

Anmerkung: Widerlegung der Behauptung "Banken würden Reserven verleihen" in einem Artikel von Standard & Poors ('Repeat After Me: Banks Cannot And Do Not "Lend Out" Reserves', vom 13.08.2013, 15 Seiten).

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Economic Research:

Repeat After Me: Banks Cannot And Do Not "Lend Out" Reserves

Credit Market Services:

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(Editor's Note: The views expressed here are those of Standard & Poor's chief global economist. While these views can help to inform the ratings process, sovereign and other ratings are based on the decisions of ratings committees, exercising their analytical judgment in accordance with publicly available ratings criteria.)

John Maynard Keynes famously wrote that: "Practical men, who believe themselves to be quite exempt from any intellectual influence, are usually the slaves of some defunct economist." (1) A modern example of that dictum, relevant to the economy, policy, and markets, is the widespread view that banks can "lend out" their reserves (deposits) at the central bank, as if bank reserves represented a pool of money that is just waiting to "flow into" bank lending. Because such a thing cannot occur and therefore has not occurred, the point is usually made in reverse: banks currently are not "lending out" their reserves--rather they are "parking" their reserves at the central bank or leaving them "idle." But that they might lend them out in the future is a lurking risk and a reason to be cautious about the central bank engaging in aggressive quantitative easing (QE) (2).

Overview

- Many talk as if banks can "lend out" their reserves, raising concerns that massive excess reserves created by QE could fuel runaway credit creation and inflation in the future. But banks cannot lend their reserves directly to commercial borrowers, so this concern is misplaced.
- Banks do need to hold reserves (as a liquidity buffer) against their deposits, and banks create deposits when they lend. But normally banks are not reserve constrained, so excess reserves do not loosen a reserve constraint.
- Banks in aggregate can reduce their reserves only to the extent that they initiate new lending and the bank deposits created as a result flow into the economy as new banknotes as the public demands more of them.
- QE does aim to ease financial conditions and spur more bank lending than otherwise would have occurred, but the mechanisms by which this happens are much more subtle and indirect than commonly implied.
- If the excess reserves created by QE were to be associated with too much credit creation, central banks could readily extinguish them.

The central bank balance-sheet mechanics of QE and how they relate to bank credit creation may sound a bit wonkish. But correctly understanding how the transmission mechanism of QE works is important. It is fine for policymakers, economists, and market participants to disagree about the appropriateness and efficacy of QE, but at least they should do so on the basis of a correct understanding of its balance-sheet mechanics.

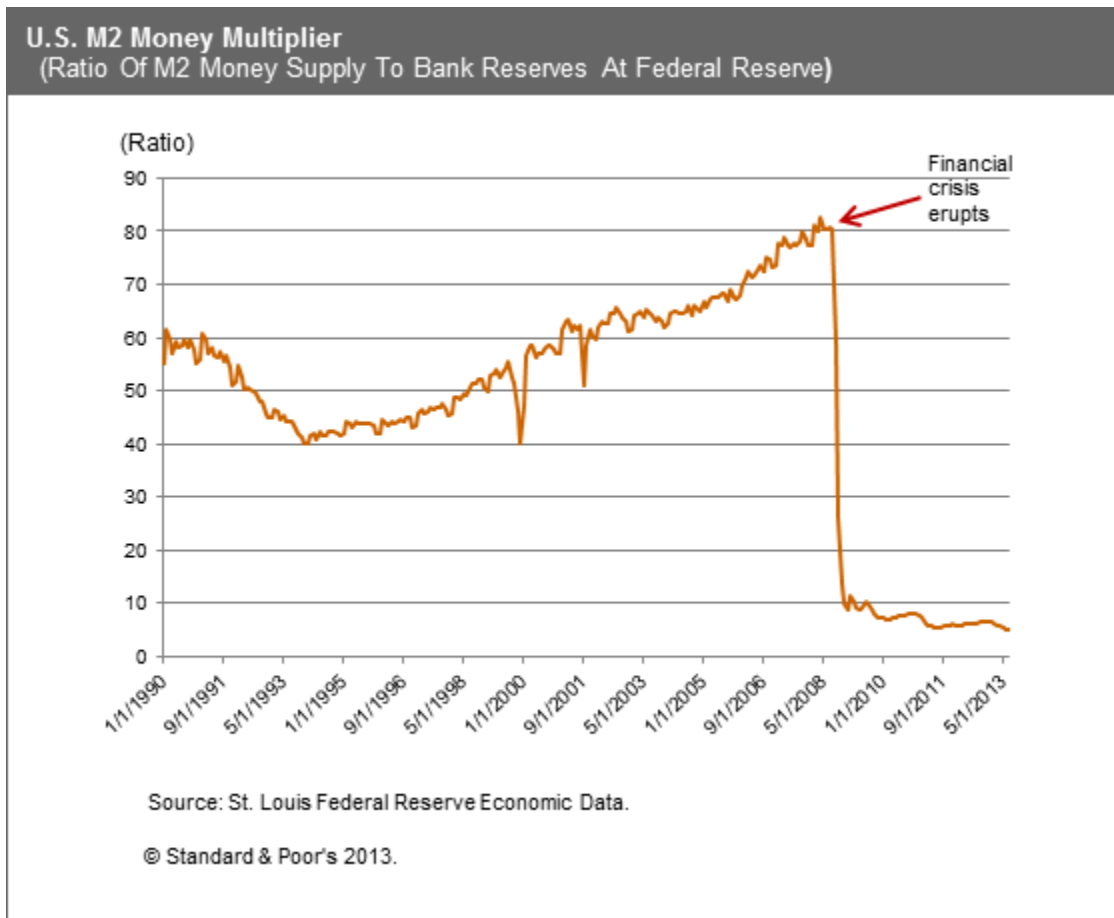
The Money Multiplier View Of Credit Creation

What is the defunct idea here that has such a grip on the world? Almost anyone who has taken an introductory course

in economics or who has consulted a textbook on the issue will have studied the "money/credit multiplier" or "fractional-reserve banking" theory of credit creation. The story line is essentially as follows (3). Under a fractional-reserve banking system (the system in operation virtually everywhere in modern developed economies), banks have to hold a fraction of their deposits (a liability for them) as deposits at the central bank (called reserves) (an asset for them), but they can "lend out" the remainder. Given these reserve requirements (set by the central bank) and the public's preferences for holding cash, there is a fixed "money multiplier" (the ratio of broad money to central bank reserves), such that a given amount of reserves multiplies into a much bigger amount of bank lending. The central bank supplies reserves to the banking system via open market operations or discount window lending, so when it increases reserves, given the fixed money multiplier, bank lending and deposits (or the broader money supply) should increase as well (4).

If this theory held, QE, by massively increasing the base of money creation, would lead to an explosion of bank credit. Because QE and credit creation do not work this way, it has not. Many commentators, and even some monetary policymakers who are schooled in the theory, respond to this by observing that "the money multiplier has collapsed," with the implication that the collapse may just be temporary (see chart 1). Banks are just "parking" their excess reserves (that is, reserves in excess of the amount that banks are required by regulation to hold) at the central bank, but, when demand for funds picks up, they might start "lending them out," and, because the amount of excess reserves is so massive, there may be a burst of inflation--perhaps uncontrollable inflation.

Chart 1

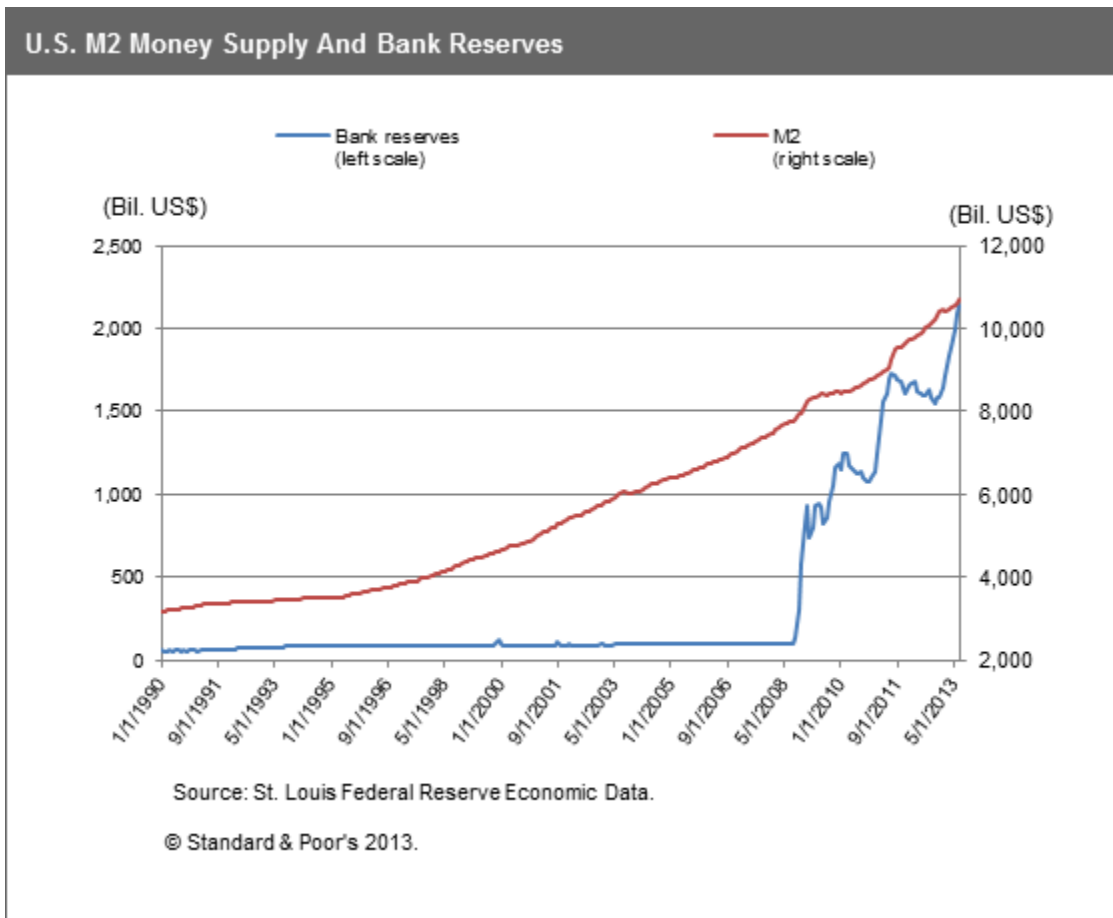


But the money multiplier has not collapsed because it was never there in a meaningful sense to begin with. Rather a ratio of two loosely connected numbers has fallen dramatically because the denominator was dramatically increased (see chart 2).

So how does QE work, and why can't banks "lend out" reserves, and why is it that, if the central bank so deems it, banks (in aggregate) have to "park" their excess reserves at the central bank--so no one should be surprised if that is exactly what is happening?

There are two pieces to the puzzle: one, what determines the amount of reserves on a central bank's balance sheet or "in the banking system," as it is equivalently described; two, how credit creation happens--that is, how banks lend. Let's take them in turn. A key distinction to bear in mind (hinted at in the last previous paragraph) is between individual banks and banks in aggregate. Neither individual banks nor banks as a whole can "lend out" reserves, but individual banks can and do offload their reserves (particularly excess reserves) by lending them to other banks or by buying assets; but the banks in aggregate cannot do this--in such cases, the reserves that leave one bank's balance sheet just pop up on another, remaining on the central bank's balance sheet all the while.

Chart 2



What Determines The Level Of Central Bank Reserves

To understand the first issue, note the composition of a central bank's balance sheet (see table 1) and note an identity linking the two sides. Abstracting from the central bank's capital (5) and some other possible minor items, the central bank balance sheet identity is:

Assets (A) = Reserves (R) + Banknotes in circulation (BK) + Government deposits (GD).

In change terms, this is:

$$\Delta A = \Delta R + \Delta BK + \Delta GD$$

Or rearranging:

$$\Delta R = \Delta A - \Delta BK - \Delta GD$$

Table 1

A Simplified Central Bank Balance Sheet

Assets	Liabilities
Assets (A)	Reserves (R)
	Banknotes in circulation (BK)
	Government deposits (GD)

There you have it. This being an identity and reserves being a liability of the central bank, their aggregate level can change in three, and only three, ways (6). Reserves go up (or down) when:

- (1) The central bank increases (decreases) its assets;
- (2) The public decreases (increases) the amount of cash (banknotes) it wants to hold;
- (3) The government reduces (increases) its deposits at the central bank because it makes net transfers to (receives net transfers from) the private sector (7).

Most importantly, banks cannot cause the amount of reserves at the central bank to fall by "lending them out" to customers. That possibility is not allowed for in the identity because bank lending does not enter into it. Assuming that the public does not change its demand for cash and the government does not make any net payments to the private sector (two things that are both beyond the direct control of the banks and the central bank), bank reserves have to remain "parked" at the central bank. To express wonder that banks don't lend out their reserves or that they park them at the central bank is to fundamentally misunderstand the balance-sheet mechanics of credit creation and how QE works.

How Banks Create Loans

So where does bank lending fit it? Surely it has to somewhere. Table 2 shows a highly simplified bank balance sheet (which here can be thought of as the aggregate balance sheet of the banking system). Again, there is an identity linking the two sides of the simplified balance sheet:

$$\text{Reserves (R) + Loans (L) + Bond holdings (B) = Deposits (D) + Equity (E)}$$

In change terms:

$$\Delta R + \Delta L + \Delta B = \Delta D + \Delta E$$

Table 2

Banking System's Simplified Balance Sheet

Assets	Liabilities
Reserves (R)	Deposits (D)
Loans (L)	Equity (E)
Bond holdings (B)	

Here is how banking lending or credit creation happens (at the point of "conception"):

$$\Delta L = \Delta D, \text{ with } \Delta R = \Delta B = \Delta E = 0$$

Banks lend by simultaneously creating a loan asset and a deposit liability on their balance sheet. That is why it is called credit "creation"--credit is created literally out of thin air (or with the stroke of a keyboard). The loan is not created out of reserves. And the loan is not created out of deposits: Loans create deposits, not the other way around. Then the deposits need a certain amount of reserves to be held against them, and the central bank supplies them (more on that below).

It might seem that:

$$\Delta L = -\Delta R, \text{ when } \Delta B = \Delta D = \Delta E = 0$$

That is, that banks can "lend out" reserves--loans going up when reserves go down. But for reserves (an item on the central bank's balance sheet) to go down, the central bank's assets have to shrink or banknotes or government deposits have to go up. These result from actions of the central bank, the public, and the government, respectively. None directly involve the bank making a loan. It follows that:

$$\text{when } \Delta B = \Delta D = \Delta E = 0, \Delta L = -\Delta R = 0$$

So how do reserves enter into the credit creation picture? Borrowers borrow in order to spend the money (or buy an asset), so the borrower will likely do just that. The money "circulates" in the economy, so to speak. In aggregate terms, that means one of two things: the deposit money either moves into cash in circulation (banknotes) or stays on deposit somewhere in the banking system (typically it is some combination of both). To the extent that the deposit ends up being converted into cash, reserves go down because that is where banknotes come from. From the central bank balance sheet identity:

$$\Delta R = -\Delta BK, \text{ when } \Delta A = \Delta GD = 0$$

Here is the link between reserves and bank lending. Reserves go down when banknotes increase. Banknotes increase when borrowers take the money they borrowed out of the bank and part or all of the money remains in cash, rather than being re-deposited in the banking system. For an individual bank, the link between reserves and loans is an indirect and largely uncontrollable one. Individual banks can try to "get rid of" their excess reserves by making new loans, and, to the extent that the deposits so created leave their bank and, importantly, do not return as new deposits (the bigger the bank the less likely this condition is to hold), this will work for them. But for banks as a whole, new lending leads to a reduction in reserves only to the extent that the deposits created move into cash in circulation. Take an extreme case where the deposits created by the new loan just move from one deposit account to another; then there is no reduction in reserves. This is a far cry from the notion that, at will, individual banks can extinguish their reserves by initiating new lending, let alone that banks in aggregate can.

Where Deposits Come From

This goes against the grain of the usual way of describing bank lending, which suggests that banks "collect" deposits and then "lend them out." That is not the way it happens at all. In a closed economy (or the world as a whole), fundamentally, (8) deposits come from only two places: new bank lending and government deficits (9). Banks create deposits when they create loans, as explained above. Governments also create deposits when they run budget deficits because they are putting more money into the public's bank accounts than they are taking out. This net flow creates new deposits in the banking system, which has its counterpart on the bank's balance sheet as an increase in reserves:

$$\Delta D = \Delta R, \text{ when } \Delta L = \Delta B = \Delta E = 0$$

And on the central bank's balance sheet,

$$\Delta R = -\Delta GD, \text{ when } \Delta A = \Delta BK = 0$$

as we saw before.

Banks don't lend out of deposits; nor do they lend out of reserves. They lend by creating deposits. And deposits are also created by government deficits.

Interest-Rate-Targeting Central Banks Supply Whatever Reserves Are Needed

Reserves play a pivotal role in money creation but not in the way often envisaged. The money multiplier view of the world envisages the central bank creating reserves and the reserves multiplying into new lending. That is, reserves constrain bank lending. That would seem compelling. If banks are subject to minimum reserve requirements (requiring them to hold reserves in a certain proportion to their deposits, and deposits are the balance-sheet counterpart to loans at the point of credit creation), then, by restricting the amount of reserves that the central bank supplies, it should be able to control the amount of credit.

But modern central banking doesn't work this way. Central banks don't constrain the amount of bank reserves they supply. Rather they supply whatever amount of reserves that the banking system demands given the reserve requirements and the amount of deposits that have been created.

Why is this? Because modern central banks, in normal times (such as before the crisis and the forays into QE) target a short-term (usually overnight) interest rate in the interbank money market (the market in which banks lend and borrow central bank reserves). They do this by adjusting the amount of reserves on their balance sheet (in the banking system) to ensure that the interest rate is in line with their announced policy rate (the federal funds rate in the case of the Federal Reserve).

The adjustment takes the form of ensuring that there are neither too few reserves (which would put upward pressure on the interest rate) nor too many (which would put downward pressure on it, assuming that the central bank does not

negate that by paying interest on excess reserves). If the central bank wants to hit its interest-rate target, it has to supply the amount of reserves consistent with that, and that amount (normally) corresponds to the amount of reserves given by minimum reserve requirements.

If bank lending increases and the associated increase in bank deposits leads, as it will, to a higher level of minimum required reserves, the central bank will naturally supply those reserves. Otherwise there will be a central bank-induced shortage of reserves, and the overnight interest rate will go up, meaning that the central bank will not be hitting its interest-rate target. Central banks, in normal times, cannot target an interest rate and independently restrict the amount of reserves they supply.

How Things Change Under QE

The situation changes under QE because QE, by definition, involves the central bank supplying (massive amounts of) excess reserves. This would normally push the overnight interest rate down to, or close to, zero. This is not a problem because QE is usually used as an easing policy after interest-rate ammunition has been exhausted—that is, it is combined with and comes on top of zero or near-zero interest rate policy (and if central banks want to keep the policy rate a little above zero, they can give themselves the leeway to pursue QE by paying interest on reserves, which sets an effective floor on the overnight interest rate).

The key point, however, is that the existence of excess reserves in the banking system does not loosen any reserve constraint on the ability of banks to lend because there was no reserve constraint to begin with (of course, the stance of monetary policy, notably the interest-rate policy decision, does affect the demand for bank lending and the willingness of banks to lend, but, to repeat, given the interest-rate setting, the central bank supplies whatever reserves are demanded).

It might be asked: if banks cannot lend the excess reserves that the central bank provides, what is the point of the central bank supplying them? The answer to that question is simply that QE does serve to ease financial conditions. Technically, QE allows the central bank to change the composition of the aggregate portfolio held by the private sector; the central bank takes out of that portfolio the government debt and other securities it buys and replaces them with reserves and bank deposits (the latter when it buys assets directly from the public or its nonbank financial intermediaries) (10). This has an easing effect via so-called "portfolio rebalance effects," including but not limited to the associated downward pressure that QE puts on the yield curve (11).

Just like any monetary easing, QE, and the supply of excess reserves that it entails, should lead, over time, to more credit creation than would have occurred in the absence of the QE (12). Partly, this is because the easier financial conditions should make borrowers a little bit more willing than otherwise to borrow. Part of the portfolio rebalancing might also involve banks being a little bit more willing than otherwise to lend because they have fewer higher-yielding or longer-duration assets on their balance sheet (as a proportion of their assets and likely in absolute amount, too). Thus the fact that banks have excess reserves on their balance sheet should induce banks to lend a bit more than they would otherwise have done. But this would occur as part of the "portfolio rebalance effect" and is a far cry from the mechanical view of the world that sees bank reserves as the (direct) fodder for bank lending.

Why Understanding The Balance-Sheet Mechanics Of QE Is Important

Is all of this just splitting hairs about the balance-sheet mechanics of central banking and credit creation? I don't think so. Important policy implications follow from having a correct understanding of QE.

Once it is understood that there is no direct link between the creation of a massive amount of excess reserves by central banks implementing various forms of QE and bank lending because banks cannot lend out reserves and banks are not reserve constrained in normal times, a number of things follow.

First, the ability of QE to lead to credit creation that otherwise would not have occurred being severely limited, one should not put much store in monetary policy's stimulatory potential in a deleveraging environment once the central bank has cut the policy rate to or near to zero and still needs to ease policy more. That is not to say central banks should not use QE. It is to say that expectations for how effective a policy tool it can be should be appropriately modest, and therefore due consideration should be given to using fiscal policy more actively and aggressively to calibrate overall macro policy to the required stimulatory level.

Second, to the extent that QE will be called upon in such circumstances, it is likely that it will have to be done on a very large scale, relative to the central bank's balance sheet or to GDP. Unfounded fears that creating too many excess reserves today could trigger runaway inflation in the future should not hold the central bank back from being aggressive with QE if it judges that is what it needs to do.

Third, it is possible, in fact desirable, that at some time in the future, sooner rather than later one hopes, the Fed and other central banks will find that the degree of monetary easing they have put in place is too much and that they will need to tighten financial conditions a lot and may need to do so rather quickly. In that case, there will be no need to fear that the massive amount of excess reserves will directly fuel rapid credit creation and risk runaway inflation. However, there will be a need to worry, given the much better conditions in the economy than prevailing, that existing monetary policy settings, comprising the amalgam of very low policy rates and QE and the associated forward guidance on both, have become far too easy and will need to be tightened, perhaps fast. If monetary conditions then are far too easy, the very act of the central bank starting to tighten them, including by unwinding QE, may tighten them enough to remove the problem. But, if not, the central bank will know what to do: tighten policy enough to bring about the desired effect. There are various ways of doing that.

Fourth, central banks hold a trump card. Because they created excess reserves at will, they can extinguish them at will, by selling the assets. Recall the crux of QE:

$$\Delta A = \Delta R, \text{ when } \Delta BK = \Delta GD = 0$$

This works both ways: central banks extinguish excess reserves when they sell assets. When they do, they reverse the easing effect associated with having changed the composition of the aggregate portfolio of the private sector in the first place. Just as QE did not trigger a "lending boom" to begin with, its unwinding is unlikely to precipitate a "credit crunch."

The Bottom Line

None of this is to say that the unwinding of QE and other nonconventional policies will be smooth and will not cause volatility in financial markets. Volatility is to be expected and needs to be managed both by policymakers and by market participants. But fears that banks stand to "lend out" the excess reserves that they currently have "parked" at central banks is not something that anyone, least of all central banks aiming to speed up the recovery or defend their inflation targets today, should worry about. I doubt that Keynes would have.

Endnotes

(1) The larger quote is: "The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influence, are usually the slaves of some defunct economist. Madmen in authority, who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back. I am sure that the power of vested interests is vastly exaggerated compared with the gradual encroachment of ideas." John Maynard Keynes, 1935: *The General Theory of Employment, Interest And Money*, ch. 24. The second sentence may flatter economists and political philosophers too much.

(2) Here is a sampling of comments from highly respected academics and journalists in that vein. Martin Feldstein: "The banks can use these excess reserves to create loans and deposits, which will increase the money supply and fuel inflation," "The Fed's Dangerous Direction," Jan. 3, 2013, *Wall Street Journal*; Phil Gramm and John Taylor: "with banks holding excess reserves rather than lending them out--and with velocity (the rate at which money turns over generating national income) at a 50-year low and falling--the inflation rate has stayed close to the Fed's 2% target." "The Hidden Costs of Monetary Easing," *Wall Street Journal*, Sept. 11, 2012; John Taylor: "When the economy begins to heat up, the Fed will have to sell the assets it has been purchasing to prevent inflation. If its asset sales are too slow, the bank reserves used to finance the original asset purchases pour out of the banks and into the economy," "Fed Policy Is a Drag on the Economy," *Wall Street Journal*, Jan. 28, 2013; Jon Hilsenrath and Kristina Peterson: "One reason the hawks have been wrong about inflation is that the money the Fed has pumped into the financial system has tended to sit at banks without being lent to customers," "Fed 'Doves' Beat 'Hawks' in Economic Prognosticating," *Wall Street Journal*, July 27, 2013; Alan Blinder: "To the extent that banks just take the newly created reserves and stuff them into their accounts at the Fed, neither the money supply nor bank credit will grow." *After The Music Stopped*, 2013, p. 250; "If the Fed reduces the reward for holding excess reserves, banks will hold less of them--which means they will have to find something else to do with the money, such as lending it out or putting it in the capital markets," "How Bernanke Can Get Banks Lending Again," *Wall Street Journal*, July 22, 2012; "the Fed should reduce the interest rate it pays on the roughly \$1.7 trillion of banks' excess reserves. If it did so, banks would keep less cash on deposit at the Fed. The liberated funds would probably flow mainly into the money markets, but some probably find their way into increased lending," *Wall Street Journal*, March 12, 2013; Allan Meltzer: "inflation--which rapid money-supply expansion inevitably fuels--has so far remained subdued, at roughly 2%, because banks are not using their swelling reserves to expand credit and increase liquidity. ... While subdued liquidity and credit growth are delaying the

inflationary impact of the Fed's determination to expand banks' already-massive reserves, America cannot escape inflation forever. The reserves that the Fed--and almost all other major central banks--are building will eventually be used." "Quantitative Quicksand," June 6, 2013; "Since September [2012] bank reserves increased about \$100 billion dollars. Bank loans to business, called C&I loans, increased a bit during this period, about \$65 billion--or a modest 5 percent. Again, most of the addition to reserves became idle bank excess reserves," "On a Path to Crisis," Testimony, Subcommittee on Monetary Policy and Trade, March 5, 2013.

(3) See, for instance, N. Gregory Mankiw, 2003: *Macroeconomics*, New York: Worth Publishers, pp. 484-487.

(4) Although the "money multiplier" view of central banking and credit creation is the dominant one, largely I would posit because its pedagogical attractiveness makes it a "dominant meme," other schools of thought have long existed in economics and have come to the fore more recently in the guise of "modern monetary theory (MMT)." See, for instance, Wynne Godley and Marc Lavoie, 2007: *Monetary Economics: An Integrated Approach to Credit, Money, Income, Production and Wealth* (Palgrave Macmillan); L. Randall Wray, 1998: *Understanding Modern Money: The Key to Full Employment and Price Stability* (Edgar Elgar); L. Randall Wray, 2012: *Modern Monetary Theory: A Primer on Macroeconomics for Sovereign Monetary Systems* (Palgrave Macmillan).

(5) Central banks usually have some equity capital on their balance sheet, which is usually supplied by the government but sometimes includes equity contributions made by the commercial banks with which it deals. But the capital of a central bank, while having some "political economy" significance, has little economic significance, being little more than a residual, balancing item. For instance, if a central bank (like the Federal Reserve), for monetary policy purposes, decided to sell assets it had accumulated under QE and incurred such losses on those sales as to more than wipe out its capital, the result would be for one entry in its balance sheet that had been positive to turn to negative. But, with one possible exception, this would have no impact on the ability of the central bank to fulfill its main functions: it could still issue currency; it could still acquire assets by creating reserves or create reserves by lending them to banks; it could still set a policy rate (including an interest rate on reserves).

The exception is the extreme case in which the value of the assets the central bank holds becomes less than the amount of excess reserves it previously created and now wants and needs to extinguish in order to tighten monetary policy. In other words, it is conceivable that the central bank could find itself without enough assets to sufficiently drain the excess reserves that it had previously created and thereby risk losing monetary control. But there would be an easy way out: the government could recapitalize the central bank by issuing bonds to it, restoring its capital (on the right-hand side of its balance sheet) and giving it the assets (on the left-hand side) that it could then use to sell to extinguish the excess reserves. Alternatively, the government could issue bonds directly to the public, which would drain reserves and increase government deposits at the central bank, and then convert the deposits into central bank capital (a book-keeping exercise).

Of course, there would be a fiscal cost associated with this, which is why unconventional monetary policy comes in for much of the criticism that it does. Unconventional monetary policy seems to stray into the realm of fiscal policy. More on the border between monetary and fiscal policy, and when the distinction between the two arms of macro policy does and does not make sense, in a future piece.

(6) For an individual bank there is a fourth way: it can borrow reserves from other banks. But this just shifts reserves among banks and does not alter the amount of reserves on the central bank's balance sheet.

(7) When the government spends more than it takes in in taxes and other revenues, its deposits at the central bank fall and reserves rise (and vice versa), but when it issues bonds to the public, its deposits go up and reserves fall (and vice versa when it redeems bonds).

(8) By "fundamentally" I mean not including the deposits that were deposits to begin with, then turned into banknotes and came back into the banking system as deposits again. All banknotes (other than new ones received in exchange for old ones) start off life as a bank deposit. There is a third source in an open economy: fund transfers from overseas. But these transfers have to come out of a foreign deposit account, and that deposit had to have its roots either in bank lending or a government deficit.

(9) To see this a bit more formally, consider the simplified case in which the only assets the central bank holds are government bonds (GB), and the only assets banks hold other than reserves and loans are government bonds, and the public holds no government bonds, so that:

$$\text{GB held by the central bank (GBCB)} + \text{GB held by the banks (GBBK)} = \text{GB}$$

Then, abstracting from bank equity, the balance sheet identities can be written, respectively, as:

$$\text{GBCB} = \text{R} + \text{BK} + \text{GD}, \text{ and}$$

$$\text{R} + \text{L} + \text{GBBK} = \text{D}$$

Rearranging with R on the left hand side of both and equating yields:

$$\text{GBCB} - \text{BK} - \text{GD} = \text{D} - \text{L} - \text{GBBK}, \text{ or:}$$

$$\text{D} = \text{GB} + \text{L} - \text{BK} - \text{GD}.$$

In words, total deposits in the banking system equal total government bonds (accumulated budget deficits) and total bank lending minus banknotes in circulation and government deposits at the central bank (this last term is subtracted because, to the extent that the government has a positive deposit at the central bank, it must have reduced the public's deposits by that net amount).

If the public (or its nonbank intermediaries) holds government bonds directly (the usual case), things are a bit more complicated. Then, the above identity becomes:

$$\text{D} = \text{GBCB} + \text{GBBK} + \text{L} - \text{BK} - \text{GD}.$$

Deposits are decreased by the amount that the public holds government bonds (GBP, where $G = \text{GBCB} + \text{GBBK} + \text{GBP}$) because, when the government sells its bonds to the public rather than to banks, it extinguishes the deposits that it created when it ran the associated budget deficit in the first place. When the government sells the bonds to banks, however, it extinguishes the reserves that were created but not the corresponding deposits.

The last identity also casts light on how QE impacts private-sector balance sheets differently depending on whether

the central bank buys bonds from the banks or from the public (including financial intermediaries that are not banks acting on its behalf). When the central bank buys bonds from banks, GBCB goes up and GBBK goes down, but the level of deposits in the banking system is unaffected. When the central bank buys bonds from the public, however, deposits go up by the same amount (as do reserves). In effect, this kind of QE just reverses the draining effect on reserves and deposits that the original issuance of government bonds to the public had on both of them.

(10) Another way to conceptualize QE is as a debt management operation of the consolidated government (the government plus the central bank). When a central bank does QE by buying long-term government debt or government-guaranteed assets, the consolidated government retires long-term debt or guarantees on long-term debt and issues central bank debt (reserves) instead. This shortens the duration and debt servicing costs of the consolidated government's outstanding debt, particularly when the central bank does not pay interest on excess reserves. This debt management operation effect is the flip side of the portfolio rebalance effect visited on the private sector's aggregate portfolio.

(11) QE puts downward pressure on long-term rates. This is different from saying it leads to lower long-term rates. Technically, QE reduces term premia, but at the same time or with a lag it may raise inflation expectations, if they had been flagging, and expectations for future real growth.

(12) That is very different from saying that it will lead to "a lot of" credit creation. I am certainly not claiming that. Given that QE is likely to be observed only in severe conditions of economic and financial distress, when deleveraging forces in the private sector are likely to be strong, weak credit growth or even credit contraction are likely to be observed. QE does not lead to strong credit growth because QE is not observed (implemented) in economic environments in which it would. However, credit growth would likely be even weaker or credit contraction even more severe in the absence of QE, although this counterfactual can never directly be tested.

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