instead of 2, and if he fails that, then 4 pounds the third week, etc. Not a credible penalty. Another analogy is proposed penalties in international agreements to cut emissions of greenhouse gases (if a country misses its target, it has to cut that much more the next period). A third analogy is the penalties that are supposedly part of Europe's Stability and Growth Pact (if Italy wantonly misses its budget target, it is to pay a penalty the next period, making it even harder to achieve the required budget target).

History has also shown it difficult to comply with rules that specify a multivariable reaction function for the central bank. The Taylor Rule (1993), of course, became inoperable when interest rates unexpectedly hit the zero lower bound in 2008. What would the Fed have done if the Taylor Rule had previously been legislated and in 2008 turned out to have the unintended effect of legally requiring an impossible interest rate of minus 3 percent?

Such stories apply to forward guidance as well. The Fed repeatedly postponed its own predictions of the dates at which it was expected to raise interest rates in 2015–16. The postponements were attributable to a slight slowing in the economic growth rate and thus were appropriate. To be sure, the Fed had repeated endlessly that its dot plots and other forward guidance were only best-guess forecasts and that ultimate decisions would be data-driven. But one suspects that the Fed found the repeated postponements somewhat embarrassing nonetheless.

Even guidance in the minimal form of thresholds hasn't worked. In December 2012, the FOMC said it would keep interest rates at zero "at least as long as the unemployment rate remains above 6.5 percent." As it happened, that threshold was reached in April 2014, not because the economy had grown unexpectedly fast but

because the labor force participation rate had declined. The Fed was not ready to signal an increase in interest rates. The guidance was abandoned.[1]

Similarly, in August 2013 the Bank of England said it would not consider raising rates until U.K. unemployment fell to 7.0 percent. That threshold was reached within 6 months (here the unexpected development was evidently a productivity shock), long before the Bank was ready to consider tightening. The guidance was abandoned. These difficulties were the consequence of statements that seemed reasonable at the time but were highly vulnerable to future shocks.[2]

The Case for Nominal GDP Targeting

Now to the question, to whatever extent the central bank is to be constrained by a rule, even if only weakly, what should that rule be? I am one of those who have argued for nominal GDP (NGDP) targeting (Frankel 1995, 2013). The reason is that it is more robust with respect to shocks than the leading alternatives: it is less likely one will regret having committed to it. In the hey-day of monetarism when the leading candidate for nominal anchor was M1, the argument for NGDP targeting was that it was (by definition) immune from the velocity shocks that plagued M1 targeting.[3]

Interest in NGDP targeting revived around 2011–12. Proponents this time include Romer (2011), Hatzius (2011), Woodford (2012), Sumner (2014), and Beckworth and Hendrickson (2016). The proposal has particularly flourished on the internet.[4]

The alternative to beat is no longer an M1 target, which crashed-and-burned in the 1980s, but an inflation target. The case in favor of a NGDP target is still its robustness with respect to shocks. But relative to an inflation target, the advantage of NGDP targeting is robustness with respect to *supply shocks*. These include productivity

[1]See www.federalreserve.gov/newsevents/pressreleases/monetary20140319a.htm.

[2]The vulnerability was predicted (e.g., Frankel 2012: fn 3; 2014).

[3]The original proposal was from Meade (1978) and Tobin (1980), followed by analysis from many others.

[4]Including contributions of David Beckworth (at *Macro Market Musings*), Scott Sumner (at *Money Illusion*), Lars Christensen (at *Market Monetarist*), and Marcus Nunes (at *Historinhas*).

shocks and commodity shocks.[5] In the presence of an adverse supply shock, an inflation target implies a needlessly tight monetary policy and a needlessly large recession.[6] Where an inflation target can push the authorities to tighten in the face of an adverse shock, NGDP targeting allows the impact of the shift to be automatically divided between some loss of price stability and some loss in the output objective. That is roughly speaking what one would want to do anyway, even if one had discretion.

Inflation targeting, especially flexible inflation targeting, has many passionate defenders (e..g., Svensson 2009). I hasten to make clear that I approve of the central bank being transparent about what it sees as the long-run inflation rate (along with the long-run growth rate and unemployment rate). If this is all that is meant by flexible inflation targeting, then fine. But if we are talking about some degree of commitment at a 1- or 2-year horizon, then I still see problems from supply shocks.

Proponents of NGDP targeting have also come up with a third-generation argument concerning financial stability inspired by the global financial crisis: Via countercyclical inflation, NGDP targeting improves the distribution of risk between debtors and creditors (see Koenig 2013; Sheedy 2014; Azariadis et al. 2015; and Beckworth 2018).

What Are the Drawbacks of Nominal GDP Targets?

One common argument against NGDP targets is that the authority cannot hit them. The same point applies to inflation targets, however. Either way, nobody proposes to stake all credibility on hitting the target.

A second common argument is that the person in the street does not understand what NGDP is, or how it breaks down into real GDP and the price level. Central bankers fear the public would hold them responsible for hitting a real GDP target that might be rendered

[5]Weather shocks, natural disasters, and terms of trade shocks, along with big productivity shocks, make NGDP targeting particularly relevant for developing countries (Bhandari and Frankel 2017).

[6]For example, in July 2008, the European Central Bank decided to raise interest rates just as the world was sliding into the Great Recession. That move was hard to explain other than as an IT-induced reaction to spiking oil prices.

impossible by an adverse productivity shock. This could well be true. But it is all the more reason to avoid choosing an ex ante target like inflation that in the event of an adverse supply shock must be abandoned ex post amid feeble explanations about the unforeseen development. If a central bank adopted NGDP targeting, it would implicitly and explicitly make the point that it has no control over productivity shocks or commodity shocks. It is better to make that point ex ante than ex post.

Third, NGDP numbers are revised over time by the statistical agencies. This problem does indeed seem a drawback of NGDP targeting, but not a fatal one, especially if the commitment is to be loose anyway.

If the Target Is to Be NGDP, How Strong Should the Commitment Be?

I once thought that it would be easier to hit a two-year target for NGDP growth within a given range (say plus or minus 1 percent) than to hit a corresponding target for inflation. The logic was that monetary policy largely has to pass through NGDP anyway, to get to inflation: Inflation can be deflected from its target by both supply and demand shocks, while NGDP can only be deflected by demand shocks. But I no longer am so sure of that. I still think NGDP targets would be better than inflation targets if they could be achieved, but I am no longer so confident that they can be achieved.

For this reason, one should not stake a lot of credibility on a particular target for NGDP growth, even with a target range (just as the Fed does not currently stake a lot of credibility on hitting its inflation target precisely, in the short term).

I come out with a very modest proposal. The Fed should add a row for Nominal GDP to the FOMC's Summary of Economic Projections (SEP). This seems a useful idea even if the governors and district presidents who fill out the SEP table simply were to derive their projected NGDP growth numbers by taking the sum of the real growth row and the inflation rate row of the table (though inflation in the SEP table is currently the PCE deflator, not the GDP deflator).

I would prefer that NGDP be reported in the first row of the SEP table, above the rows for real growth, unemployment, inflation, and the fed funds rate (Table 1), and that the public be allowed to infer that the Fed was now paying some attention to NGDP.

TABLE 1
Modified Summary of Economic Projections (SEP)

Economic Projections of Federal Reserve Board Members and Federal Reserve Bank Presidents under Their Individual Assessments of Projected Appropriate Monetary Policy, December 2018

	Median[a]				
	2018	2019	2020	2021	Longer run
	Percent				
Nominal GDP Growth					
Change in Real GDP	3.0	2.3	2.0	1.8	1.9
Unemployment Rate	3.7	3.6	3.6	3.8	4.4
PCE Inflation	1.9	1.9	2.1	2.1	2.0
Core PCE Inflation[b]	1.9	2.0	2.0	2.0	—
Memo: Projected Appropriate Policy Path Federal Funds Rate	2.4	2.9	3.1	3.1	2.8

[a]For each period, the median is the middle projection when the projections are arranged from lowest to highest. When the number of projections is even, the median is the average of the two middle projections.
[b]Longer-run projections for core PCE inflation are not collected.
Source: See www.federalreserve.gov/monetarypolicy/files/fomcprojtabl20181219.pdf for the original SEP.

Should Politicians Constrain the Fed?

Rules are one kind of constraint on the central bank's discretion; but another kind is control by the rest of the government. In recent years, Congress and the White House have made attempts to rein the Fed in. If they were to succeed in puncturing the Fed's vaunted independence, there is reason to think that the effect would be to make monetary policy procyclical.

Consider a few quotes, out of many that one could equally well have chosen:

- On November 15, 2010, 23 conservative economic and financial leaders wrote a letter to the *Wall Street Journal* protesting

the Fed's monetary easing and warning of "currency debasement and inflation." At the time the unemployment rate was 9.8 percent.[7]

- On September 29, 2011, Donald Trump tweeted: "The Fed's reckless policies of low interest and flooding the market with dollars needs to be stopped or we will face record inflation." Unemployment was still 9.0 percent.
- On July 19, 2018, President Trump said: "I am not happy about [interest-rate increases]" (*Wall Street Journal* 2018). And on October 11: "the Fed is out of control." The unemployment rate had by then fallen to 3.7 percent.

This and other historical evidence[8] suggests that if the politicians who want to bring the Fed under control got their way, they might act procyclically instead of countercyclically. They could tighten monetary policy when unemployment exceeded 9 percent and loosen when it was lower than 4 percent. Needless to say, such a pattern would work to exacerbate the swings in the business cycle.

The conclusion? Let the Fed do its job.

[7]Signers included Michael Boskin, Charles Calomiris, Niall Ferguson, Kevin Hassett, Douglas Holtz-Eakin, David Malpass, Paul E. Singer, and John B. Taylor.

[8]To take two more examples, Presidents Richard Nixon and Ronald Reagan both put pressure on the Fed to ease monetary policy at times when inflation and growth were already relatively high. Frankel (2007) summarizes the episodes under "Inflation Crises," citing evidence from Abrams (2006) and Woodward (2000), respectively.

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Book Reviews

Holding Bankers to Account: A Decade of Market Manipulation, Regulatory Failures and Regulatory Reforms
Oonagh McDonald
Manchester, UK: Manchester University Press, 2019, 288 pp.

How could a small clique of derivatives traders manipulate some of the world's most important financial benchmarks for their own enrichment? In general, global capital markets are much too liquid, competitive, and integrated for any individual participant to materially alter outcomes. Opportunities to gain a sure profit from market inefficiencies are hard to come by and quick to disappear.

Yet, starting in 2008, evidence that prominent banks were rigging the London Interbank Offered Rate (LIBOR) began to surface, potentially affecting financial contracts worth hundreds of trillions of dollars. Subsequent investigations by British and American regulators confirmed these suspicions and revealed additional manipulation of the markets for foreign exchange and precious metals, ushering in large fines and considerable new regulation. The scandal has had long-term implications, with the main LIBOR watchdog now encouraging financial institutions to use alternative reference interest rates.

The collusion between banks that enabled this manipulation, and the regulatory response, are the subject of *Holding Bankers to Account*, a forensic new treatment by Oonagh McDonald. McDonald is a veteran of financial regulation who has authored

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books on the failure of government-sponsored mortgage giants Fannie Mae and Freddie Mac, as well as the collapse of Lehman Brothers. From 1993 to 1998, she served as a director of the Securities and Investments Board, the agency then overseeing Britain's capital markets.

Despite her insider status, McDonald does not avoid discussing the regulatory failures that enabled market manipulation. Painstakingly, she documents how traders and other bank staff worked together to rig reference rates for their own gain, and how regulators procrastinated as evidence of malfeasance accumulated. Her tone, however, is dispassionate and removed, leaving the reader to decide how to allocate the blame.

Most books on the LIBOR scandal have tended to focus on the personalities of the people involved, notably Tom Hayes, the erratic Londoner who as a yen trader for UBS and Citigroup made millions for himself and his employers by recruiting brokers and other traders to get the benchmark where he wanted it. McDonald's is decidedly not one of those books. She rarely mentions individuals by name, focusing instead on institutions and practices. One might think that a few references to the characters involved would have increased the book's appeal to the lay public, who are otherwise prone to eschew dry analyses like this one for less scholarly journalistic pieces. But that is probably not McDonald's target audience anyway.

More than half of the book is devoted to the manipulation of LIBOR, which was created in 1969 as a dynamic benchmark for banks' funding costs. Minos Zombanakis, a Greek merchant banker looking to make a loan to the shah of Iran, needed a measure that would periodically adjust to reflect changes in banks' cost of capital. His solution was to ask a group of large banks to submit regular estimates of their cost of borrowing and use those submissions to derive an interest rate that would change every three to six months. Zombanakis's benchmark proved a rapid success in the burgeoning market for syndicated loans. In 1986, the British Bankers' Association began to publish LIBOR rates for loans in U.S. dollars, pound sterling, and Japanese yen. Thereafter, LIBOR grew to become the reference measure for more than $550 trillion worth of financial contracts, including retail mortgages and interest-rate swaps.

Despite this growth, LIBOR continued to be set daily by what can only be described as a cozy cartel. Each day at 11am London time, officers at Barclays, Deutsche Bank, UBS, and other large

banks—but never more than 16 of them—would submit estimates of their short-term cost of unsecured credit. LIBOR submissions were meant to reflect the terms a bank could negotiate on the market, but with no-one assessing them for accuracy, submitters had much leeway to diverge from the true rates.

It was the financial crisis that signaled to market observers something might be amiss. Despite widespread worries that many financial institutions, including LIBOR submitter banks, faced potential solvency problems, the benchmark showed no sign of stress. An April 2008 study published in the *Wall Street Journal* compared LIBOR rates to those implied by default insurance on LIBOR-submitting banks, finding discrepancies of as much as 0.87 percent for Citigroup and 0.42 percent for UBS. Banks seemed to be "lowballing" their LIBOR submissions, lest their true, higher cost of borrowing be interpreted as a sign of impending failure.

The implications for financial stability of suspected lowballing prompted regulatory scrutiny from 2010 onward. In the course of their investigations, regulators uncovered evidence of manipulation going back to 2005, mostly aimed not at hiding potential vulnerabilities but at altering submissions for the benefit of banks' trading books. LIBOR is derived from taking daily rates from the 16 reference banks, dropping the four highest and four lowest values, and averaging the rest. One bank's attempt to manipulate could therefore not easily succeed, as a submission that diverged significantly from those of other banks might be ignored or, in the best of cases, offset by other submissions. Thus, rigging the benchmark necessitated the collusion of submitters and traders *across* banks—and they did collude, enlisting brokers to help with communication.

It is easy to find fault with the regulatory response in hindsight. But McDonald shows sympathy for the view, expressed by top UK regulator Lord Turner soon after the scandal broke, that watchdogs' focus on shoring up financial stability during the crisis blinded them to banks' LIBOR shenanigans. Even when regulators managed to spot anomalies, however, they misdiagnosed the problem. The Bank of England's Paul Tucker, giving evidence to the UK Parliament's Treasury Select Committee, said that the Bank "thought [LIBOR] was a malfunctioning market, not a dishonest market." In fact, Tucker himself had cautioned Barclays chief executive Bob Diamond in October 2008 about the perils of paying high rates for short-term loans.

Yet excusing regulatory forbearance at the height of the meltdown cannot hide the failure to spot manipulation before the crisis. McDonald argues that the supervisory powers of the regulator over LIBOR were insufficient to pose an adequate deterrent against wrongdoing. A key merit of her book is showing that the privilege bestowed upon a small clique of banks to set LIBOR for everybody else was a remnant from a bygone era. While an old boys' network ran the City of London, capital markets were subject to strict exchange controls. The governor of the Bank of England knew the heads of all supervised institutions by their first name, and the system of LIBOR submissions could perform adequately. But as financial market liberalization from 1986 spurred the entry of scores of foreign players, setting the stage for a dramatic growth of derivatives and currency trading, opportunities for LIBOR manipulation increased—and so did the rewards.

Rigging of foreign exchange and precious metals markets marched to the same tune. In both cases, as with LIBOR, a small group of banks took advantage of their position as price-setters to benefit themselves rather than submit measures reflective of prevailing market conditions.

A benefit of the LIBOR scandal has been to hasten regulators' efforts to replace it with benchmarks that are less dependent on the judgment of submitters, who are interested parties, and are based instead on market transactions. In July 2017, Andrew Bailey, who as chairman of the UK Financial Conduct Authority oversees LIBOR, indicated that the regulator would seek a gradual transition away from the old benchmark, arguing that the market for term loans between banks—on which LIBOR was designed to be based—"is no longer sufficiently active." Bailey's counterparts in the United States and the eurozone have similarly sought to replace LIBOR with market-based measures, typically overnight wholesale loans, either unsecured or with government bonds as collateral.

McDonald is skeptical that a single short-term rate can replace the term structure of interest rates that LIBOR offers. However, benchmark rates are just that: a baseline to which premiums may be added for various kinds of risk, including term risk. While it may take time for a liquid market for contracts using non-LIBOR benchmarks to develop, transaction-based reference rates are clearly preferable to judgment-based ones, particularly when the latter are the private province of a few banks and regulators.

While acknowledging that post-2012 regulation—aimed at prescribing the expected conduct, reporting procedures, and enforcement against wrongdoing—is "expensive and time-consuming," McDonald is optimistic that the benefits of the new regime will outweigh its compliance costs. Her discussion of the new rules, however, is mostly descriptive, and she spends little time telling the reader quite why he should be confident that the same regulators who failed to spot and address malfeasance last time will get it right this time. Is it because senior bankers now have "skin in the game," discouraging them from pleading ignorance of their underlings' bad behavior? Have new regulations sufficiently increased the information and enforcement powers available to regulators? Do regulators now have stronger incentives to act on suspicions of manipulation? Again, it is up to the reader to decide.

McDonald's book gives a detailed account of how LIBOR and other benchmark rates came about, how manipulation could take place, and the attempts to eschew the benchmarks' weaknesses and improve oversight after the scandal. Yet, on a topic as complex as this one, her experienced voice as a former regulator and constant observer of events is too often missing. Most accounts of the LIBOR scandal leave readers with the impression that nothing could have gone wrong were it not for greedy bankers. McDonald shows compellingly that only institutions and incentives can explain why manipulation took place here, and not elsewhere. Alas, her book is not the place to find out what the way forward should be.

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The Future of Capitalism: Facing the New Anxieties
Paul Collier
New York: HarperCollins, 2018, 248 pp.

Paul Collier, Professor of Economics and Public Policy at the Blavatnik School of Government, Oxford University, acknowledges that writing *The Future of Capitalism* was intellectually "daunting, my proposition being that what was needed was a synthesis of moral philosophy, political economy, finance, economic geography, social psychology and social policy." In presenting a comprehensive case for what ails capitalism and his "remedies that address our new anxieties,"

Collier proposes "an ethical capitalism that meets standards that are built on values, honed by practical reasoning, and reproduced by the society itself."

The social bases of these new anxieties, found in North America, Europe, and Japan, are geographic, educational, and moral. The successful "metropolitan-located class" is well educated, affluent, and possesses the skills needed for the 21st century. Individuals in that class have developed a distinctive moral superiority and have elevated group characteristics, such as minority ethnicity and sexual orientation, into "victim" identities. In contrast, the stigmatized "white working class," is made up of older workers and young, first-time employees, often (but not always) located outside metropolitan hubs; they are employed in less meaningful, lower paying jobs, and have declining living standards. With a growing percentage of wealth accruing to the rich, capitalism has lost some of its popular support and is regarded by many as unfair.

Collier mirrors British political analyst David Goodhart who, in his book *The Road to Somewhere* (2017), describes this socioeconomic-political divide as the "Anywheres" versus the "Somewheres." The Anywheres are cosmopolitan, educated, mobile, and networked, their lives centered on communities of affinity rather than place, which is secondary. Their politics are progressive or classically liberal. Somewheres, however, are rooted in local communities, where their jobs (often working with their hands or on their feet), commitments, and friendships are part of their families, neighborhoods, and religious congregations. Politically, they tend to be socially conservative, patriotic, and less disposed to vote with their feet.

Collier acknowledges that the parties of the center-left and center-right are incapable of addressing these new anxieties. Ideologues and populists have, since the Great Recession of 2008, replaced social democracy, which was the prevailing political force of the post-World War II era through 1970. Why? Because "the social democrats of the left and right each drifted away from their origins in the practical reciprocity of communities, and became captured by an entirely different group of people who became disproportionately influential: middle-class intellectuals," who Collier refers to as the "WEIRDs: Western, Educated, Industrial, Rich and Developed."

The economics profession also incorporated a bastardized version of Jeremy Bentham's utilitarian morality into its concept of "economic man," who Collier defines as "utterly selfish and infinitely

greedy, caring about nobody but himself." The incorporation of economic man into the public policy calculus resulted in post-World War II social democratic policies changing from a foundation of reciprocal obligations of all citizens (i.e., loyalty and fairness) to a toxic combination of utilitarian economics and a morally reliable state justified to redistribute income to whomever had the greatest needs. "Citizens ceased to be moral actors with responsibilities, and were and instead reduced to their role as consumers. The social planner and his Utilitarian vanguard of angels knew best: communitarianism was replaced by social paternalism," says Collier. From the perspective of communitarianism, one concludes that the interdependence (and balance) among the self, the state, and the market had become increasingly tilted toward the state and market, with the citizen becoming less ethically and morally responsible.

Beginning in the 1970s, political parties of the left abandoned communitarian principles of social democracy, substituting utilitarian and Rawlsian ideologies, the latter ideology focusing on redress for the disadvantaged individual or "victim groups." Likewise, political parties on the right, embracing the libertarian views of Robert Nozick and Milton Friedman, argued that individuals have rights to freedom that override collective interests, and that freedom to pursue one's self-interest, constrained only by competition, produces superior results compared to what is achievable through public regulation and planning. While I agree with Collier that the political parties of the left have dutifully embraced utilitarian and Rawlsian orthodoxy, which became starkly apparent in both the United States (Democrat Party) and Britain (Labor Party) in 2019, I do not find this libertarian orthodoxy omnipresent in the U.S. Republican Party or British Conservative Party.

Collier argues in favor of an intellectual reset for social democracy, built upon a foundation of pragmatism and communitarianism. Pragmatism argues that, because societies change, we should not expect eternal truths, and the efficacy of a policy should be judged on whether it works, not on whether it conforms to tenets of an ideology. Furthermore, pragmatism is communitarian in origin, as the task of morality is to fit our actions to the values of our community and the specifics of context. Collier emphasizes that a willingness to help others is the result of combining three narratives: "shared belonging" to a group, "reciprocal obligations" within the group, and a link from an action to the well-being of the group that shows it to be "purposive."

Collier proposes a manifesto that recognizes an active state, but one that embraces a more modest role; and a functioning market, but one harnessed by a sense of purpose securely grounded in the ethics and philosophy of David Hume and Adam Smith. Collier replaces "economic man" with his conceptualization of "social man," who cares what others think of him. Moreover, social man, while still rational, views utility beyond his own consumption—namely, to include personal esteem built on a foundation of "shared belonging." Social man enables us to understand people and induces us to care about them while assessing their moral character.

Restoring ethics to the market, says Collier, involves four societal entities: state, firm, family, and world. The state's current lack of ethical purpose reflects a moral decline across society, with many people becoming less generously disposed toward those less fortunate. His prescription is not to instill national values ("they fail to distinguish a particular country from many others"), but to cultivate a sense of "belonging to place." Collier argues that "patriotism" (rather than nationalism), defined as belonging to a common territory, can be used to recapture "belonging" from nationalists and to restore it as central to people's identity.

At the level of the firm, Collier argues that the prevailing idea that the sole purpose of a firm is to make profits ("shareholder primacy") needs to give way to a new way of thinking about corporate governance—one that explicitly recognizes that decisions of corporate boards are of importance to the greater society. Consequently, he recommends different rates of corporate taxation by company size, laws requiring due consideration of the public interest for all board members, and legally requiring representation of worker interests on the board of directors (as found in Germany). Finally, while the role of the state as regulator is necessary, policing the public interest for the firm should be the role of informed "ethical citizens." And while the responsibility of any board of directors is to be the final arbiter of strategy formation in the publicly traded firm, directors should recognize their mutually interdependent relationships with relevant stakeholders in the firm's environment. Corporate law does not preclude due consideration of the "public interest"; thus, making this a legal requirement would recognize a reality of the 21st century business environment.

The "ethical family" is the natural unit for creating a sense of belonging, according to Collier. However, he sees ethical family structure under siege, with marriage and child rearing diverging between the highly educated and less educated. By 2010, the divorce rate was one-in-three among less-educated couples compared to one-in-six among highly-educated couples, resulting in "many [less-educated] families disintegrating into empty shells" and the paternalistic state becoming more involved with child rearing. Collier's antidote is that, while the decreasing number of children has reduced the *size* of families, the *longevity* of families has increased. That longevity allows patriarchs and matriarchs to help by "regenerating the force of esteem that polices the obligations of the extended ethical family."

Building an ethical world today, argues Collier, will require a new multipurpose "club" that reflects the realities of current economic and military power. His proposed G6, consisting of China, India, the United States, the European Union, Russia, and Japan, would "fix" global problems, such as climate change, pandemics, and failing states. He believes it will take years for this club to form, but hopes for a more effective club than the existing international arrangements such as the G20 or G7. For Collier's G6 to work, the authoritarian and strongly nationalistic governments in China and Russia will require a major infusion of enlightened self-interest.

To heal the cleavages now found in modern capitalist societies, Collier proposes general policies for restoring the inclusive society. The first task is addressing the geographic divide between booming metropolises and broken cities. Collier takes a page from Henry George and recommends taxing the annual appreciation in the value of land and property as a percentage of land and property values, with the revenue accruing nationally to benefit the recovery of broken cities. I hope that these policies that redistribute income will be evaluated based on pragmatism—that is, on the efficacy of whether the policy actually works—and will not continue to be ideologically driven. Of course, designing an equitable formula for distributing this revenue back to the local government will be a public policy challenge.

Collier also recommends private-sector solutions that may regenerate the provincial cities, including legally restricting banks to a specific city so that their futures are dependent upon the success of the

local economy. That proposal, however, ignores the success of branching, which allows banks to diversify their portfolios and hence reduce the risk of failure. Public-sector solutions include (1) compensating pioneering firms like Amazon that locate to broken cities (attracting a mega-firm like Amazon reaps sufficient scale economies entirely with its own operations to justify being a pioneer for broken city redevelopment); (2) providing access to financing through local development banks; (3) establishing business zones that provide dedicated space and infrastructure; (4) organizing investment promotion agencies that forge connections with potential firms; and (5) developing mutually favorable relationships between local universities and local industry. In the United States, emphasis on state and local initiatives to guide urban redevelopment has a strong foundation in federalism.

Addressing the class divide, argues Collier, requires that stressed families be bolstered through public policies (such as an expanded earned income tax credit and supplemental income support programs) that begin early in the child's life and help maintain two-parent families. Moreover, Collier holds that, when adults are parenting a child, encouraging both parents to get a job provides the wrong signal. Providing transfer payments and in-kind support to assist parents at this critical child-rearing time reflects their longer-term contribution to society. Collier also argues for high-quality technical vocational education and training that young people may choose in lieu of the cognitive-focused training found in most universities, and he points to Germany's success in producing a highly productive and well-paid workforce. This latter dose of reality needs further support in the United States.

In conclusion, Collier accuses capitalism of generating divided societies and advocates restoring the pragmatic center to the mainstream political parties in the West. He believes that a "shared identity becomes the foundation for far-sighted reciprocity." Returning to a moral pragmatism, he contends, can guide our politics and regenerate the capitalist system from its recent polarized failure to address the divisions fracturing our societies.

Collier, like Adam Smith before him, is right to focus on the explicit recognition of an ethical foundation for capitalism. I believe, however, that Collier has given short shrift to the importance of religion in Western democracies and to capitalism and its moral foundations. Moreover, the teachings of Christianity, Islam, and

Hinduism, and recognition of their ethical importance in institutional development, can facilitate policy efforts to bolster democracy and capitalism in a global political climate that is increasingly receptive to nationalism, authoritarianism, and socialism.

I agree with Collier's assessment that "the pertinent economic menace is the new and virulent divergence in geographic and class fortunes." Like Collier, University of Chicago economist Raghuram Rajan, in his book *The Third Pillar: How Markets and the State Leave Community Behind* (2019), also proposes "inclusive localism" to rebuild broken cities and offer people dignity, status, and purpose in life. However, I remain unconvinced that substituting *place* for *shared values* will work. As Goodhart notes, the lives of Anywheres center on "communities of affinity rather than place." Considering the divergence in social and political views between the Anywheres and Somewheres, one can only hope that this secondary affinity to place is sufficient to develop patriotism at the national level and economic redevelopment at the non-metropolis, local level.

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Unjust: Social Justice and the Unmaking of America
Noah Rothman
Washington, D.C.: Regnery Gateway, 2019, 256 pp.

The "social justice" movement has provided endless oxygen for right-wing media programming. Indeed, many libertarians are inclined to view the budding cottage industry of books, Youtube channels, and Patreon pages devoted to denouncing "social justice warriors (SJWs)" and their ilk as merely the latest conservative fever dream: the Huns are not braying at the gates of Western Civilization. We are not Rome in the 5th century. But into this saturated market steps Noah Rothman with his book *Unjust: Social Justice and the Unmaking of America*. Far from a conservative overreaction to a troubling-but-trivial trend confined to college campuses, Rothman makes the case that the modern "social justice" movement represents a threat to our most fundamental institutions. Riotous uproars on college campuses are but the most theatrical, made-for-TV epiphenomena of this broader and dangerously corrosive ideological crusade.

What, exactly, is "social justice"? To Mr. Rothman, it is an idea with a long intellectual pedigree, whose first modern incarnation appears in Pope Leo XIII's 1891 encyclical *Rerum Novarum*. Therein, social inequality was conceived of as a tolerable and indeed natural condition, stemming inevitably from interpersonal inequalities in talents and capacities. The mere fact of inequality does not prevent justice from obtaining. Rather, when those divinely endowed (might we say "privileged"?) with greater capacities fail to exhibit *noblesse oblige* and instead prey upon and exploit the less fortunate, the state is justified in intervening to ensure a harmonious cooperation between the plebeians and the patricians. Such intervention was a prophylactic against the twin evil of socialism, which sought to eradicate the natural inequality between men and thus obliterate their divinely sanctioned property rights. Social justice, in this context, might entail a welfare state, support for labor movements, or regulation of working conditions and benefits—but emphatically not the outright acquisition of the means of production by the state.

This Catholic conception of social justice was transformed by John Rawls into a secular schema widely known for its "veil of ignorance" thought experiment. Stripped of any divine injunction and premised instead on "publicly accessible" reasoning, this iteration of social justice was more palatable to the areligious, postwar left. Moreover, because Rawls tolerated inequality so long as it redounded to the benefit of the least-well-off in society, his notion of social justice definitively separated the center-left from its erstwhile Marxist hangers-on.

After quickly noting the libertarian objections to Rawls, Rothman lays out the core of his thesis: The modern identitarian movement rejects the Rawslian notion of social justice, not because it agrees with the libertarians that justice cannot be *social*, but because it believes justice cannot be *blind*. As Rothman writes, "To achieve real social justice, the activists have determined that Lady Justice needs to lose her blindfold."

Social justice, according to its modern proponents, can only be achieved by using the instrument of the state to proactively rectify past injustices. Nobody today, of course, is directly responsible for committing these past injustices, just as nobody today directly suffered through them. Rather, past privilege and past oppression alike are intergenerationally transmitted via identity groups, such as African Americans who were devastated by slavery and Jim Crow. An

identity group can only achieve justice in the present if its individual members are not treated as individuals to stand or fall on their individual merits and demerits but as members of an aggrieved class deserving its recompense. Affirmative action and reparations, then, are justified specifically because they do not blindly maximize a given individual's ex ante probability of success à la Rawls, but because they identify a victim group ex post and award compensatory damages to individuals qua victim-group members.

This pernicious logic is particularly dangerous when applied to science and politics. "Standpoint epistemology," the notion that one's identity group and its historically conferred experiences delimits one's possible range of understanding, abandons the century-long project of consilience among the social sciences. The goal of wedding the insights of, say, political science and economics becomes hopeless if one must first concede that political science is not a single discipline united by a common set of axioms and methodological best practices but is instead a bundle of subdisciplines—female political science, African-American political science, and so on—each with its own experiential and mutually inaccessible first principles.

Politics, too, becomes a doomed enterprise. The very notion of "public policy" is exposed as naïve. Policies are to be assessed on the sole basis of their intergroup redistributive implications. A shared conversation concerning which policies properly derive from a shared understanding of bedrock principles dissolves into an implacably hostile contestation between warring tribes nakedly grasping for the levers of power. White Americans are no less susceptible to this temptation, and the rise of Donald Trump may very well represent a triumphant turn at the wheel by white identitarians.

Rothman's book reads much like a prosecutor's brief. Its primary contribution is a comprehensive recitation of the worst excesses of the social-justice movement, without veering into the ramblings of a Hannity or a Carlson. For anyone even casually plugged in to the right-wing media world, the anecdotes it reviews will sound like a "greatest hits" album: Nicholas Christakis's two minutes' hate at Yale, Charles Murray's bodily expulsion from Middlebury, and many more. But rather than merely reciting this laundry list of horrors, Rothman deftly weaves a coherent analytical theme between these otherwise disparate events. He demonstrates how the underlying principles of this modern, transmogrified project of "social justice"

directly and necessarily lead to this behavior that shocks the conscience of polite society.

Rothman's answer to the timeless question "What is to be done?" (asked by Lenin over a century ago as he contemplated his own society on the cusp of violent convulsion) is multilateral disarmament. Race-blind, individualist meritocrats on both the center-left and center-right must ostracize and expel the identitarians in their ranks, a process for which he cites hopeful precedent in Buckley's banishment of the Birchers and the American Federation of Labor's lustration of its Stalinists.

Indeed, if I could select just one book to hand to a complacent centrist on either side of the aisle—a book that will wake them up to the wolf at the door—it would be *Unjust: Social Justice and the Unmaking of America*.

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Democracy and Truth: A Short History
Sophia Rosenfeld
Philadelphia: University of Pennsylvania Press, 2018, 224 pp.

When news organizations focus on eyeballs and clicks, presidents scream "fake news," and "pay-for-play" think tanks generate seemingly disinterested policy papers, can citizens possibly know the truth? And if not, is democracy still possible?

These are the questions University of Pennsylvania intellectual historian Sophia Rosenfeld asks in *Democracy and Truth: A Short History*. Professor Rosenfeld anchors her arguments in her area of academic expertise, the French Enlightenment and its later variant, Scottish "common sense" theory. Her understanding of the Enlightenment's *philosphes* becomes the foil against which she measures contemporary liberal democratic practice. As one might expect, current practice falls desperately short. Over the course of the book, Rosenfeld becomes more the contemporary political theorist and less the intellectual historian, and it is in this light that her book should be read.

Our ideas of both democracy and the democratic citizen, Rosenfeld suggests, rests on the *philosophes'* attempt to root out "the deceptive institutions, social norms, and language games" that kept

all nations and peoples in "superstitious ignorance." The *philosophes*' answer was to confront all failed orthodoxies with reason and thereby slay the false gods (and power) of absolutist monarchy, inherited aristocracies, and the Catholic Church. In their newly liberated world, Rosenfeld argues, the *philosphes* predicted "liberty and equality would go hand and hand with a commitment to demonstrable evidence and accuracy." Access to truth would emerge from transparent institutions and open debate. Citizens would increase their civic competency, and more competent citizens would strengthen representative democracy. While not fail proof, this virtuous cycle was the attainable end of the Enlightenment project.

Despite the attractiveness of this vision, Rosenfeld concludes that the Enlightenment model contained the seeds of its own opposition and, in our current stage of capitalism, is no longer a plausible theoretical grounding for democracy.

First, Rosenfeld suggests that the marriage of empirical reason and "common sense" will inevitably create a problem for democratic equality. As knowledge becomes more cumulative and complex, experts will become "epistemic authorities" and over time become embedded in bureaucracies, universities, and other distant institutions. Distance and expertise itself must remove these elites from the fabric of everyday life and invite populist backlash and political manipulation. Whenever there are social and economic problems, a popular sense of betrayal will separate reason (experts) from "common sense" (the populace), undercutting both and opening up the probability of anti-liberal and anti-democratic populism. Over time, the loss of trusted arbiters will create a vacuum in which fake news and real news become mere matters of choice or identity.

Here the reader will feel Donald Trump looming in the background, but Rosenfeld is quick to point out that we can apply this understanding to earlier periods of modernity and also to many other polities in the contemporary world.

Second, Rosenfeld seems to believe what we call truth is a manufactured narrative created by the contending interests and very unequal relationships that comprise what she calls "late capitalism." For anyone who has watched even a few nights of TV news, it's difficult to argue with her critique of cable news, talk radio, and the business models of contemporary "news entertainment." So corrupted and corrupting are these institutions that Rosenfeld concludes they can only be solved by changing both democracy and capitalism "in tandem."

By this time, Rosenfeld has moved beyond intellectual history and into the realm of contemporary political analysis, but I would argue a bit of additional intellectual history might help the reader in evaluating her case. Since it is the current American condition that seems to animate the book, it is worth remembering that the American Enlightenment was rooted in a different set of assumptions about human nature and thus a different set of appropriate institutions. The classic statement of the American Enlightenment's constitutional theory, the Federalist Papers—especially Federalist 10 and 51 (Madison)—recognized that interests, passions, and factions were sown into the nature of human beings and will always be part of any open society. Thus, Madison welcomed the multiplication of interests, religions, and ideologies in an extended national republic precisely because no one group could gain a permanent monopoly on power. Allow for a separate national government distinct from each of the state governments. Create within the national government separate legislative, executive, and judicial branches capable of checking and balancing each other. Finally, within the legislative branch itself, have one house elected by the people and one by the states. "Ambition must be made to counteract ambition," Madison wrote, "a republican remedy for the diseases most incident to republican government." Notice, there is not a word here about virtue or reason. Both are desirable over time but not always necessary for the republic to survive.

In slightly different forms, these arguments continued to inform American political thought. Walt Whitman (*Democratic Vistas*, 1871), one of our most fulsome egalitarian optimists, argued that democratic voters were largely "crude, superstitious, and rotten." James Bryce (*American Commonwealth*, 1894) perhaps our first empirical political scientist, found "little solidity and substance to the average voter." Mid-20th century American political scientists such as V.O. Key, E.E. Schattschneider, and Theodore Lowi all found interest groups embedded in parties and public bureaucracies to be the energy pushing public policy. Later behaviorists Paul Lazarsfeld, Philip Converse, and Angus Campbell concluded that the policy views and commitments of average voters were quite thin and often contradictory. And current election modelers often have ignored ideas and policy preferences altogether. Professor Alan Abramowitz, who has predicted correctly every presidential election since 1988, weights second quarter GDP growth, incumbent popularity during

that same month (whether or not he or she is on the November ballot), and the number of consecutive terms the incumbent party has held the presidency. He accurately predicts November's winner, all without even knowing the candidates, their messages, or their party platforms. Abramowitz's success suggests that our citizenry is more like Aristotle's Demos in Book III of the *Politics,* at best able to tell us if the shoe pinches rather than an informed electorate able to design a better fit.

All of this suggests an alternative, neither pessimistic nor optimistic, to Rosenfeld's Enlightenment ideal. Elites, elected or not, can make use of empirical knowledge to help make policy. Governing parties will have an incentive to create outcomes that are pleasant enough that most voters will not feel ignored, while the party out of power will have an incentive to offer plausible alternatives. Abuses of power can be exposed by competing media outlets and by competing political elites. Witness the recent mid-term election and the contemporary fight over the border wall. The democratic republic offered checks and balances, avenues for alternative policy choices, opportunity for citizen engagement, and openings for new elites to enter the fray with a different set of narratives. The performance might not have satisfied a French *philosophe* but an American Madisonian might feel a bit vindicated.

Given Rosenfeld's fear that truth necessarily has been abandoned in "late capitalist" institutions, it is worth noting that she does not see "post-modernist" philosophies currently dominant in universities as similar threats to either truth or democracy. This is not for want of understanding. Rosenfeld offers interesting discussions of Michel Foucault, Richard Rorty, Thomas Kuhn, and Peter L. Berger chipping away at the idea of objective truth in favor of a "social construction of reality"—a reality that almost always serves the needs of the society's most powerful. And indeed, the Madisonian arguments offered above might seem in this light as nothing but an apologia for existing ruling-class interests. Nonetheless, Rosenfeld accepts that post-modern theory, if it really mattered, might undercut the Enlightenment quest for unvarnished truth and leave in its stead only a "will to power." However, she seems to dismiss the entire activity as academic scribbling largely contained within the university walls and of no real concern.

I fear she underestimates academia's influence. Today's student cutting off a visiting campus speaker because his or her views hide a

"rigged system" is tomorrow's activist at a New York city town hall shouting down Amazon, or a Trump supporter busting up a peaceful protest outside a campaign rally. Illiberal ideology leads to illiberal acts, and these are indeed a threat to democratic institutions outside of the ivy-covered walls.

Nonetheless, *Democracy and Truth* is a useful and challenging book offering serious critiques of contemporary news and information gathering. It could be profitably read with Christopher Achen and Larry Bartel's *Democracy for Realists,* a text that grapples with many of the same questions but written from the perspectives of a political scientist and an economist rather than an Enlightenment intellectual historian. These are important questions, especially at a time when so many liberal democratic norms are being challenged.

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