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MONETARY POLICY WHEN RESERVES PAY INTEREST

Thomas R. Saving
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SUMMARY

The Federal Reserve's decision in 2008 to begin paying interest on bank reserves, particularly excess reserves (the IOER) has changed the role of the banking system in the determination of the nation's money supply. Paying interest on bank reserves essentially turned these reserves into investment opportunities for banks. Now the effect of an increase in the monetary base on the money supply is reduced by the share of that base increase that is absorbed by bank reserves rather than increases in the money supply. Now banks are active, rather than passive players in Federal Reserve monetary policy actions.

The fundamental tool of monetary policy is to control the monetary base and the nation's money supply. It is clear that the banking system responds to the level of the IOER relative to market interest rates. As result we are now in a world where the banking system shares, almost on an equal footing with the Federal Reserve, the control of the money supply.

The Federal Reserve can conduct an expansionary monetary policy by entering the market for securities, but also by reducing the interest rate it pays on bank reserves. As a result, this interest rate, which is wholly determined by the Federal Reserve, is now an important part of monetary policy. But by the same token, market interest rates now play a role independent of the Federal Reserve in monetary policy. An increase in market interest rates, with a fixed Federal Reserve-determined IOER, will increase the effective monetary base and then increase the nation's money supply.

But these changes do not mean that the Federal Reserve has lost its power to control the money supply. But to maintain its ability to control monetary policy, it must be constantly cognizant of financial market interest rates. Thus, the Federal Reserve is more subject to the vagaries of financial markets than at any time in its more than 100-year history.

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CONTACT US

Private Enterprise Research
Center
Texas A&M University
4231 TAMU
College Station, TX 77843-4231
(979) 845-7559
perc@tamu.edu

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MONEY AND BANKING WHEN RESERVES PAY INTEREST

INTRODUCTION

In the simpler money and banking world before the Great Recession, the money supply was determined by the monetary base, the public's desire to hold currency and the level of reserves banks were required to hold. In that world, the money multiplier, the ratio of the level of bank demand deposits to required bank reserves, was stable. Then, banks were passive players in the determination of the money supply and as a result, a passive part of monetary policy.

But the Federal Reserve's decision in 2008 to begin paying interest on bank reserves, particularly excess reserves (the IOER) has changed this passive role for banks. Paying interest on bank reserves essentially turned these reserves into investment opportunities for banks. Now the effect of an increase in the monetary base on the money supply is reduced by the share of that base increase that is absorbed by bank reserves rather than increases in the money supply. Now banks are active, rather than passive players in Federal Reserve monetary policy actions.

THE IOER AND THE MONEY SUPPLY

When it buys securities, the Federal Reserve creates what has been termed "High Powered Money." Traditional money and banking was about how this high powered money was used to create essentially private money. This private money and Federal Reserve money, currency, combine to be the transactions media for the economy; the money supply. Furthermore, all measures of the money supply can be expressed as multiples of the Federal Reserve-produced currency and bank reserves, so-called high powered money, which is usually referred to as the monetary base.

Here I will concentrate the analysis on M1, the narrowest of the usual measures of the money supply.¹ Only 77% of the composition of M1 consists of traditional money and banking bank expansion elements, currency and demand deposits at member banks. Virtually the entire remainder is "Other Checkable Deposits (OCDs)," supplied as money market accounts at member banks, Federal Home Loan Banks and other financial institutions that allow checkable transfers (Negotiable Orders of Withdrawal).²

For the last five years, the composition of M1 has varied little from the five-year average of 42.8% currency, 40.5% demand deposits and 16.6% OCDs, implying a currency-checkable deposit ratio of 0.75 and an OCD-demand deposit ratio of 0.4. Assuming that these ratios are relatively independent of market interest rates, the simple math of the relation between the monetary base and M1 can be written:

¹ M1 includes funds that are readily accessible for spending. 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.

² The other checkable deposits component of M1 consists of negotiable order of withdrawal (NOW) accounts and automated transfer service (ATS) balances at banks, thrifts, and foreign related institutions, credit union share draft balances, and demand deposits at thrifts.

$$M1 = \frac{(\gamma + 1)(1 + \delta)}{(\gamma + \rho + \epsilon)} B$$

Where γ is the currency-deposit ratio, δ is the OCD-demand deposit ratio, ρ is the required reserve ratio, ϵ is the excess reserve to deposit ratio and B is the monetary base.

The apparent simplicity of the formula belies the intricacies of the money supply process as it assumes that the ratios included are constant. While for the most part, all of the ratios have remained relative constant for the past decade, ϵ , the excess reserve ratio has varied significantly as it is dramatically affected by the level of the IOER relative to market interest rates. If neither the IOER nor market interest rates affect the composition of checkable deposits, the relation between $M1$ and the monetary base can be written as:

$$M1 = \frac{(\gamma + 1)}{(\gamma + \rho + \epsilon)} B$$

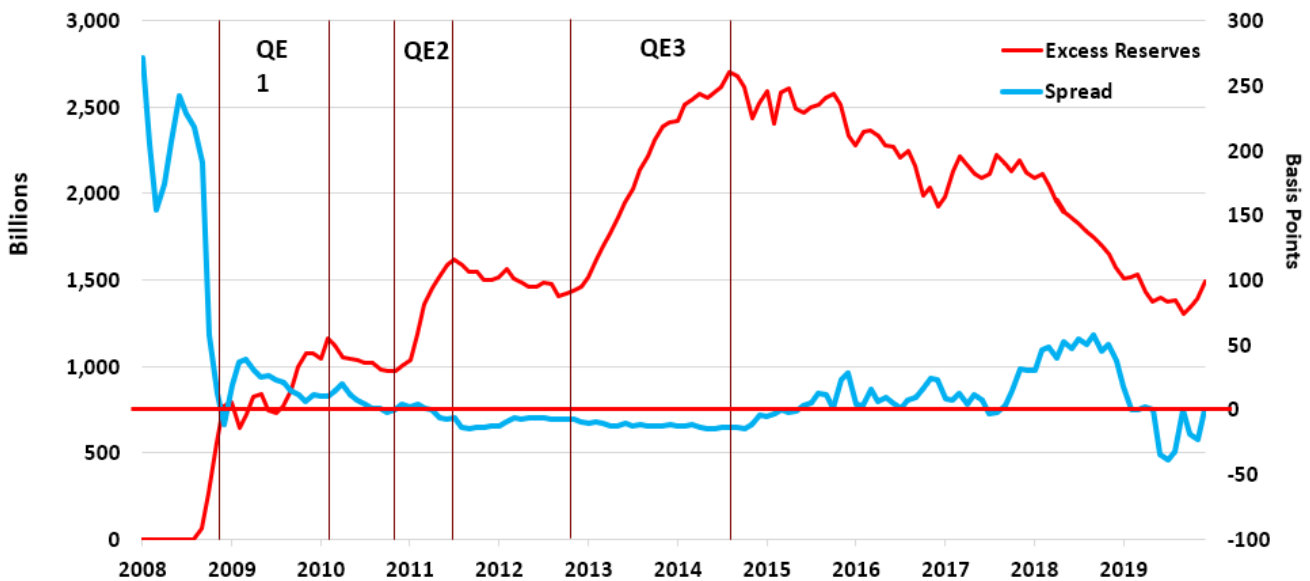
Whichever simple formula for the effect of the monetary base on any measure of the money supply we choose the impact of the decision in 2008 to pay banks interest on reserve holdings has had and will continue to have a dramatic effect on monetary policy. This effect stems from the impact of the IOER and market interest rates on the banking system's desire to hold excess reserves. The introduction of paying interest on bank reserve holdings made reserves a real investment opportunity for banks.

Before interest on reserves, bank excess reserve holdings averaged less 0.4% of bank checkable deposits, while required reserves averaged 10% of checkable deposits. As a result, at the beginning of 2008 excess reserves held by banks represented less than 0.02% of all bank assets. But as Figure 1 shows, all of this changed with the onset of paying banks to hold reserves. With the onset of interest on all reserves, excess reserves became a valuable bank investment. Like any other bank investment, the return on reserves should be compared to alternatives available to banks.

Figure 1 shows the level of member bank investment in excess reserves for the period January 2008 through January 2020. The figure also shows the difference between the rate of return on 1-year Treasuries and the rate of interest paid on reserves, the IOER, measured in basis points.³ Before the introduction of interest on reserves in October of 2008, the spread was simply the rate of return on 1-year Treasuries, as the IOER was zero. When the rate of return for holding reserves was zero, the excess reserve share of bank assets was, for all practical purposes, zero.

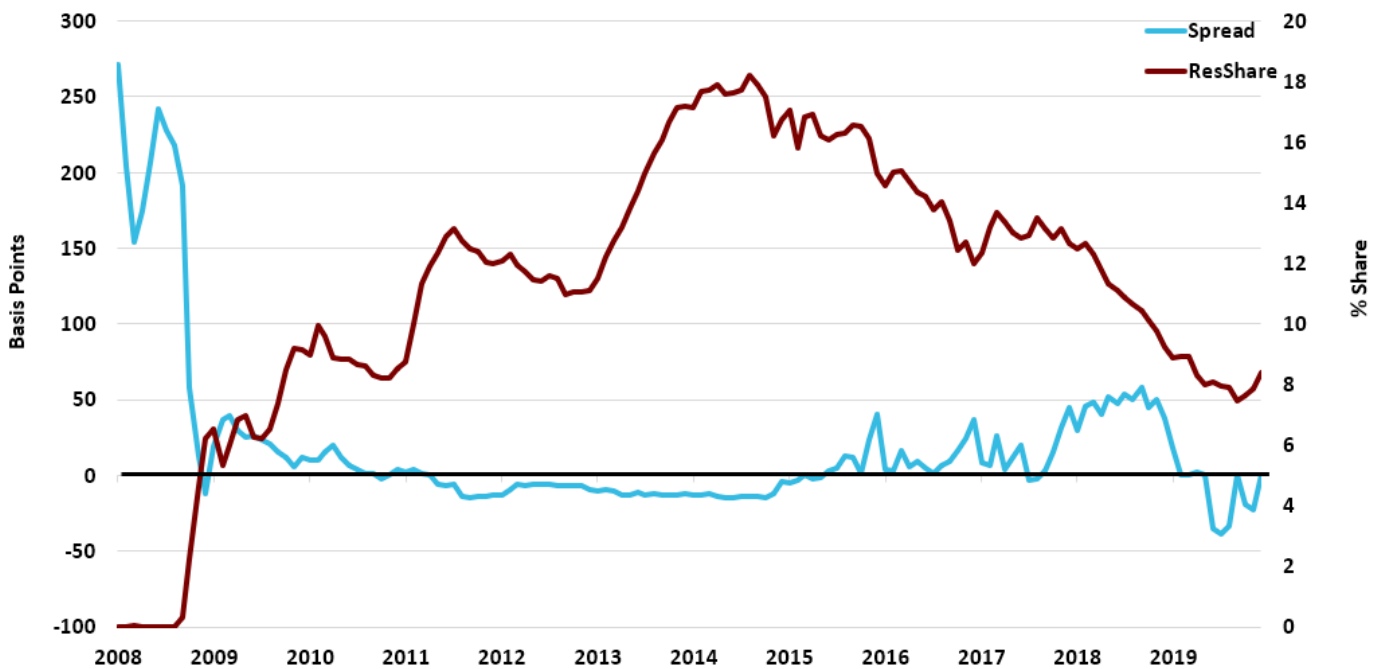
³ A basis point is defined as 1/100 of an interest rate. Thus, 100 basis points is a rate of interest of 1.00%.

Figure 1. 1yr Treasury - IOER Spread and Excess Reserves
Jan. 2008 - Jan. 2020



Three things happened in the fourth quarter of 2008. First, the economy-wide September financial meltdown occurred. Then, the introduction paying interest on reserves and finally, the onset of the first of three Federal Reserve quantitative easings. The three easings are denoted in the figure as QE1, QE2 and QE3. For both latter QE's, the IOER was equal to or above the rate of return on 1-year treasuries. Bank holdings of excess reserves rose from just over \$900 billion to \$2.6 trillion, an increase of 320%. Not surprisingly, the share of excess reserves in the asset portfolios of banks shown in Figure 2 is virtually an image of Figure 1 as the share of excess reserves in bank asset portfolio rose from 1.5% at the beginning of 2008 to over 18% in mid-2014.

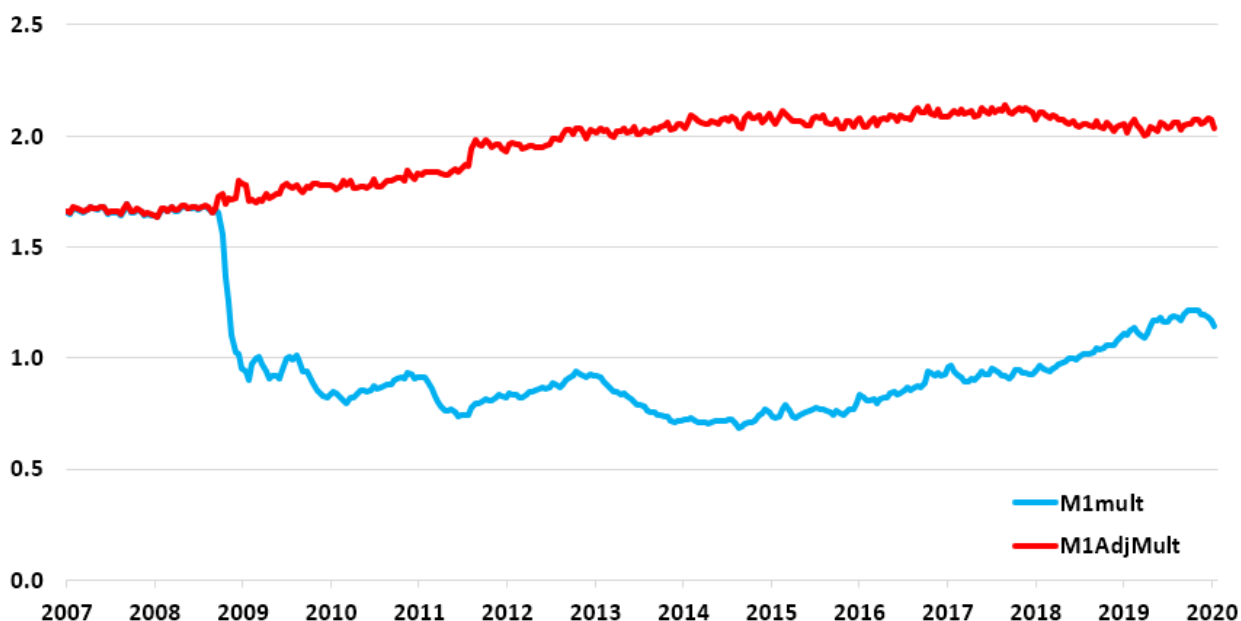
Figure 2. 1-yr Treasury-IOER Rate Spread and Excess Reserve Asset Share
Jan. 2008 - Jan. 2020



Taking another look at High Powered Money, or what is more traditionally referred to as the monetary base and is essentially the sum of currency and Federal Reserve member bank reserves. The level of M1 is a multiple of the Federal Reserve controlled monetary base, the public's desires concerning the use of currency relative to checkable deposits and banking systems desire to hold reserves.

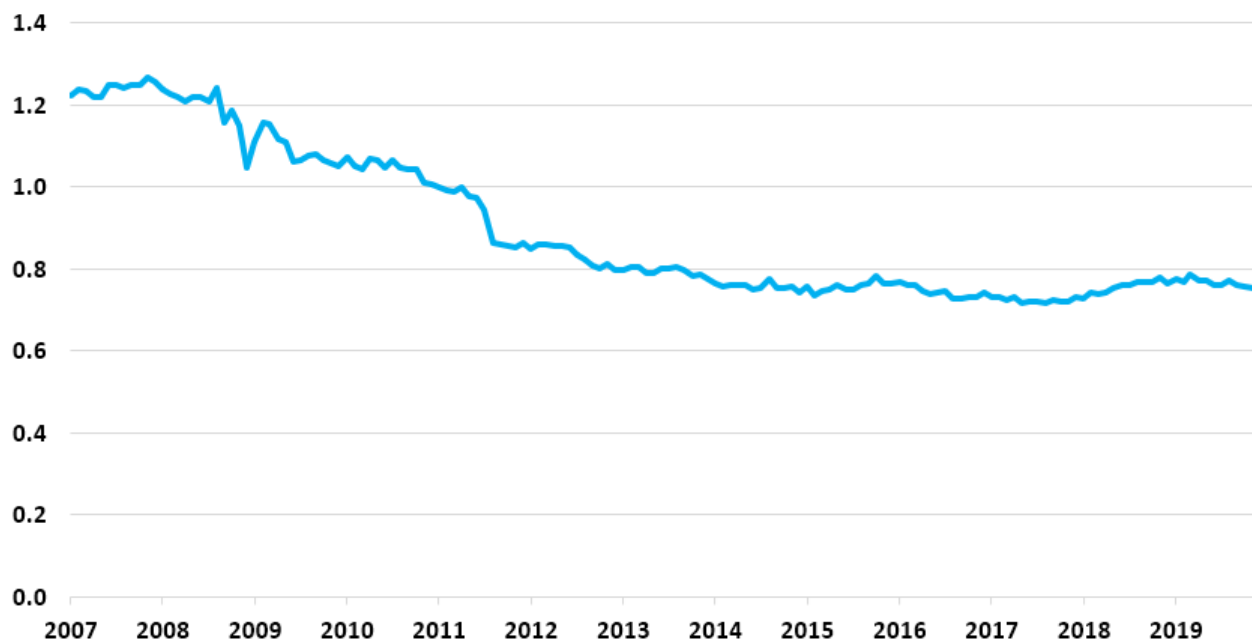
Figure 3 shows this multiple for the period 2007 to the present. Prior to the onset of interest on reserves, the level of the M1 money stock was consistently about 1.65 times the monetary base. Not surprisingly, this multiple fell dramatically as banks' desire to hold reserves grew with their newfound positive returns. In effect, the banking system was using high powered money as an investment, rather than as an input in the money supply. The figure also shows the multiple adjusted for banks' holdings of excess reserves, or essentially the multiple for adjusted high powered money. This series actually increases from the 1.65 average to over 2.0.

Figure 3. The M1 Base Multiplier
Jan. 2007 - Jan. 2020



The greater sensitivity of the M1 money stock to the adjusted level of high powered money is the result of the effect of historically low interest rates on the public's desired currency-deposit ratio. Essentially, one cost of using currency in transactions is giving up the interest that checkable deposits yield. As interest rates fell, the return on checkable deposits fell as well. Figure 4 shows the path of the currency-deposits for the 2007 to 2020 period.

Figure 4. Currency-Deposit Ratio
Jan. 2007 - Jan. 2020



THE NEW MONEY, BANKING AND THE FEDERAL RESERVE'S MONETARY POLICY

Traditional monetary policy is about Federal Reserve actions that increase or decrease the money supply. These money supply changes take place when the Federal Reserve buys assets from the public or sells assets to the public.

When buying assets, the Federal Reserve essentially prints the money that it uses to pay for the purchase. Such a purchase would be a simple reorganization of the public's wealth toward money and from other assets, so no net change in wealth would occur. But the income from the assets now held by the Federal Reserve has to go somewhere. By law, that somewhere is to the U.S. Treasury. In a balanced-budget world, the increased Treasury income would be offset by lower taxation of an equal amount. Thus, in a real sense this open market purchase of assets from the public is the same as if the money dropped from the sky.

When selling assets, the Federal Reserve essentially takes money out of the economy. Such a sale would be a simple reorganization of the public's wealth toward assets and away from money, so no net change in wealth would occur. But the income from the assets that were held by the Federal Reserve reduces U.S. Treasury income. In a balanced-budget world, the reduced Treasury income would be offset by higher taxation of an equal amount. Thus, in a real sense this open market sale of assets to the public is the same as if the money received by the Federal Reserves was sucked up and burned.

Because these changes in the money supply represent real changes in the public's wealth, they have real effects on demand for the nation's output. How do the above Federal Reserve policies fit into the charge that Federal Reserve policy be conducted to achieve maximum employment, stable prices and low long-term interest rates?

Prior to the introduction of interest on reserves, controlling the money supply was essentially about controlling the monetary base. Except for periods of financial distress, Federal Reserve policy was aimed at controlling the monetary base by controlling the level of Federal Reserve assets, principally by operating in securities markets. These market operations were usually couched in terms of interest rate targets, essentially targets for the Fed Funds rate, since it was observable in real time.

Raising (or lowering) the Fed Funds rate simply involved making bank reserves more (less) scarce by selling (buying) securities in the market. But what really affects the economy is not the Fed Funds rate change, but ultimate money supply change. The effect of such operations on the money supply happens with a lag, as the final result depends on the banking system's response to the change in reserves. The final result then, is the culmination of the banking system's desire to hold reserves and the public's desire to hold currency.

Now that excess reserve holdings pay interest the banking system's desire to hold reserves is a market decision. That market decision has resulted in a level of bank excess reserve holdings that was \$1.46 trillion in January 2020. This level of excess reserves implies a propensity to hold 73 cents of excess reserves per dollar of banking system checkable deposits. In contrast, the required reserve ratio is only 10 cents per dollar of banking system checkable deposits.

The simple formula for the money supply relates the public's desire to hold currency and bank and financial institutions desire to hold reserves. Importantly, only member banks can hold deposits at the Federal Reserve. These deposits account for required reserves and what is termed "excess reserves." Also, some part of required reserves can be held as vault cash, i.e., currency. As a result of the banking system's large holdings of excess reserves, the Federal Reserve can increase the money supply by increasing the monetary base through buying assets or by making reserves less profitable for banks. It does the latter by reducing the interest rate it pays on bank holdings of excess reserves.

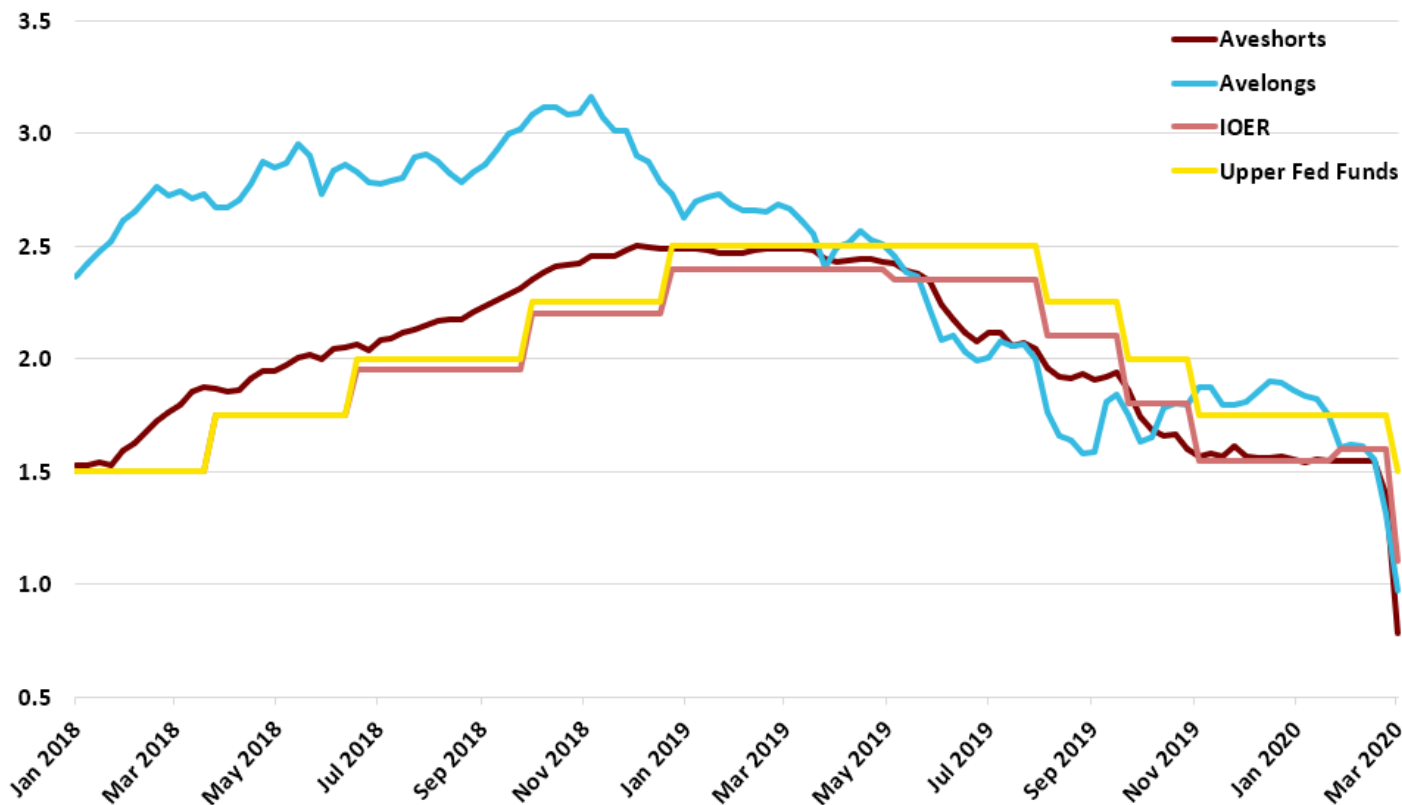
An increase in the rate of interest on bank reserves, given no change in market interest rates, results in banks adding reserves by contracting non-reserve investments. As banks contract non-reserve investment in order to increase reserves, the money supply necessarily falls. Once again, the real monetary policy is the effect of the change in the money supply and not the change in interest paid on bank reserves.

THE FED AND INTEREST RATES

Despite the question "When is the Fed going to raise rates?" heard often in the financial press, the Federal Reserve has little or no control over market interest rates? Yes, the Federal Reserve can set the rate it pays on bank reserves. And yes, in so doing it affects the money supply. These changes in the money supply come from the changes in the value to the banking system of reserves relative to other investments. As reserves become less valuable relative to other investment opportunities, banks reduce reserves and increase investment in the economy, resulting in an increase in the money supply. Or as reserves become more valuable, meaning that the interest rate on reserves rises relative to other investment opportunities, banks increase reserves by reducing the funds they invest in the economy, resulting in a reduction in the money supply.

If indeed Fed actions were a major determiner of market interest rates, then these actions would lead the market. As the figure below shows, the Fed actions, depicted by its choice of the Fed Funds upper target and the IOER, actually lag market interest rates. The figure shows the average market interest rates short-term treasuries, 1-year and shorter, and long-term treasuries, 3, 5, 7, 10, 20 and 30 year treasuries. What is apparent from even a casual observation of the figure is that rather than the Fed leading interest rates, it is a follower of market rates.

Figure 5. Average Short Treasury, Average Long Treasury , Fed Funds Upper Bound and IOER
January 5, 2018 to March 6, 2020



THE MONEY SUPPLY AND FED-SET INTEREST RATES

While the Fed must accept market interest rates, the lone rate of interest it controls, the IOER, gives it tremendous power to determine the money supply. This power comes from two aspects of the current interest-on-reserves world. First is the tremendous level of bank excess reserves and the potential for money growth residing in these reserves. Second, while the Fed must accept the market interest rates, its control of the IOER allows it control to a significant extent of bank holdings of excess reserves.

As Figure 3 shows, the money supply is a fairly consistent multiple of the level of high powered money adjusted for excess reserves. The Fed can change the adjusted level of high powered money in the traditional way by increasing or reducing its portfolio through open-market operations or by changing the profitability of bank reserves through changes in the IOER. Raising (lowering) the IOER makes holding reserves more (less) profitable for banks so that excess reserve holdings rise (fall) and the

adjusted level of high powered money with constant Fed asset holdings falls (rises).

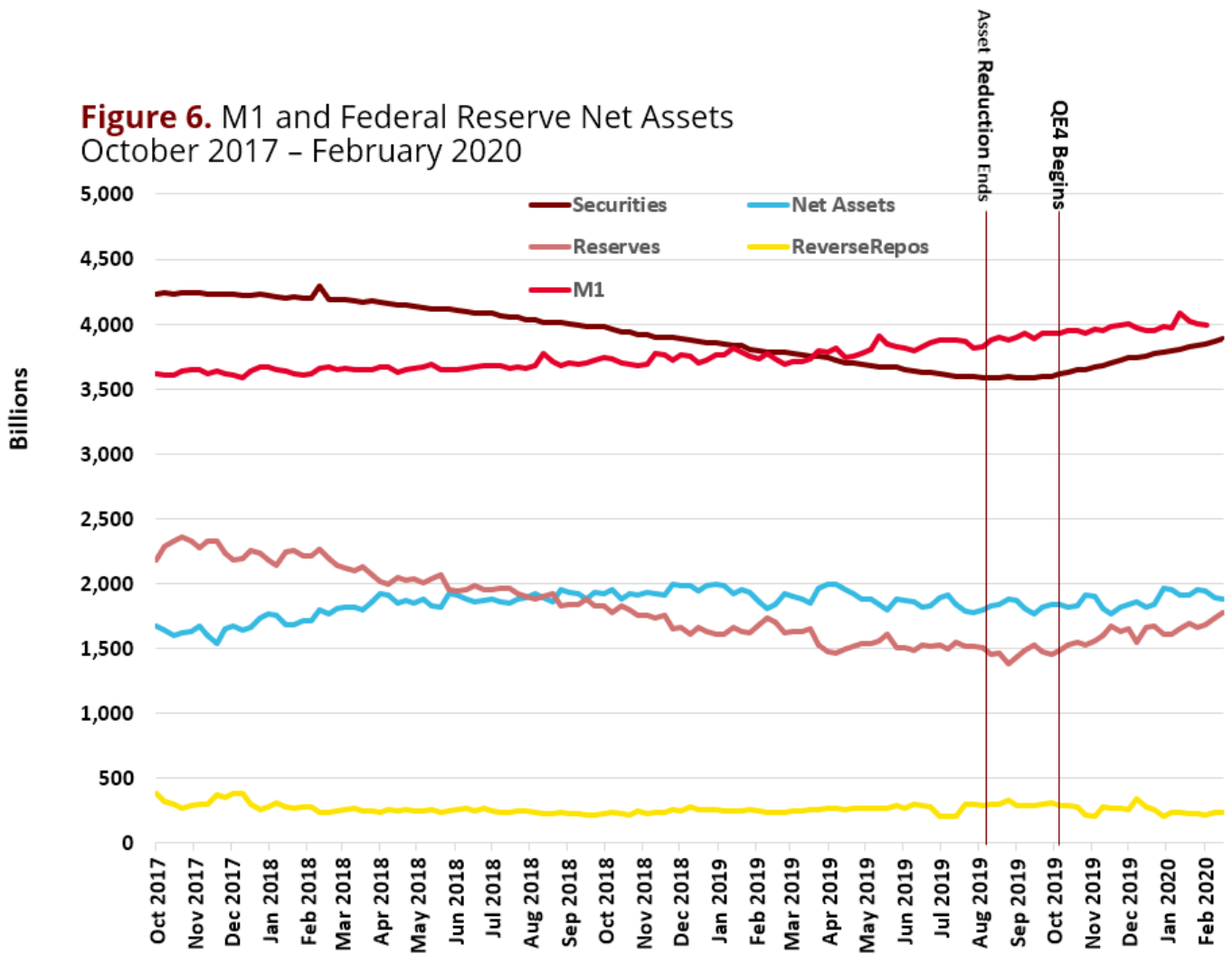
The Fed can control changes in the money supply by adding or subtracting from their assets, leaving bank reserves alone or leaving its assets unchanged and changing the IOER to induce banks to increase or reduce excess reserves. At the close of the three Fed quantitative easings at the end of 2014, the Fed's securities holdings were \$4.5 trillion, up from \$0.9 trillion at the beginning of the 2008 monetary crisis. During the period of asset expansion, bank excess reserves increased by \$2.5 trillion. As a result, the net monetary base rose by only \$1 trillion. Moreover, the money supply effect of that rise in the monetary base was mitigated by the fall in the velocity that resulted from low interest rates.⁴

Beginning in October of 2017, the Fed embarked on a program to return its asset position relative to the size of the economy to approximately 7% of GDP. Just as the massive expansion of Fed assets failed to produce the inflation many expected because of the IOER induced expansion of bank excess reserves, the reduction in assets need not be deflationary. All that is required for the Fed to achieve its 2% inflation goal as it reduces its assets is for the banking system to reduce its holdings of excess reserves faster than the Fed reduces its assets.

Figure 6 shows the level of the M1 measure of the money supply, Fed holdings of securities, bank holdings of reserves at the Fed, Fed sales of reverse repurchase agreements (these absorb reserves), and Fed net assets from October 2017 to March 2020. From October 2017 until October 2019, the Fed reduced its securities holdings by \$650 billion while bank holdings of reserves fell by \$900 billion. Thus, during the asset reduction program, Fed securities reductions were more than offset by bank reserve reductions.

⁴ See Thomas R. Saving, "The Federal Reserve, the Great Recession and the Lost Inflation," PERC Study No. 1604, July 2016, http://perc.tamu.edu/perc/media/perc/policy%20study/study_no1604_07_2016.pdf?ext=.pdf.

Figure 6. M1 and Federal Reserve Net Assets
October 2017 – February 2020



Clearly, the Fed’s asset reduction program was a success in that the combination of asset sales and making reserves less profitable for the banks resulted in excess reserves falling more than the asset reductions. This combination of liability reductions exceeding asset reductions resulted in increased Fed net assets. As a result, the effective monetary base, essentially the level of Fed net assets, rose consistently. As Fed net assets rise, the base for the money supply rises, as demonstrated by the steady increase in the M1 money over the period of Fed asset reductions.

In spite of the apparent success of its asset reduction program, the Fed stopped reducing assets in August of 2019. Just three months later in October of 2019, the Fed began an asset addition program. Just as the combination of asset decreases and the right interest on reserves allowed Fed net assets to increase, the right combination of asset increases and interest on reserves can increase Fed net assets at the rate to achieve the desired effect on the economy. In fact, by the end of March 2020 with the viral pandemic in full force, Fed assets were above their previous end of 2014 level.

During most of the Fed’s asset reduction period, the rate of return on both long and short treasuries exceeded the IOER giving the banks incentive to reduce excess reserves. The fall in excess reserves is easily discernable in Figure 6 from November 2017 through January 2019. By that time, the average rate of return had fallen to close to the IOER. Average returns continued to fall so that by the close of Fed

asset sales, both long and short-run average returns were below the IOER. As a result, Fed net assets had actually begun to fall.

With falling treasury yields and the cessation of excess reserve decline, the Fed began buying assets to return to net asset growth. The key to Fed policy leading to net asset growth is controlling the IOER so that banks have the incentive not to absorb the entire increase in reserves resulting from asset purchases. This result is shown in Figure 6, as Fed net assets have been growing since the onset of QE4. The real question is why not just keep lowering the IOER and let the banking system supply the level of net monetary base required for money growth?

CONCLUSION

The introduction of interest on reserves has made the banking system an active player in Federal Reserve monetary policy. The fundamental tool of monetary policy is to control the monetary base and the nation's money supply. We are now in a world where the banking system shares, almost on an equal footing with the Federal Reserve, the control of the money supply.

It is clear that the banking system responds to the level of the IOER relative to market interest rates. The Federal Reserve can conduct an expansionary monetary policy without entering the market for securities, but by reducing the interest rate it pays on bank reserves. As a result, this interest rate, which is wholly determined by the Federal Reserve, is an important part of monetary policy. But by the same token, market interest rates now play a role independent of the Federal Reserve in monetary policy. An increase in market interest rates, with a fixed Federal Reserve-determined IOER, will increase the effective monetary base and then increase the nation's money supply.

In the final analysis, the introduction of the IOER has changed the face of monetary policy. It has put the banking system on an equal footing with the Federal Reserve in the determination of the nation's money supply. Importantly, however, the Federal Reserve has not lost power, but to maintain its ability to control monetary policy, it must be constantly cognizant of financial market interest rates. Given that the Federal Reserve has an interest rate it totally controls in one sense, it is more powerful than ever. But importantly, it is more subject to the vagaries of financial markets than ever.