# The Liquidity Trap and U.S. Interest Rates in the 1930s

SHORT SUMMARY

Christopher Hanes

Department of Economics
School of Business
University of Mississippi
University, MS 38677
(662) 915-5829
*chanes@bus.olemiss.edu*

In the late 1990s, low inflation and nominal interest rates in the U.S. and Europe, and a major depression in Japan accompanied by short-term interest rates barely above zero, revived interest in the notion of a "liquidity trap" as a potential constraint on the effectiveness of monetary policy. Krugman (1998) argues that Japan was indeed in a liquidity trap, defining that to be "a situation in which conventional monetary policies have become impotent, because nominal interest rates are at or near zero: injecting monetary base into the economy has no effect" (p. 141). Long-term interest rates usually exceed short-term rates, of course, and remained above zero even in 1990s Japan. But most recent discussions of liquidity traps argue that *all* interest rates are bound as soon as rates at the *shortest* maturity, that is overnight rates, have hit the zero floor. Presumably, a longer-term rate equals the expected return to a series of overnight investments, plus a term premium. Term premiums are not generally believed to be affected by a central bank's open-market operations, except to the degree that the yield curve can be twisted by changes in the maturity structure of government debt, which is doubtful. Thus, in the event that overnight rates have been driven to zero, a central bank loses its ability to drive down interest rates at *any* maturity. The central bank can perhaps manipulate expectations to increase confidence that overnight rates will remain zero in the future. But if expectations do not change as desired, the central bank cannot use an increase in reserve supply to enforce a decrease in interest rates.

In the 1930s, the United States was in a situation that satisfied the conditions for a liquidity trap on this definition. Over 1929-1933 overnight rates fell to zero, and they remained on the floor through the 1930's. According to Krugman (1998), U.S. interest rates were "hard up against the zero constraint" (p. 137) in this period. At the time, however, many economists held a different view. Keynes (1936, p. 207) and his followers did not think a liquidity trap was binding in the mid-1930s. They always described the liquidity trap in terms of *long-term* interest rates. Once short-term rates had been driven to zero, they argued, short-term bonds were equivalent to money, but there was still a demand schedule for money broadly defined reflecting its usefulness as an asset free of interest-rate risk (Keynes, 1936, p. 201; Hicks, 1982, p. 263), so a central bank could depress long-term rates by increasing reserve supply through open-market operations in longer-term bonds.

In the paper, I explain the current conventional view that interest rates at all maturities are bound by the liquidity trap as soon as short-term rates have been driven to the zero floor. Using a model, I present an alternative view of liquidity traps based on monetary theory of the 1930s-1950s. The model implies that, when overnight rates are zero, longer-term rates will tend to fall in response to an increase in the supply of nonborrowed reserves *whether or not* there is a downward revision to expectations of future overnight rates. I examine the relation between reserve quantities and bond yields in the U.S. 1930s. I find that changes in yields were negatively related to changes in nonborrowed reserve supply, even if the reserve supply shocks were unrelated to news about future monetary policy and overnight rates.

## I. Reserve demand, interest-rate determination and the liquidity trap

### *The current conventional view*

Federal Reserve policymakers and much literature in economics (an example is Poole, 1968) share a common model of reserve demand and interest rate determination in the United States that rests on certain institutional facts. Banks that hold reserve accounts at the Fed use debits (credits) to the accounts to make payments to (receive payments from) other banks and federal agencies. A bank is required to maintain a zero or positive balance in its reserve account over every night, and a predetermined "reserve requirement" or "required clearing balance" on average over a "maintenance period" of several days. If the bank's balance of "nonborrowed" reserves - that is, its reserve balance before borrowing from the Fed - falls short of the minimum, the bank must cover the shortfall with a "discount loan" from the Fed. To put it another way, a bank must take out a discount loan if its "free reserve" balance - nonborrowed reserves *less* required reserves - falls below zero. The Fed pays no interest on (most) reserve balances, while a bank can lend or borrow overnight at positive interest rates through a variety of instruments. But it is impossible for a bank to predict the exact balance of debits and credits that the Fed will apply to its reserve account at the end of the day, and a bank does not receive a report of its final balance until it is too late to arrange an overnight. Thus, a bank that aimed for a zero free reserve balance would sometimes find itself short, which would be costly because discount credit is rationed by the Fed and also because banks fear that discount borrowing will be taken as a signal that the bank is in financial distress. A bank must therefore weigh the return to overnight lending against the benefit of having another dollar in reserves to cover unforeseeable reserve debits and avoid a reserve deficiency. This tradeoff creates a negative relation between the overnight rate and demand for free reserves. In periods when the Federal Reserve has a target for the overnight rate, such as the present, its open-market operations are adjusted to counteract foreseeable shocks to free reserve demand and supply, and hold market overnight rates near the target level.

The essential institutional elements of this model held in the 1920s. Overnight debt instruments included federal funds loans, repurchase agreements, interest-paying interbank deposits, and "call money" loans collateralized by a basket of stocks and bonds traded on the New York stock exchange. End-of-day payments to a bank's account were unpredictable and overnight lending markets were effectively closed before a bank received its final reserve balance. A bank facing a reserve deficiency could make up the shortfall with a discount loan but discount borrowing was subject to rationing and reputational costs; in addition discount rates were usually above comparable market rates.

Applied to any period, this model implies that a liquidity trap binds all interest rates as soon as overnight rates have been driven to zero, because reserve demand becomes *indeterminate* when there is no opportunity cost of holding reserve balances overnight. Once free reserve supply is sufficient to drive the overnight rate to zero, further increases in supply have no direct effect on asset prices (Orphanides and Wieland, 2000).

*An alternative view*

In the money-demand literature of the 1930s-1950s, it was often proposed that households held money not only for a transactions medium but also because money is free of interest-rate risk. For example Tobin (1958) argues that the “theory of risk-avoiding behavior” can “provide a basis for liquidity preference and for an inverse relationship between the demand for cash and the rate of interest” (p. 85). Given this relation, interest rates at maturities longer than overnight would be negatively related to money supply, *holding fixed* expectations of future interest rates and asset prices.

A similar argument could apply to banks' demand for reserve balances. A bank has special reason to avoid risk of capital loss. Regulators have generally tried to guard banks' creditors against bank insolvency by requiring a bank to maintain a standard margin between the value of its assets and liabilities, that is by imposing capital requirements.

Since the 1950s, the money-demand literature has turned away from interest-rate risk as an element of money demand. McCallum and Goodfriend (1987) point out that "rate-of-return uncertainty on other assets cannot be used to explain why individuals hold money in economies - such as that of the US - in which there exist very short-term assets that yield positive interest" (p. 779). This also holds for banks' reserve demand. Overnight loans are completely free from interest-rate risk.

Suppose, however, that there were no return to very short-term lending. Then any liquid asset promising a positive return would be subject to interest-rate risk (in addition to any other risks such as default risk). The allocation of a bank's assets between such assets and reserves would necessarily involve a tradeoff between yield and risk of capital loss.

In the paper, I present a model in which banks' need to avoid risk of capital loss creates a negative relation between reserve supply and bond yields when overnight rates are zero. This is true even though, when overnight rates are *positive*, an increase in reserve supply does *not* generally tend to reduce the spread between bond yields and overnight rates. An implication of the model is that bond yields are related specifically to the supply of *nonborrowed reserves* (reserve balances including required reserves) when overnight rates are zero, even though it is the supply of *free reserves* (reserves less required reserves) that influences the overnight rate when overnight rates are positive. Thus, the alternative view of liquidity traps is consistent with conventional propositions about interest-rate determination under "normal" conditions.

<u>II) Interest rates and reserve quantities in the 1930s U.S.</u>

An environment of zero overnight rates developed in the U.S. in the early 1930s. Fed funds overnight loan rates, call money rates, and repo rates were all effectively zero by early 1934, as were rates paid for interbank demand deposits (before interest on such deposits was banned by regulation). They remained zero throughout the rest of the decade.

Meanwhile, longer-term rates interest rates varied. Figure 1 plots yields to maturity on high-grade corporate bonds, long-term Treasury bonds, medium-term Treasury 3-5 year notes, and weekly auction discount rates for newly issued Treasury bills (the maturity of which varied) from April 1934 through the end of 1939.

Over the same period, there were large fluctuations in reserve quantities. Most of these fluctuations constituted shocks to reserve supply (see Friedman and Schwartz, 1963; Romer 1992). Some, but not all of these reserve supply shocks were coincident with news about monetary policy.

Figure 2 plots reserve quantities along with two closely related variables: the value of the U.S. gold stock, and total funds held by the Treasury outside commercial banks. Changes in nonborrowed reserves from 1934 through 1936 reflect Treasury purchases of gold, and a much smaller amount of silver. These boosted nonborrowed reserves when the Treasury created a certificate backed by the purchased metal, deposited the certificate in its Federal Reserve account, and spent the funds or transferred them to Treasury accounts in commercial banks. Most gold and silver purchases were a consequence of foreign exchange operations. After March 1934 most Treasury purchases of foreign exchange were passive, depending on the volume of foreign exchange offered at the fixed rate. The inflow of foreign exchange, in turn, mainly reflected capital flight to the U.S. from political and economic disruptions in Europe and Asia. The inflow was unsteady, spurred or slowed by political events. Nonborrowed reserve supply was also affected by the vagaries of the Treasury's payment system. A purchase of precious metal did not increase reserves until the Treasury spent the resulting funds or transferred them to its accounts in commercial banks. In the meantime the value of purchased metal was booked as an increment to the Treasury's Federal Reserve balance or "vault cash." Ordinary tax payments, spending and financing operations also affected reserve supply as the Treasury transferred funds into and out of its commercial bank accounts. Over 1934-1936, the Federal Reserve made no attempt to sterilize the effects of Treasury operations. In fact the Federal Reserve undertook no deliberate open-market operations at all.

In July 1936, the Federal Reserve Board announced a change in monetary policy: reserve requirements would be hiked as of the following August. In January 1937, the Fed announced another hike in reserve requirements to become effective in March and May 1937. Nonborrowed reserves, meanwhile, were affected by a change in Treasury policy. In December the Treasury announced it would sterilize the effects of gold inflows on reserve supply, booking the value of all "inactive" gold as Treasury vault cash. In adopting these policies, neither the Treasury nor the Federal Reserve intended an immediate increase in interest rates. The goal of the policies was to make it easier for the Fed to tighten in the *future.* Treasury authorities, however, feared the hikes in reserve requirements would cause a rise in bond yields, which they wanted to avoid. In fact bond yields remained stable around the time of the first hike in reserve requirements in August 1936, but they began to rise sharply at the end of December 1936.

In early 1937 both the Fed and the Treasury began to take steps intended to lower bond yields, including open-market purchases of bonds. In September 1937, the Treasury began to release its stock of "inactive" gold into the reserve supply. In February 1938 the Treasury began to allow current gold inflow to pass through to reserves. In April 1938 Roosevelt announced that all of the Treasury's remaining gold balances would be passed through to reserves, no further inflows would be sterilized, and reserve requirements would be reduced. From that time through the outbreak of the Second World War there were no obvious changes in monetary policy.

Figures 1 and 2 together show a clear relation between reserve quantities and bond yields. This is most obvious with respect to the monetary policy changes of 1936-1937. But there was also a relation between yields and nonborrowed reserves apart from these changes in monetary policy, as is evident in Figure 3, which scatters Treasury bond yields against the log of nonborrowed reserves. Observations from all of the weeks from the Federal Reserve's first announcement of an upcoming hikes in reserve requirements (July 15, 1936) through the final reversal of policy in 1938 (April 22, 1938) are specially marked. These weeks' observations actually appear as disturbances to a negative relation between yields and nonborrowed reserves that prevailed *before and after* the policy shifts.

How might one explain the apparent negative relation between reserve quantity and bond yields? According to the current conventional view of liquidity traps, it must reflect coincidence between changes in reserve quantities and news that changed expectations of future overnight rates.

The alternative view of liquidity traps illustrated by the model presented in the paper offers a different explanation of interest-rate movements over the 1930s. In this view, yields would have been affected by exogenous shocks to reserve supply whether or not the shocks to reserve supply were accompanied by changes in expectations of future overnight rates. Reserve supply shocks could have influenced bond yields through two channels: the direct effect of reserve supply on the expected overnight yield to holding bonds, and a possible effect on expected future bond prices *given* expectations of future overnight rates.

The alternative view has some distinct or at least specific implications that can be tested. First, changes in bond yields should have been negatively correlated with changes in reserve quantities that did *not* coincide with announcements about monetary policy or otherwise constitute news about future overnight rates. Second, bond yields should have been specifically related to *nonborrowed* reserves, and unrelated to changes in required reserve balances except to the degree that the latter were coincident with news about monetary policy. Finally, the relation between bond yields and nonborrowed reserves should have been *weaker* for bonds of *longer* maturities. In the model, reserve supply directly affects the bond price because nonborrowed reserve demand is related to the expected overnight bond yield. If there are bonds of longer and shorter maturities, nonborrowed reserve supply shocks would have relatively small effects on yields to maturity for longer-term bonds, because a longer-term bond's yield to maturity does not change as much for a given change in its expected overnight yield.

*Relations between bond yields and reserve quantities*

*1934-1939*

I regress week-to-week changes in Treasury note and bond yields to maturity on weekly changes in (log) reserve quantities, excluding weeks when either the Fed or the Treasury (or both) announced changes or future changes in monetary policy. I find that changes in bond yields appear negatively related to changes in reserve quantity, specifically to changes in the quantity of *nonborrowed* reserves. Changes in *required* reserves were unrelated to bond yields. The relation between nonborrowed reserves and yields was weaker for bonds of longer maturity.

*1934-1936*

In the period from April 1934 through the beginning of July 1936 there were no announcements by the Treasury or Federal Reserve with obvious implications for monetary policy. No agency sterilized the effects of international flows and Treasury payments on nonborrowed reserves, or adjusted reserve supply in response to interest rates. Changes in the gold stock, net of the change in the Treasury's balances held outside the banking system, constituted shocks to reserve supply that were not counteracted by other reserve supply factors.

Confining the sample to this 1934-36 period, I again regress week-to-week changes in bond yields on nonborrowed reserves and required reserves. I also regress changes in yields on changes in the gold stock net of the change in the Treasury's balances held outside the banking system. Again I find that changes in bond yields appear negatively related to changes in *nonborrowed* reserves, this relation was weaker for bonds of longer maturity, and changes in required reserves do not matter. Also, I find that changes in bond yields are negatively related to gold inflows net of changes in Treasury balances.

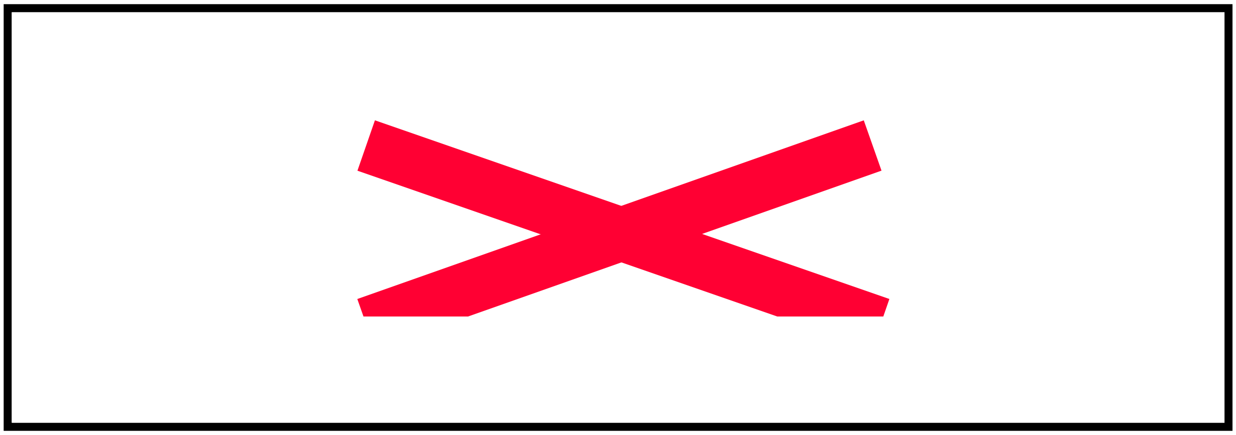
These results for the 1934-1936 period are hard to account for in terms of the conventional view. Could one plausibly argue that, within this period, changes in nonborrowed reserves caused by interactions of gold inflows and Treasury payments were correlated with changes in expectations of future overnight rates?

## 4) Conclusion

The experience of the U.S. over the 1930s contradicts the view that longer-term interest rates are bound by a liquidity trap as soon as short-term rates have been driven to zero. Data are more consistent with an alternative view of liquidity traps based on monetary theory of the 1930s-1950s.

The alternative view has implications for monetary policy in other times and places when overnight rates are at the zero bound. Banks nearly everywhere may have reasons to avoid risk of capital loss, which could create a defined demand for reserves when overnight rates are zero. The central bank would therefore have the ability to enforce a decrease in longer-term interest rates by boosting reserve supply through ordinary open-market operations in bonds or foreign exchange, whether or not the central bank can manipulate expectations of future overnight rates.

Figure 1



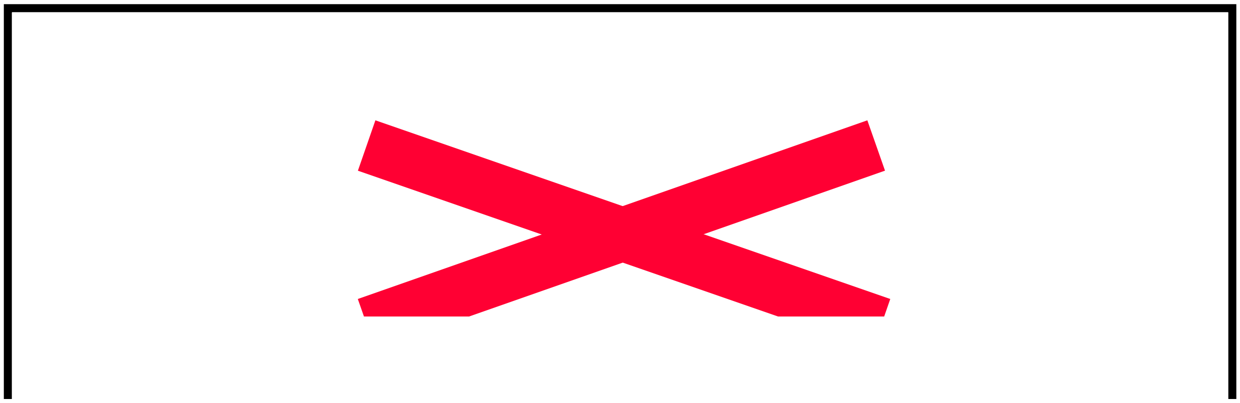


Figure 2

Figure 3