

**The Liquidity Trap:
A Lesson from Macroeconomic History for Today**

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[The *General Theory*] is a purely theoretical work, not a collection of wisecracks.
Everything turns on the mumbo-jumbo ...

John Maynard Keynes
to D. H. Robertson
February 1935

But do not be reluctant to soil your hands [with quantitative economic history] ... I think it is most important. The specialist in the manufacture of models will not be successful unless he is constantly correcting his judgment by intimate and messy acquaintance with the facts to which his model has to be applied.

John Maynard Keynes
to R. F. Harrod
July 1938

I beg for an occasional re-reading of what I did say!

John Maynard Keynes
to E. W. Gilboy
February 1939

After a hiatus of nearly three decades, the Keynesian “liquidity trap” – a situation in which low interest rates engineered with monetary policy are ineffective in stimulating an economy in recession or depression – is experiencing a revival as a newly prominent topic among both academic economists and business journalists. The new interest was inspired, **first**, by the experience of the Japanese economy in the mid- to late-1990s that made monetary policy appear to be ineffective in reviving a sagging and depressed economy. Paul Krugman, the most prominent of many, declared the Japanese situation a modern-day example of the almost-forgotten experience of the United States during the defining moment of the Great Depression.¹ **Second**, some economists, Krugman among them, expressed concerns that the interest rate cuts of 2001 and 2002 initiated by Alan Greenspan’s Open Market Committee may be ineffective in reviving the American economy from the then current recession.² **Third** and most dramatic, the ongoing financial crisis which saw the three-months Treasury Bill rate fall to 0.03 percent on 17 September 2008 has most economists, financial journalist, and even some politicians exposing a new familiarity with liquidity traps. In December the Fed established a target range for the Federal Funds Rate between zero and a quarter of one percent and signaled it is likely to leave the rate there for some time.³

¹ Paul Krugman, “It’s Baaack! Japan’s Slump and the Return of the Liquidity Trap,” *Brookings Papers on Economic Activity* 2 (1998): 137-205.

² For example, Paul Krugman, “Dealing With W,” *New York Times*, October 1, 2002; and “My Economic Plan,” *New York Times*, October 4, 2002.

³ For an account of the September 17th episode see Joe Nocera, “As Credit Crisis Spiraled, Alarm Led to Action,” *New York Times*, October 2, 2008. For the Open Market Committee’s decision in December see Federal Reserve System, Open Market Committee, Brian F. Madigan, Secretary, “Minutes of the Federal Open Market Committee,” December 15-16, 2008.

Until this recent turn of events the liquidity trap was thought to be phenomena of the Great Depression in the United States. In 1932, the most aggressive monetary policy ever pursued had been successful in reducing interest rates to historically low levels, but it utterly failed in the goal of preventing the collapse of the economy or in stimulating a revival of investment spending.

This paper has three tasks. First I review and reinterpret the theory of the liquidity trap, as presented by John Maynard Keynes in his *General Theory*. Second, I examine the impact of Federal Reserve open market operations during the Great Depression. The year 1932 is given particular emphasis since Keynes suggested that the U.S. “liquidity crisis” of October and November of that year was evidence that monetary policy could become powerless to stimulate recovery during a deep depression. Third, I present recent data from Japan and the United States to illustrate the theory’s applicability to these two modern situations.

Monetary versus Fiscal Policy

In June 1931 John Maynard Keynes articulated most of the essential ingredients of the macroeconomic model he later described in the *General Theory* [1936] in a series of lectures delivered in Chicago. This early version included the inadequacy of effective demand as the cause of business downturns and the concept of an unemployment equilibrium as an argument supporting the need for government intervention. At that time, however, Keynes suggested that government should place primary reliance upon monetary policy as a cure for the on-going depression. “It may not be easy and a large change may be needed, but there is no other way out.” About fiscal policy he had this to say in 1931:

Theoretically, it seems to me, there is everything to be said for action along these lines. For the government can borrow cheaply and need not be deterred by overnice calculations as to the prospective return. ... The difficulty about government programmes seems to me to be essentially a practical one. It is not easy to devise at short notice schemes which are wisely and efficiently conceived and which can be put rapidly into operation on a really large scale. Thus

I applaud the idea and only hesitate to depend too much in practice on this method alone unaided by others.⁴

Less than five years later, when the *General Theory* appeared, Keynes had added a new feature to his macroeconomic model which led him to disregard his practical objections to increased government spending with borrowed money.

For Keynes in 1936, fiscal policy was the *only* cure for the deep economic depression of the mid-1930s compatible with the preservation of “capitalistic individualism.” The new ingredient, inspired he said by the “crisis of liquidation” in the United States “at certain dates in 1932,” was Keynes' insistence that orthodox monetary policy would be ineffective in the face of such a depression.⁵

Keynes' historical analysis of monetary policy during the Depression contains two distinct theoretical arguments:

- (1) the collapse of the investment demand schedule had been so great that the *long-term* interest rate would have to be reduced to very low levels (perhaps even to negative nominal rates) before the quantity of investment demanded would be adequate to restore full employment; and
- (2) orthodox monetary policies (expansion of the monetary base and open market operations in *short-term* government securities) failed to reduce the long-term

⁴ Keynes, “An Economic Analysis of Unemployment,” reprinted in Donald Moggridge, editor, *The Collected Writings of John Maynard Keynes*, Volume 13, *The General Theory and After, Part I, Preparation*, Macmillan St Martin's Press, 1973: 343-367 [Originally published in *Unemployment as a World Problem* (1931)]. The discussion of alternative policies can be found on pp. 362-367, the short quotation on p. 365, and the long extract on p. 364.

⁵ Keynes, *General Theory of Employment, Interest and Money*, Macmillan, 1936, pp. 207-208. The reference to capitalistic individualism is from p. 381 and Keynes mentions the “crisis of liquidation” on p. 207.

interest rate sufficiently because there is an effective floor to long-term lending rates.⁶

The first phenomenon, the collapse of investment demand, I take to be the defining characteristic of a “Keynesian depression,” that is, a depression caused by inadequate aggregate demand induced by a drying up of investment opportunities and characterized by a loss of business confidence. The second phenomenon is generally called the “liquidity trap” although that was not Keynes' term.⁷

After briefly establishing, to my satisfaction at least, that the Great Depression was an example of a Keynesian depression, the balance of this paper will focus upon the proper interpretation and historical applicability of the liquidity trap argument. Although the *General Theory* was a “purely theoretical work,” Keynes clearly intended it to be an interpretation of the Great Depression; and the liquidity trap argument, I believe, is a model intended to explain the events of 1932. The reader, I hope, will thus appreciate making an “intimate and messy acquaintance with the facts.”⁸

⁶ At this point I consider both the demand for investment (Keynes' “marginal efficiency of capital”) and “the” interest rate to be expressed in nominal rather than real terms. Keynes, I believe consistently, referred to the nominal rate of interest throughout his discussion of these matters, a point he makes explicit some pages later in Chapter 17, “The Essential Properties of Interest and Money,” pp. 222-229. When explicit precision was called for, he called the nominal rate the “money rate of money-interest,” p. 227.

⁷ Dennis H. Robertson is said to have coined the term “liquidity trap” but the usual citation for this origin to his review in the *Quarterly Journal of Economics* (November 1936: 190) seems to me to be a stretch. Robertson said there: “Liquidity in the long run appears perhaps rather as a kind of ghost or poor relation of Productivity than as its equal partner, and as likely to furnish a progressively less dangerous trap for savings as, with a successful process of saving, the normal rate of interest declines.” Hardly a memorable turn of phrase. The more likely source is Robertson's *Essays* [1940: 34-36] where the phrase “liquidity trap” does appear. This source was cited by J. R. Hicks who defined the “liquidity trap for savings ” as “Mr. Keynes's doctrine about the difficulty of reducing the rate of interest below a certain minimum level” [Hicks 1942: 56]. And surely it was Hansen who popularized the phrase in his presentation of the Hicksian IS-LM diagram in his widely read *A Guide to Keynes* [1953].

⁸ Keynes characterized the *General Theory* as a “purely theoretical work,” in a prepublication exchange with Denis Robertson [Moggridge, Volume 13, p. 520]. His call for an acquaintance with quantitative economic history was in a post publication letter to Roy Harrod [published in Donald Moggridge, editor, *The Collected Writings of John Maynard Keynes*, Volume 14, *The*

But first, a few more words about the liquidity trap theory. Keynes offered three theoretical reasons why an effective floor to interest rates would be encountered at the depth of a depression:

- (1) the rise of default premiums included as a portion of the interest charges on business loans could become so great that it would become difficult to bring down the effective long-term rate of interest;
- (2) it was, at least theoretically, possible that the demand for money could become “virtually absolute” at a sufficiently low rate of interest and, if so, then increases in the money supply would be absorbed completely by hoarding; and
- (3) the demand for liquid assets could become so great that continued open-market purchases of short-term government debt would lower the short-term rate of interest to zero without producing further declines in the long-term rate.⁹

The first element of Keynes' proposition he called the problem of “lender's risk” or, alternatively, “moral risk.” As far as I am aware, only scant attention has been given to this phenomenon in either post-war textbook treatments of the Keynesian system or the empirical work on investment, interest rates, and monetary policy.¹⁰ For that reason, I shall discuss this phenomenon at some length. I do not anticipate, however, that my treatment will prove particularly controversial though I submit it does put an insightful light on the macroeconomic history of the Great Depression.

The second argument I call the problem of “absolute liquidity preference” and the third I want to label the problem of “rigidity in the term structure of interest rates.” These two parts of the liquidity trap argument are often confused and conflated because of a tendency in the post-Keynesian literature to drop short-term assets from the Keynesian

General Theory and After, Part II, Defense and Development, Macmillan St Martin's Press, 1973, p. 300.

⁹ *General Theory*, pp. 144-145, 172, 207-208, 232-234.

¹⁰ An exception is Ben S. Bernanke, “Nonmonetary Effects of the Financial Crisis in the Propagation of the Great Depression,” *American Economic Review* 73 (June 1983): 257-276.

model, leaving money, bonds, and physical capital as the only assets.¹¹ This may be acceptable for a textbook simplification, but not, I submit, for an application to the economic history of the Great Depression or a clear-eyed view of the current situations in Japan and the United States. The evidence that I examine suggests that the term structure problem was encountered in late 1932 but that absolute liquidity preference was not. Keynes, I think, would have agreed with both of these conclusions.

In addition to the three general theoretical arguments I have mentioned, Keynes added several specific institutional reasons that contributed to establishing a floor to interest rates:

- (4) the existence of transactions costs would compel a bank to “charge its customers 1½ to 2 percent; even if the pure rate of interest to the lender is nil;”
- (5) the monetary authorities may limit their open-market activities to “debts of a particular type” – in the U.S. and Japanese cases to short-term debts, and
- (6) the monetary authorities might show themselves to be unwilling to conduct an effective monetary policy for political or other reasons.¹²

These institutional features have some relevance to the history of the Great Depression and will be discussed briefly in what follows.

The liquidity trap was a popular piece of textbook apparatus in the late 1960s, but it seems to have been rejected by monetarists and most macroeconomists some time in

¹¹ Keynes did not consistently hold to the distinction between cash and short-term assets and subsequent interpreters felt free to drop the short-term asset for the sake of simplification. One such simplified model is the familiar IS-LM framework introduced by John R. Hicks, “Mr. Keynes and the ‘Classics’: A Suggested Interpretation,” *Econometrica* 5 (1937): 147-159. For alternative discussions of the role of short-term assets in the Keynesian model see Franco Modigliani, “Liquidity Preference,” *International Encyclopedia of the Social Sciences*, Volume 9 (Cromwell, Collier and McMillan, 1968): 394-409; and Axel Leijonhufvud, *On Keynesian Economics and the Economics of Keynes* (Oxford University Press, 1968): Chapter 2.

¹² *General Theory*, pp. 207-208.

the 1960s or early 1970s on the strength of time-series econometric evidence.¹³ Before the most recent round of revisions, the liquidity trap rarely appeared in modern textbooks and when mentioned it was almost always dismissed as an unlikely possibility by the author.¹⁴

This, I believe, was a mistake. By providing a slightly altered version of the standard model, I am able to argue that U.S. monetary policy did reach a liquidity-trap impasse at several points during the depression and in particular in October and November of 1932 during the episode referred to by Keynes. Accordingly I reject the notion, popular with many monetarists and some economic historians, that the Federal Reserve's conduct of monetary policy was insufficiently aggressive during this phase of the Great Depression.

The Collapse of Investment, 1929-1933

To make a distinction between a Keynesian depression and economic downturns of any other sort is not standard. I choose to make it here because the liquidity trap problem

¹³ Several journal articles reported the conclusion that the liquidity trap did not exist after examining time-series regression relationships estimated with U.S. data. The most influential were Martin Bronfenbrenner and Thomas Mayer, "Liquidity Functions in the American Economy," *Econometrica* 28 (1960): 810-834; Allan H. Meltzer, "The Demand for Money: The Evidence from the Time Series," *Journal of Political Economy* 71 (June 1963): 219-246; and David Laidler, "The Rate of Interest and the Demand for Money: Some Empirical Evidence," *Journal of Political Economy* 74 (December 1966): 543-555. Milton Friedman and Anna Schwartz reject the liquidity trap on other, to me mysterious, grounds: "The failure of repeated attempts by central banks to peg interest rates at low levels has made that proposition untenable," *Monetary Trends in the United States and the United Kingdom: Their Relation to Income, Prices, and Interest Rates, 1867-1975*, University of Chicago Press, 1982, p. 55. I find this statement puzzling since (1) the Federal Reserve was highly successful in pegging short-term Treasury bill rates at low levels from 1942 through 1951 and (2) any failure to peg long-term bond yields, private market rates, or the rates implicit in the sale and rental prices of assets would be evidence in favor of the liquidity-trap argument.

¹⁴ *Pearce's Dictionary of Modern Economics* (MIT Press, 1981) says: "When originally suggested by Keynes in the GENERAL THEORY this appeared to be an important qualification of the effectiveness of monetary policy. However in practice there is no empirical evidence to support the existence of a liquidity trap," p. 252. Even most textbooks are equivocal. N. Gregory Mankiw in the fifth edition of *Macroeconomics* (Worth, 2003) has a boxed insert on the liquidity trap that mentions the situation in Japan but which also presents the concept as debatable with "no consensus about the answers," p. 303.

becomes relevant only if a substantial fall in the interest rate is required to restore full employment. To illustrate the distinction, I consider the case of monetary policy applied in the absence of a Keynesian depression.

Suppose aggregate final sales decline and unemployment rises not because of a downward shift in the demand for investment but because of a fall in demand arising from consumption spending, the government, or the foreign trade sector. Suppose further that the demand schedule for fixed investment (what Keynes called the “marginal efficiency of capital”) remained unaffected and was reasonably elastic with respect to the relevant interest rate.¹⁵

In such a case one might suppose that a modest decline in interest rates induced by an orthodox open-market operation would be sufficient to offset the decline in aggregate demand. Declines in the bank loan rate and the cost of money in the bond market would stimulate new investment and the increased demand for investment goods would compensate for the deficient component of aggregate demand. If this monetary policy could be implemented rapidly and effectively, recovery might be accomplished before accelerator effects caused a weakening of investors' confidence.

This, I imagine, is how monetary policy could be effective in stabilizing an economy otherwise sensitive to shocks in aggregate demand. This use of monetary policy might even be effective in checking a recession initiated by a decline in the demand for investment – provided, first, that the initial decline was relatively small and, second, that action was taken sufficiently quickly to reverse the situation before accelerator effects caused a plunge into a Keynesian depression. Nothing in what follows is intended to cast doubt on the effectiveness of monetary policy in preventing serious depressions that

¹⁵ I mean: suppose the demand for investment in *nominal terms* does not change. Notice, however, that if the decline in aggregate demand causes entrepreneurs to expect a fall in prices then the nominal demand for investment is unlikely to remain unaffected; most likely it would fall. Thus I am assuming for this argument that expectations about future prices do not change. The additional assumption that the demand for investment is “reasonably elastic” is a standard of macroeconomic theory.

might otherwise arise in such cases.¹⁶ The question at issue is whether monetary policy can be effective in curing a serious depression once it has appeared.

We can, I think, be certain that Keynes believed that the world-wide depression of the 1930s was produced by a massive collapse of investment demand. Although he made only passing references to contemporary economic conditions in the *General Theory*, he unquestionably intended his macroeconomic analysis to be applicable to the on-going depression. Within the *General Theory* almost all of the formal attention is given over to the case of a depression caused by a collapse in investment demand. By contrast, the consumption function is treated as stable.¹⁷

Keynes' analysis of the cause of the Great Depression can be found in the first of his Chicago lectures from the 1931 series. Entitled "The Originating Causes of World-Unemployment," Keynes' talk could not have been more emphatic about the role of the collapse of fixed investment:

I see no reason to be in the slightest degree doubtful about the initiating causes of the slump. ... I find the explanation of the current business losses, of the reduction of output, and of the unemployment which necessarily ensues on this not in the high level of investment which was proceeding up to the spring of 1929, but in the subsequent cessation of this investment. I see no hope of a recovery except in a revival of the high level of investment.

[T]his falling away of fixed investment, while most marked, perhaps, in the United States, was not confined to that country. The complex of circumstances which [led to the initial fall in investment] combined to cause a very marked diminution in the rate of investment all over the

¹⁶ We need not consider the question of whether discretionary stabilization policy is necessary or wise in these cases. I am merely arguing that if used to fine tune the economy, monetary policy could be effective in insulating the economy from shocks.

¹⁷ Keynes did allow conceptually for shifts in the consumption function induced by what he labeled "subjective factors." But, "the subjective factors," he went on to say, "include those psychological characteristics of human nature and those social practices and institutions which, though not unalterable, are unlikely to undergo a material change over a short period of time except in abnormal or revolutionary circumstances;" *General Theory*, p. 91. At the time, government spending was too small a proportion of total demand to produce much of an aggregative effect by a cut in its spending program.

world. Once this decline was started on a significant scale, it is exceedingly easy to see (on my way of looking at the matter) how the mere fact of a decline precipitated a further decline ... This decline has continued down to the present time, and so far as fixed investment is concerned, the volume of new investment must be today, taking the world as a whole, at the lowest figure for very many years.

Here I find – and I find without any doubts or reserves whatsoever – the whole explanation of the present state of affairs.¹⁸

Most subsequent writers in the Keynesian tradition have accepted Keynes' analysis of the collapse in investment. Peter Temin, however, has argued otherwise. Temin suggested that it was a collapse of consumption – not investment – that precipitated the Depression.¹⁹ Yet, even Temin does not deny that by 1932 the demand for investment had collapsed. Temin's argument about a causal role for the decline in consumption has been challenged by others who – persuasively in my view – reject his argument.²⁰ Perhaps, though, a few more words are warranted here about the evidence that led Temin to question the Keynesian view that investment had collapsed.

Temin examined John Kendrick's data on aggregate investment, comparing the percentage decline in gross investment from 1929 to 1930 (alternatively from 1928 to 1930) with the decline experienced during the recession of 1920-1921. He found the magnitudes of the two declines were about the same and on this basis he concluded the difference between the sharp but brief recession of 1920 and the Great Depression “does

¹⁸ Reprinted in Moggridge, Volume 13, pp. 343-352. The passages quoted are from pp. 344 and 349-351. For a similar, though less emphatic, expression of these views see Keynes, *A Treatise on Money*, Volume 2, *The Applied Theory of Money*, Macmillan, 1971, pp. 170-177 (original publication 1930).

¹⁹ Peter Temin, *Did Monetary Forces Cause the Great Depression?* Norton, 1976, see particularly p. 172. In Temin's view it was a collapse of consumer durable purchases, not non-durables and services. Many Keynesians would wish to consider consumer durable purchases as similar to investment. Also see Christina Romer, “The Great Crash and the Onset of the Great Depression,” *Quarterly Journal of Economics* 105 (August 1990): 597-624; and Martha Olney, “Avoiding Default: The Role of Credit in the Consumption Collapse of 1930,” *Quarterly Journal of Economics* 114 (February 1999): 319-335.

²⁰ Thomas Mayer, “Consumption in the Great Depression,” *Journal of Political Economy* 86 (February 1978): 139-145. Martha L. Olney, “Consumer Durables in the Interwar Years: New Estimates, New Patterns.” *Research in Economic History* 12 (1989): 119-150.

not lie here.” “It lies rather,” he argued, “in the combined behavior of consumption and exports.”²¹

My objection to this line of argument is that Temin refers to total gross private domestic investment when the concept referred to by Keynes in 1931 was fixed net investment, excluding the change in business inventories.²² Inventory investment will tend to rise at the onset of a Keynesian depression. When aggregate demand drops unexpectedly, unsold goods will pile up in an unintended inventory accumulation. This rise in inventory investment will partially offset the drop in fixed investment. Thus changes in gross investment will disguise the extent of the fall in fixed investment demand. Aggregate demand excludes unintended inventory investment. The unintended rise in inventories, however, is critical to the Keynesian transmission mechanism. Business firms, in an attempt to bring inventories back to desired levels, will cut prices to induce sales or cut production or both.

Kendrick's data can be used to separate gross private domestic investment (GPDI) into fixed investment and inventory investment (the change in business inventories), indeed Temin had to add the two series together to obtain the total he examined. According to Kendrick, 61 percent of the drop in GPDI between 1929 and 1930 was accounted for by fixed investment, as compared with only 17 percent for 1920-21. A comparison of Temin's figures for GPDI and Kendrick's for fixed investment is presented in Table 1.

²¹ Temin, pp. 62-68. The data Temin based his argument upon is in his Table 6 (p. 64); the quotations are from p. 65. Temin's source was John W. Kendrick, *Productivity Trends in the United States*, Princeton University Press, 1961, Table A-IIa, following p. 292.

²² In 1931 Keynes defined investment as “the expenditure of money on the output of new capital goods of whatever kind,” Moggridge, Volume 13, pp. 362-363. Also see Keynes discussion of inventory fluctuations in the *General Theory*, pp. 331-332, and in “Fluctuations in Net Investment in the United States,” *Economic Journal*, September 1936, reprinted as Appendix 2 of Donald Moggridge, editor, *The Collected Writings of John Maynard Keynes*, Volume 7, *The General Theory of Employment, Interest, and Money*, Macmillan St Martin's Press, 1973: 386-393.

Table 1
Changes in Real Investment in Two Collapses
Percentage Changes of Aggregates in 1929 Dollars,
1920-1921 and 1929-1930

	1920-21	1929-30
Gross Private Domestic Investment (Temin)	-41.7	-35.6
Gross Fixed Investment (Kendrick)	-10.5	-24.4

Source: Temin, Table 6, p. 64. Kendrick, Table A-IIa, following p. 292.

Temin was wrong to suggest that investment behaved in 1929-30 as it had in 1920-21. Fixed investment suffered a substantially greater fall, just as Keynes argued. In both episodes real inventory investment collapsed to negative numbers (see Table 2), the difference between the two depressions was that inventory investment was very high in 1920 (33.8 percent of GPDI) compared to 1929 (10.3 percent). The declines in inventory investment are a mixture of planned and unplanned changes. During the initial phases of a Keynesian downturn inventories are likely to increase as sales declines catch producers unaware and unsold goods pile up in unintended inventory accumulation. But after a Keynesian recession is well advanced planned inventory investment typically becomes negative as a response to revised expectations of sales. Thus Keynes, quite properly, focused on fixed rather than gross investment when discussing the precipitating cause of the Great Depression.

Table 2
Real Inventory Investment
Millions of 1929 Dollars
1919-1921 and 1928-1930

1919	2,865
1920	4,313
1921	-122
1928	-417
1929	1,674
1930	-558

Source: Kendrick, Table A-lia, following p. 292.

Even if the reader were inclined to agree with Temin that the cause of the 1929 collapse was something other than a shift of the demand for investment, there is still the fact that by 1932 the bottom had undeniably fallen out of investment demand no matter how it is measured.²³ Temin does not deny this, he explains: “The much larger declines [in total investment] of subsequent years [1931-33] were part of the Depression; they did not precipitate it in any meaningful sense of the word.”²⁴ Whether the collapse of investment is viewed as part of the depression whose cause lays elsewhere or the whole cause of the Great Depression, the collapse in spending on investment goods surely must be modeled as an inward shift of the demand for investment curve rather than a movement along a stable curve. That is all that is needed for the Keynesian argument about the liquidity trap to proceed.²⁵

²³ Kendrick's figures (which are the same after 1929 as the Department of Commerce data) would put GPD I at a mere \$965 million dollars in 1932 compared to over \$16 billion in 1929; U.S. Department of Commerce, Bureau of Economic Analysis, *The National Income and Product Accounts of the United States, 1929-76, Statistical Tables*, Government Printing Office, 1981, Table 1.1, p. 1.

²⁴ Temin, p. ?

²⁵ Barry Eichengreen has suggested to me a theoretically possible circumvention of the liquidity trap dilemma. If saving were highly interest elastic, a moderate drop in interest rates (to a point

Specification of the Demand for Investment

Granted, then, that the demand for investment began a drastic collapse sometime after the spring of 1929, one might picture the before and after demand curves for investment as I have drawn them in Figure 1. The fraction of net national product accounted for by net fixed investment (I/Y) is plotted on the horizontal axis and the relevant rate of interest (i) is plotted on the vertical.²⁶ The higher of the two curves is meant to represent the pre-Depression situation (say in early 1929) with $(I/Y)^*$ measuring the level of investment compatible with full employment and i^* indicating the level of the relevant interest rate consistent with the maintenance of full employment. The lower of the two curves represents the situation after the collapse in investment (say in early 1932). As drawn, a substantial fall in the relevant rate of interest to very low levels, from i^* to i^d , would be needed to return investment demand to the full employment level.²⁷

still above the liquidity trap floor) might choke off saving, shift consumption upward, and, via the accelerator, stimulate investment. Keynes explicitly rejected this possibility as “not likely to be important in ordinary circumstances;” *General Theory*, pp. 93-94 and 96. Virtually all empirical work on savings and consumption has born Keynes out on this point and even those economists most predisposed to the classical view now seem unwilling to place much confidence in the mechanism; Lawrence Summers and Chris Carroll, “Why Is U.S. National Saving So Low?” *Brookings Papers on Economic Activity* 2: 1987 (1987): 607-635. In the recorded discussion of this paper by the Brookings panel (pp. 636-642) none of the commentators argued that saving was interest elastic.

²⁶ Keeping with the spirit of the *General Theory*, the interest rate is measured in nominal terms. Since we are plotting the investment-output ratio we need not specify whether the quantities are measured in real or nominal terms unless we were to admit the possibility that the prices of investment goods could move differently than the prices of other goods and services. Keynes made much of this possibility – particularly in the *Treatise on Money* (1930) – and the two prices indexes do diverge substantially during the course of the depression. However, because the theoretical implications of these disparate price movements do not impinge on the issues dealt with here and a proper treatment of them would involve much additional and needless complexity, I assume both price indexes move together.

²⁷ We are taking some liberties here with the Keynesian system by treating the value of I/Y^* as invariant. In a more complete system the required volume of investment for full employment would depend upon the level of government spending, the volume of net exports, the position of the consumption function (which can be shifted by changes in the tax rate or tax structure), and the position of the liquidity preference schedule. We ignore these other factors because formally

The "relevant" interest rate for this conceptualization of the demand for investment is the nominal rate charged for borrowed money to the firms and entrepreneurs whose demands are represented by the curve. This is so because the marginal efficiency of capital curve represents the expected rate of return (after discounting for risk) on the array of potential investment projects also calculated in nominal terms. That curve slopes down because the investment projects are arranged in the order of their expected rate of return with the most promising projects at the left and the less attractive ones towards the right. The entrepreneur is assumed to borrow money to finance any projects undertaken.²⁸ Maximizing behavior assures that every project where the expected rate of return exceeds the rate of interest charged by lenders will be undertaken.

On this logic, the relevant rate of interest would be that charged on a bank loan or obtainable in the bond market for an asset with a maturity that matched the payout period of the prospective investment.²⁹ Since most investment projects have intermediate- to long-term lives, the relevant rate is a long-term rate.³⁰

introducing them would add unnecessary and unhelpful complications to our argument. The reader should note, of course, that Keynes' advocacy of fiscal policy as a cure for depressions amounts to proposing changes in government spending and taxation that would shift I/Y^* to the left.

²⁸ The case of self-finance from retained earnings has some subtle features, discussion of which will be postponed since they do not affect the general argument.

²⁹ This does not mean that every borrower will perfectly match the maturity of the assets and the liabilities. However the maturity length of the investment project is the "preferred maturity habitat" of the borrower who would require a pecuniary inducement before being tempted to leave that habitat. For a discussion of maturity habitats see Franco Modigliani and Richard Sutch, "Innovations in Interest Rate Policy," *American Economic Review* (May 1966): 178-197; and Richard Sutch, "Expectations, Risk, and the Term Structure of Interest Rates," PhD Dissertation, Economics Department, Massachusetts Institute of Technology, August 1968.

³⁰ In a more realistic model we should explicitly treat the entire complex of interest rates and introduce such real-world features as credit rationing, compensating balances, and equity markets into the model. It is a simplification consistent with the Keynesian system to reduce this complex structure of relevant rates to a single index and to speak theoretically, at least, of that index or representative rate as "the" rate of interest.

Different borrowers are charged different rates of interest reflecting the apparent risk of default by the borrower and the strength of the collateral offered. For the economy as a whole one would suppose that the credit worthiness of an average borrower was less than that of the prime borrower or the Aaa-rated corporation. For the 1920s and 1930s in the United States, it seems reasonable to use the yield on Baa-rated corporate bonds as an index of the relevant rate.³¹

I have drawn the post-collapse demand curve in Figure 1 as less elastic than the pre-collapse demand curve at i^* . This seems reasonable to me, but is not an essential part of the argument.³² What is of some importance, though, is whether the investment demand curve intersects the horizontal axis. If so, then it would be possible for the investment demand curve to fall so far that it would intersect the axis at a point to the left of I/Y^* , so that even a zero rate of interest would not restore full employment. But, some economists would argue that such a situation could not persist for any substantial period if there were any hope at all that the economy would eventually stabilize or recover. This belief is derived from the (very) neoclassical proposition that investment demand would be effectively unlimited at a zero interest rate. As Paul Samuelson has said: "As long as there is a curve or hillock in any railroad line or highway in the world there will exist an investment project with a finite rate of return."³³ It might seem, on the basis of this argument then, that monetary policy could be effectively applied provided the authorities could drive the interest rate to zero.

³¹ Empirical investigations of the demand for investment agree that the Baa rate is an appropriate proxy for the relevant rate; Robert J. Gordon and John M. Veitch, "Fixed Investment in the American Business Cycle, 1919-83," in Robert J. Gordon, editor, *The American Business Cycle: Continuity and Change*, University of Chicago Press, 1986: 267-357.

³² After a depression is underway, many firms will have excess capacity. Before they are willing to undertake new investments to expand their productive capacity, they will want to put the existing plant and equipment back to work. At this point in the cycle a reduction in the rate of interest may produce only very feeble stimulus to new investment.

³³ I remember this statement from Samuelson's lectures at MIT about 1965 and have been told it also appeared in early editions of his textbook, *Economics*. However, I was unable to find it in the incomplete search I have made and would welcome a reference if anyone could supply it.

Samuelson's argument, however, is couched in real terms whereas the Keynesian demand for investment is a nominal relationship. If the depression were accompanied by an expected deflation of prices (not unlikely in the early 1930s), then, the neoclassical flattening out of the demand for investment might still take place but at a point below the axis – at negative nominal rates of interest, but positive real rates. However, many monetarists interpret the Keynesian model as incorporating an unstated assumption that prices are constant.³⁴ Such observers would probably be unwilling to see Samuelson's argument dismissed by the evocation of expected price deflation and Keynes made no such argument himself.

In his Chicago lectures (1931), Keynes seemed to agree with the neoclassical view on this issue.³⁵ But, in Chapter 16 of the *General Theory*, “Sundry Observations on the Nature of Capital,” Keynes reconsidered the point. There he asserts that a zero real rate of interest would bring forth a strictly limited (and potentially inadequate) demand for new capital. This new argument he based on the existence of an “optimum amount of roundaboutness” in an obscure passage the logic of which I have been unable to appreciate.³⁶ But whatever his logic, immediately thereafter Keynes dismisses the relevance of the point by stating:

³⁴ For example see Friedman and Schwartz, *Monetary Trends*, pp. 41-52. This view, I think, is wrong but I shall not pursue the point here.

³⁵ “A sufficient change in the rate of interest must surely bring within the horizon all kinds of projects which are out of the question at the present rate of interest,” Keynes, in *Collected Writings*, Volume 13, p. 365.

³⁶ *General Theory*, pp. 215-217. Keynes' use of the Austrian concept of the roundaboutness of production at this point in the *General Theory* strikes me as inconsistent with the whole. The investment projects he discusses elsewhere (like housing) require an initial investment (construction cost) that yields a stream of future returns (housing services). Capital expenditures in the Austrian model (planting a tree) yield a one-time return at a harvest that is timed by the investor (lumber when the tree is cut). Switching capital models at this point in his argument prevented Keynes from considering the possibility of an investment (like road straightening) that yields an indefinitely long stream of returns whose present value is unbounded as the real interest rate approaches zero. Other commentators have also found Keynes hard to follow at this point. Alvin Hansen notes, “this section of the *General Theory* is badly written,” *A Guide to Keynes*, McGraw Hill, 1953, n.2, p. 157. Right or wrong though, there is no doubt that Keynes believed investment demand might be inadequate even at a zero rate of interest. In his “Concluding

In fact, however, institutional and psychological factors are present which set a limit much above zero to the practicable decline in the rate of interest. In particular the costs of bringing borrowers and lenders together and uncertainty as to the future of the rate of interest, which we have examined above, set a lower limit, which in present circumstances may perhaps be as high as 2 or 2 ½ per cent on long term.³⁷

This statement was made in the context of an economy with “correct foresight,” that is without lenders assuming a risk of default. The two factors referred to – cost and uncertainty – relate to the rigid term structure argument mentioned as point (3) above and to which I shall turn shortly. But if we accept this passage as definitive, I may finally be specific about the preconditions for Keynes' ineffectiveness argument to be valid: the demand for investment must collapse so far that the rate of interest necessary to induce sufficient investment to restore full employment lies below the lower limit of practicable rates.

That limit Keynes guessed was at about 2 or 2.5 percent on long-term government bonds during the Depression. The US 20-year rate fell below 2.5 percent only briefly. That was in 1935 when it bottomed out at 2.24 percent in February. It also hovered around 2.5 percent in 1939 and 1940, but never fell below 2 percent during the long course of the Depression. To make matters worse, the more relevant rate for business investment decisions, the Baa-rated corporate bond rate, rose high above the government rate. The explanation was the rising risk of default with the resulting increase in lender's risk.

Notes” Keynes says “I feel sure that the demand for capital is strictly limited in the sense that it would not be difficult to increase the stock of capital up to the point where its marginal efficiency had fallen to a very low figure;” *General Theory*, p. 375.

³⁷ *General Theory*, pp. 218-219.

Lender's Risk

As stated above, the "relevant" interest rate on the vertical axis of the demand for investment diagram would be the bank lending rate on middling loans or the bond yield on long-term Baa-rated securities.³⁸ One can think of this rate as the sum of two components: the rate of return on risk-free long-term loans and a "default premium" that would vary with the borrower's credit rating. The rate of return on long-term obligations of the U.S. government can be said, in this context, to be nominally risk free. That is because any debt can be discharged by payment with legal tender. Since the U.S. government can print its own legal tender, it never need be forced into default on its obligations.³⁹

The default premium charged over and above the Treasury yield, what Keynes called the "lender's risk," is risk associated with the character and collateral of the borrower. Keynes had this to say about risk:

Two types of risk affect the volume of investment which have not commonly been distinguished, but which it is important to distinguish. The first is the entrepreneur's or borrower's risk and arises out of doubts in his own mind as to the probability of his actually earning the prospective yield for which he hopes. If a man is venturing his own money, this is the only risk which is relevant.

³⁸ This is a nominal rate of interest because the marginal efficiency of capital is also calculated in nominal terms. It would be possible to put both into real terms provided consistent definitions for converting from nominal to real are employed. Of course, to make a formulation in real terms useful for empirical work the economic historian would have to explicitly provide or assume a specific model for the formulation of expectations about future price. This is not a straightforward exercise since the proper specification of expected price models is the subject of a considerable debate between economic theorists; Franco Modigliani and Robert J. Schiller, "Inflation, Rational Expectations and the Term Structure of Interest Rates," *Economica* (February 1973): 12-43. Note that expectations of deflation (not unlikely by mid-1930) would cause the nominal marginal efficiency of capital schedule to fall; *General Theory* p. 144. The collapse, however, would be fully offset by a fall in the nominal rate of interest because the maturity of the loan that defines the relevant rate of interest is matched exactly to the maturity of the proposed investment project.

³⁹ It is true that the holder of government bonds still bears the risk of unforeseen inflation (or less-then foreseen deflation) and the risk of default for political motives. That is why we said "nominally" risk free in the text. Since we are conducting the entire analysis in nominal terms and in any case both the borrower and lender face the same risk of unforeseen price movements our treatment here is appropriate.

But where a system of borrowing and lending exists, by which I mean the granting of loans with a margin of real or personal security, a second type of risk is relevant which we may call the lender's risk. This may be due either to moral hazard, i.e. voluntary default or other means of escape, possibly lawful, from the fulfillment of the obligation, or to the possible insufficiency of the margin of security, i.e. involuntary default due to the disappointment of expectation. ...

Now the first type of risk is, in a sense, a real social cost, though susceptible to diminution by averaging as well as by an increased accuracy of foresight. The second, however, is a pure addition to the cost of investment which would not exist if the borrower and lender were the same person. Moreover, it involves in part a duplication of a proportion of the entrepreneur's risk, which is added *twice* to the pure rate of interest to give the minimum prospective yield which will induce the investment. ...

This duplication of allowance for a portion of the risk has not hitherto been emphasized, so far as I am aware; but it may be important in certain circumstances.⁴⁰

I interpret this passage in the following way. The “pure rate of interest” is what I call the default-free rate of interest and I measure it by the yield on 20-year government bonds. The borrower's risk is associated with the project, is assessed by the entrepreneur, and is reflected in the risk-adjusted expected rate of return on a potential investment project. In terms of my Figure 1 then, an increase in borrower's risk caused by an increased uncertainty about the future would cause the investment demand curve to shift downward. This is the collapse of the marginal efficiency of investment that is at the root of a Keynesian depression.

The lender's risk is what I have called the “default risk” and might be measured, say, by the difference between the yield of Treasury bonds and the Baa-rated corporate bonds. Keynes' statement that a proportion of the lender's risk represents a duplication of the borrower's risk means he believed that whenever the marginal efficiency of capital

⁴⁰ *General Theory*, pp. 144-145.

schedule fell, the default premiums charged by lenders would rise by at least as much.⁴¹ Thus, if the monetary authorities were to hold the long-term rate of interest constant while the investment schedule depicted in Figure 1 shifted down, the relevant rate of interest (the Baa-rated Bond rate) would simultaneously rise. The volume of investment spending would fall for two reasons: first, because entrepreneurs were less optimistic about the future profitability of the prospective investments (a downward shift in the I/Y curve); and, second, because lenders would demand a higher return on any loan to an entrepreneur since they would now be less optimistic about the future and would raise their subjective evaluation of default accordingly (a movement upward to the left along the I/Y curve induced by an increase in i).

Figure 2 plots the movements in the Treasury 20-year bond yield and Moody's Baa-Rated Corporate Bond Yield for the period from 1925 through 1932. The difference between the two interest rates (called a "spread") is plotted in Figure 3. The explosion of lender's risk can be clearly seen. Despite the fact that the default-free rate was held relatively stable between 1929 and late 1931, the rate of interest relevant to typical entrepreneurs began to rise in early 1928 and rose very rapidly after September 1930.⁴² This is not surprising since bankruptcy rates rose dramatically during this period. Surely, the perceived risk in lending to a Baa-rated corporation increased as the economy plunged into depression.

Peter Temin and Ben Bernanke have both directed attention to the rise in the Baa-Treasury spread during this period. Temin saw the phenomenon as reflecting a growing risk of corporate failure. However, the primary significance he attached to the divergence of Baa yields from the Treasury bond yield was that it undermined Friedman and Schwartz's "pebble in the pond theory" of how monetary changes would influence

⁴¹ The "other" components of lenders' risk should be zero if there were no information costs.

⁴² Peter Temin has pointed out that the Baa-Treasury spread is an underestimate of the lender's risk since the quality mix of bonds included in the Baa average improved as the depression worsened. The improvement was brought about by the downgrading of bonds of previously more highly-rated corporations; Temin, *Monetary Forces*, pp.106-108.

the economy.⁴³ Bernanke uses the rise in the Baa-Treasury spread as a proxy for the increased cost of credit intermediation. This cost “includes screening, monitoring, and accounting costs, as well as the expected losses inflicted by bad borrowers.”⁴⁴ Defined in this way, the cost of intermediation would seem to include both Keynes' lender's risk and his transactions cost (elements 1 and 4 of the liquidity trap argument in the list provided above). Neither Temin nor Bernanke seem to be aware of Keynes' discussion of lender's risk or his assertion that the lender's risk in part duplicates the borrower's risk.⁴⁵

Keynes' logic suggests using the rise in the Baa-Treasury spread as a crude index of the shift in the demand for investment. Whenever the demand for investment shifts down because of an increase in borrower's risk, the Baa-Treasury spread should rise.⁴⁶ Examination of Figure 3 suggests, on these grounds, that the fall in the investment schedule began in February of 1929, eight months before the famous stock market crash in October. An early date for the decline of the investment schedule supports the traditional Keynesian view that a decline in investment was responsible the Great Depression. Critics of this view, however, will be quick to note that the magnitude of the rise in the spread was not very impressive. Moreover, the Baa-Treasury spread actually

⁴³ Temin, *Monetary Forces*, pp. 96-98, 102-106, and 169. The "pebble" theory suggests that monetary changes should cause the entire structure of interest rates to shift in the same direction; Milton Friedman and Anna J. Schwartz, "Money and Business Cycles," *Review of Economics and Statistics* 45 (February 1963): 32-78. Thus divergence of the rates is inconsistent with a monetary explanation of the Great Depression.

⁴⁴ Bernanke, p. 263.

⁴⁵ Both Keynes and Bernanke seem to have been influenced by Irving Fisher in their treatment of risk; "The Debt-Deflation Theory of Great Depressions," *Econometrica* 1 (October 1933): 337-357.

⁴⁶ Changes in the spread will not be perfectly correlated with shifts in the marginal efficiency of investment for two reasons. First, there can be changes in the transactions cost elements of the Baa yield that would be independent of changes in borrower's risk. Bernanke makes much of this possibility. A declining amount of lending would require any fixed costs of credit intermediation to be spread over fewer loans. Moreover, the costs of some forms of information gathering might rise as lenders engage in more thorough credit checks and monitoring in response to an increased risk of default. Second, the marginal efficiency of capital can fall for reasons other than increases in the borrower's risk. The most obvious and probably the most important of these would be the decline in expected future revenues associated with expectations of continuing decline in product prices, expectations of continued depression, and the existence of excess capacity.

fell slightly during the first half of 1930 suggesting that the fall in the demand for investment had temporarily been arrested. It begins rising rapidly only after the first wave of bank failures in November 1930. This supports those who would argue that the bank failures converted a recession into a depression. Indeed, examining the trend of industrial production during the early months of the Great Depression and the movements in industrial production in 1920 and 1924 during two earlier recessions (see Figure 4), it is hard to see much difference before mid-1930.

Thereafter, however, matters deteriorated greatly. June of 1931 saw another run on banks, even as Keynes was advocating the use of monetary policy in Chicago. A much larger wave of bank failures came in August, September, and October of 1931 and the default premiums measured by the Baa-Treasury spread rose to seven percent. By that point clearly the American economy was in full decline.

The first problem faced by those who would use monetary policy to off-set a decline in the demand curve for investment is that the government borrowing rate will have to be brought down at least twice as many interest points as the fall in prospective rates of return on capital projects. In other words, if entrepreneurs feel that the marginal efficiency of capital has fallen by one percentage point, the government rate will have to be reduced by two percentage points in order to prevent a decline in investment demand. Monetary policy will have to work twice as hard to stop a recession as to start one. Of course, up to a point, even when battling against a rising default premium, a sufficiently vigorous monetary policy might have checked the depression.

As a sort of counterfactual game, I have calculated what the yield of U.S. Treasury bonds would have had to be to offset the fall in the investment schedule. I begin this exercise in March of 1929 and assume that the rise in the Baa-Treasury spread provides an exact instantaneous measure of the vertical fall in the marginal efficiency of capital. The hypothetical bond yield is compared with the actual in Figure 5. In the initial phase of the Great Depression, before the first bank run, the analysis suggests that a modest fall in bond yields would do the trick. Thereafter, however, significant declines would have been required. (Just how significant, we shall see later).

If I take the month of June 1931 as an interesting date, I can say on the basis of Figure 5, first, that monetary policy had yet to be applied in sufficient force to bring down the long-term default-free rate of interest (the "pure" rate), and, second, that an effective monetary policy would have required a fall in the bond yield from the prevailing level to negative numbers. If negative nominal yields are deemed impossible (since cash yields a return of zero), then Keynes was whistling in the windy city when he advocated monetary policy during his Chicago lectures. Monetary policy, even though it had yet to be effectively pursued, was facing a depression too large for it to handle by mid-1931.

Absolute Liquidity Preference

Quite apart from the problem of lender's risk and the cost of credit intermediation, is the problem that the government may be unable to lower the pure rate of interest below some limit. Keynes gave two possible reasons for this: (1) the demand for money (defined as cash and bank accounts) might become infinitely elastic at a sufficiently low rate of interest and (2) the term structure of interest rates might prove rigid. These two mechanisms are closely related, both are explained by the public's fear of a decline in bond prices, and at places Keynes confused the two in his own presentation.

Keynes thought that liquidity preference could become absolute if a large proportion of the public became convinced that bond prices could go no higher. If the monetary authorities attempted to bid bond prices higher on the open market against such a formidable alliance of public opinion, they would find the public willing to exchange their bond holdings in unlimited quantities and retain the cash in idle balances until more favorable asset prices returned.

There is a problem with this argument. The proposition that investors will attempt to sell long-term bonds when their price is expected to fall seems sensible, but the funds they receive in exchange would be better invested in short-term government assets than

in cash.⁴⁷ Short-term bills, for example, present no risk of capital loss if they are held to maturity. A flight from long-term to short-term assets will drive the short-term rate lower, but as long as it is above zero short-term assets should dominate cash.⁴⁸ So the speculative demand for cash cannot become absolute until the rate of interest on short-term assets becomes zero. On the other hand, in the process of reaching a zero short-term rate of interest the government is unlikely to be able to lower the long-term rate by very much. The flight from long-term bonds after all would put a downward pressure on their prices. A government purchase program would have to be undertaken during such an episode just to prevent long-term rates from rising.

Whatever the theoretical merits of the absolute liquidity preference argument, Keynes did not put much stock in this part of his liquidity trap argument. He stated:

Whilst this limiting case might become practically important in the future, I know of no example of it hitherto. Indeed, owing to the unwillingness of most monetary authorities to deal boldly in debts of long term, there has not been much opportunity for a test.⁴⁹

Rigidity of the Term Structure

The second problem facing those who would rely upon monetary policy to bring the economy out of the Great Depression was the term structure problem. Monetary policy can be used to shift the term structure of interest rates down, but the forces of arbitrage within the bond markets will determine the relationship between long-term and short-term rates. Generally speaking, the shape of the term structure determined by this

⁴⁷ Modigliani, "Liquidity Preference," pp. 399-400, has made this argument.

⁴⁸ Two qualifications might be made. First, we assume that the rate of return on cash was zero, but during this period banks paid interest (though at a very low rate) on demand deposits. We should say that absolute liquidity preference could not become evident until the short-term interest rate falls below the rate on demand deposits. Second, there are costs involved with making portfolio transactions and so short-term rates may still be positive but insufficiently attractive to overcome the inertia produced by those transactions costs.

⁴⁹ Keynes, *General Theory*, p. 207.

arbitrage process is thought to be independent of orthodox monetary policy.⁵⁰ In particular, when rates are low, the short-term rate will be less than the long-term rate and this structural relationship is likely to be unaffected by open market operations at least in the short run. If so, the entire structure of rates can be brought no lower than the floor reached when the short-term rate is zero.

As Keynes related the argument, the shape of the term structure when rates were low and its rigidity in the face of continued open market operations could be explained by the fear of capital losses on holdings of long-term bonds. When interest rates fall, bond prices rise; and, of course, vice a versa. Expectations of a future rise in interest rates would be the same as an expectation of capital losses. Keynes argued that when rates were abnormally low, potential investors would likely anticipate a rise in rates sometime in the future. If the expected losses due to the anticipated increase in rates are greater than the return earned from the receipt of interest, the investor would prefer to hold cash or short-term bonds to long-term bonds.

The problem is more acute when interest rates are low and for two reasons. First, the lower the rate of interest relative to the long run normal rate of interest, the more likely will be a rise in rates in the future than a fall. Second, small changes in percentage points of interest will produce large changes in bond prices when rates are low. A rise from 2 percent to 2 ½ percent would produce a twenty percent decline in long-term bond prices. While an increase from 10 percent to 10 ½ percent generates only a 4.8 percent

⁵⁰ Policies could in principle be designed to "twist" the term structure of rates as was attempted during the early years of the Kennedy administration; Franco Modigliani and Richard Sutch, "Innovations in Interest Rate Policy," *American Economic Review* 56 (May 1966): 178-197. However, empirical work has suggested that the effectiveness of such policies may be quite limited; Franco Modigliani and Richard Sutch, "Debt Management and the Term Structure of Interest Rates: An Empirical Analysis of Recent Experience," *Journal of Political Economy* 75 (Part 2 August 1967): 569-589.

capital loss.⁵¹ Keynes suggested that the lower the rate of interest the more the public would fear a fall in bond prices:⁵²

Unless reasons are believed to exist why future experience will be very different from past experience, a long-term rate of interest of (say) 2 per cent leaves more to fear than to hope.

If the public fears to hold long-term bonds when their yields are very low because they anticipate capital losses, they will prefer to hold short-term bonds no matter how low the rate of return on short-term assets. The point may even be reached when the rate of return on default-free short-term bonds is driven to zero and still the public would prefer to hold short-term bonds to long-term bonds. Monetary authorities can continue to increase the money supply and to purchase short-term bonds from the public, but the excess liquidity would be in these circumstances held as cash rather than invested in long-term bonds or capital goods. The demand for money ("liquidity preference" was Keynes' term) would become absolute, bond prices would rise no further, and the long-term rate would fall no further. At this point the monetary authorities have lost their ability to control interest rates and influence the quantity of investment goods demanded. This is the Keynesian liquidity trap.

Figure 6 presents monthly data on the short-term rate of interest in the United States from 1925 to 1941.⁵³ The rate actually fell to five-one-hundredth of one percent in November of 1932. No further expansion of monetary policy could reduce the rates any further. The liquidity trap had been reached.

⁵¹ For simplicity, I assume an infinitely long-lived bond for these calculations.

⁵² *General Theory*, p. 202.

⁵³ Data are for 3- to 6- month Treasury notes and certificates and are taken from the Board of Governors of the Federal Reserve System, *Banking and Monetary Statistics. 1914-1941*, The Board, 1943, Table 122, p. 460.

An Addendum: Leijonhufvud and the meaning of *tête montée*

Axel Leijonhufvud, alone – I think – among commenters, states that Keynes “explicitly repudiated” the liquidity trap “notion” [Leijonhufvud 1968: 158 and 161]. Leijonhufvud refers to the following passage from the General Theory [p. 64]:

It might be, of course, that individuals were so *tête montée* in their decisions as to how much they themselves would save and invest respectively, that there would be no point of price equilibrium at which transactions could take place. In this case our terms would cease to be applicable, since output would no longer have a definite market value, prices would find no resting-place between zero and infinity. *Experience shows, however, that this, in fact, is not so*; and that there are habits of psychological response which allow of an equilibrium being reached at which the readiness to buy is equal to the readiness to sell. That there should be such a thing as a market value for output is, at the same time, a necessary condition for money-income to possess a definite value and a sufficient condition for the aggregate amount which saving individuals decide to save to be equal to the aggregate amount which investing individuals decide to invest. [Italics added as suggested by Leijonhufvud]

I find Leijonhufvud’s claim that this passage is relevant to the liquidity trap puzzling. It appears near the end of chapter 6 on the definition of income, saving and investment. Keynes has just introduced the macroeconomic identity that:

$$\text{Saving} = \text{Investment}$$

Keynes then continues:

Saving, in fact, is a mere residual. The decisions to consume and the decisions to invest between them determine incomes. Assuming that the decisions to invest become effective, they must in doing so either curtail consumption or expand income. Thus the act of investment in itself cannot help causing the residual or margin, which we call saving, to increase by a corresponding amount. [Keynes: 63]

The passage cited by Leijonhufvud follows immediately. It is intended to demonstrate that the propensity to consume and the decisions to invest would be endogenous, that is, responsive to prices. This I think is made clear in the paragraph which immediately follows the one just quoted and which also concludes the chapter [Keynes, 1936: 64-65]:

Clearness of mind on this matter is best reached, perhaps, by thinking in terms of decisions to consume (or to refrain from consuming) rather than

of decisions to save. A decision to consume or not to consume truly lies within the power of the individual; so does a decision to invest or not to invest. The amounts of aggregate income and of aggregate saving are the *results* of the free choices of individuals whether or not to consume and whether or not to invest; but they are neither of them capable of assuming an independent value resulting from a separate set of decisions taken irrespective of the decisions concerning consumption and investment. In accordance with this principle, the conception of the *propensity to consume* will, in what follows, take the place of the propensity or disposition to save.

To properly understand the paragraph cited by Leijonhufvud one needs to understand what Keynes intended when he used the French phrase *tête montée*. Taken literally this translates as “excited head.”⁵⁴ The phrase is rarely encountered in English.⁵⁵ Roget’s *International Thesaurus* defines the phrase as equivalent to “Quixotic” or “insane” [Roget 1922: numbers 503 and 825]. Fredrika Bremer, a Swedish visitor to the United States uses the phrase to indicate insanity [1853 (in translation by Mary Howitt): letter 18]. I think it is this sense that Keynes intended. Only if people were insane, he suggests, would the equilibrium defined by $S = I$ fail to be achieved. The passage has nothing to do with the interest rate’s influence on the demand for new investment or the liquidity trap which incidentally is not introduced until nine chapters later in the book.

⁵⁴ It is currently used in French to describe an overhead shower fixture and a “bobblehead doll” [for example: Betty Boop *Tête Montée Sur Un Ressort*].

⁵⁵ A Google search turns up only two examples. The most frequent hits reference a notorious novel published in 1899 entitled *The Awakening* by Kate Chopin [1851-1904]. A reader’s guide to the novel describes the phrase as a French/Creole expression for a “quick-tempered or rash person” [www.enotes.com/awakening-qn]. The sentence from the novel containing the phrase reads: “Victor was the younger son and brother—a *tete montee*, with a temper which invited violence and a will which no ax could break” [www.enotes.com/awakening-text: Chapter 8 page 2]. The second Google discovery is the very passage from the *General Theory* under discussion here.

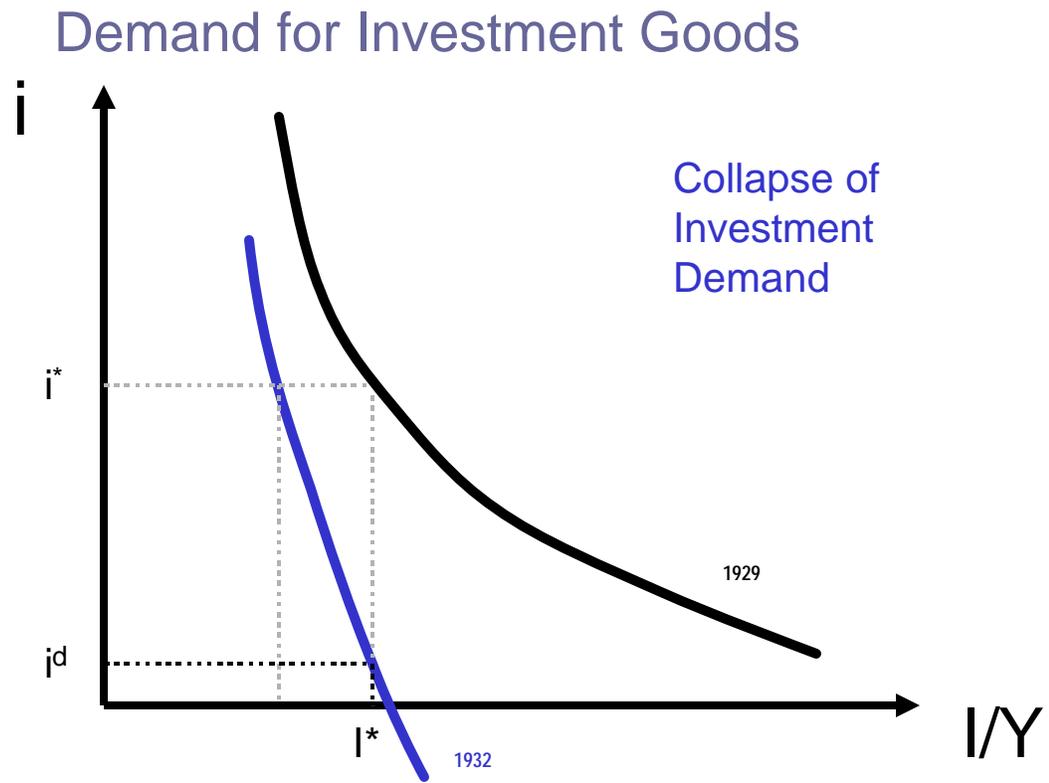


Figure 1

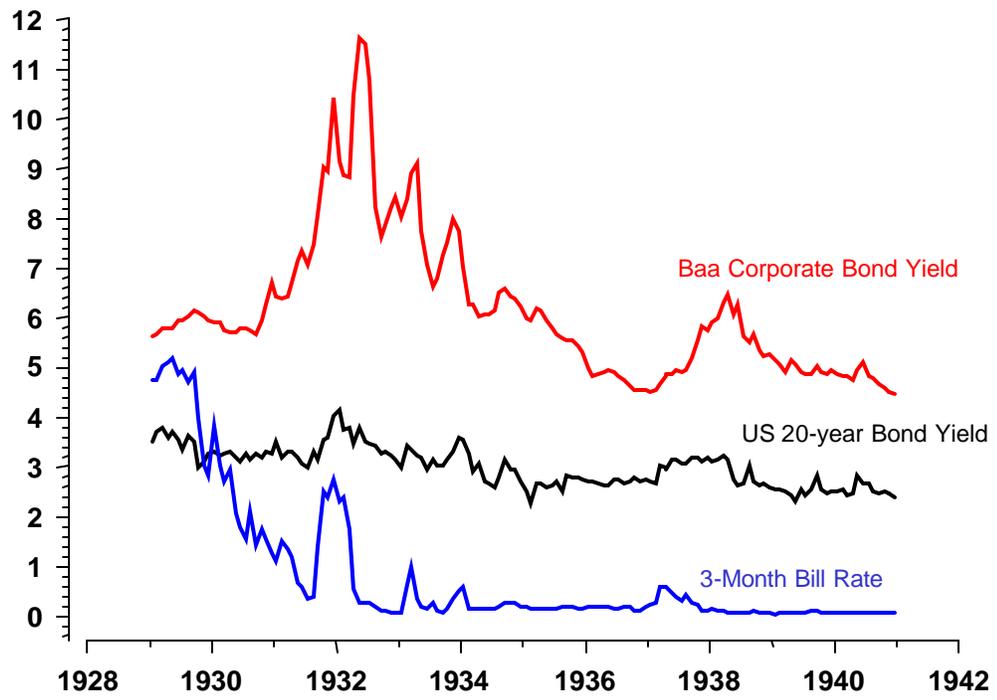


Figure 2

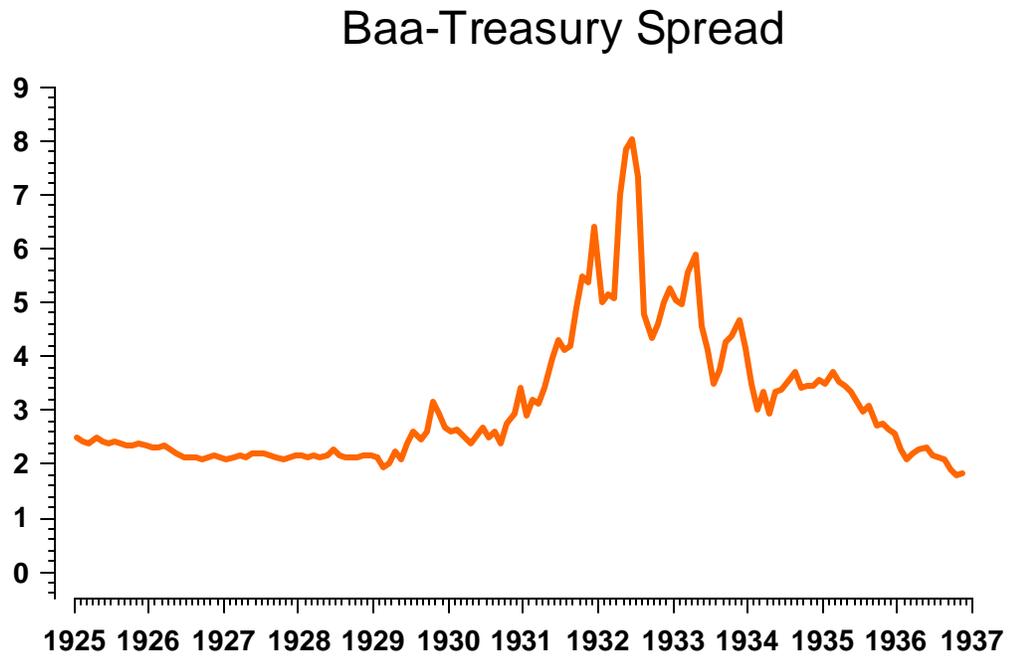


Figure 3

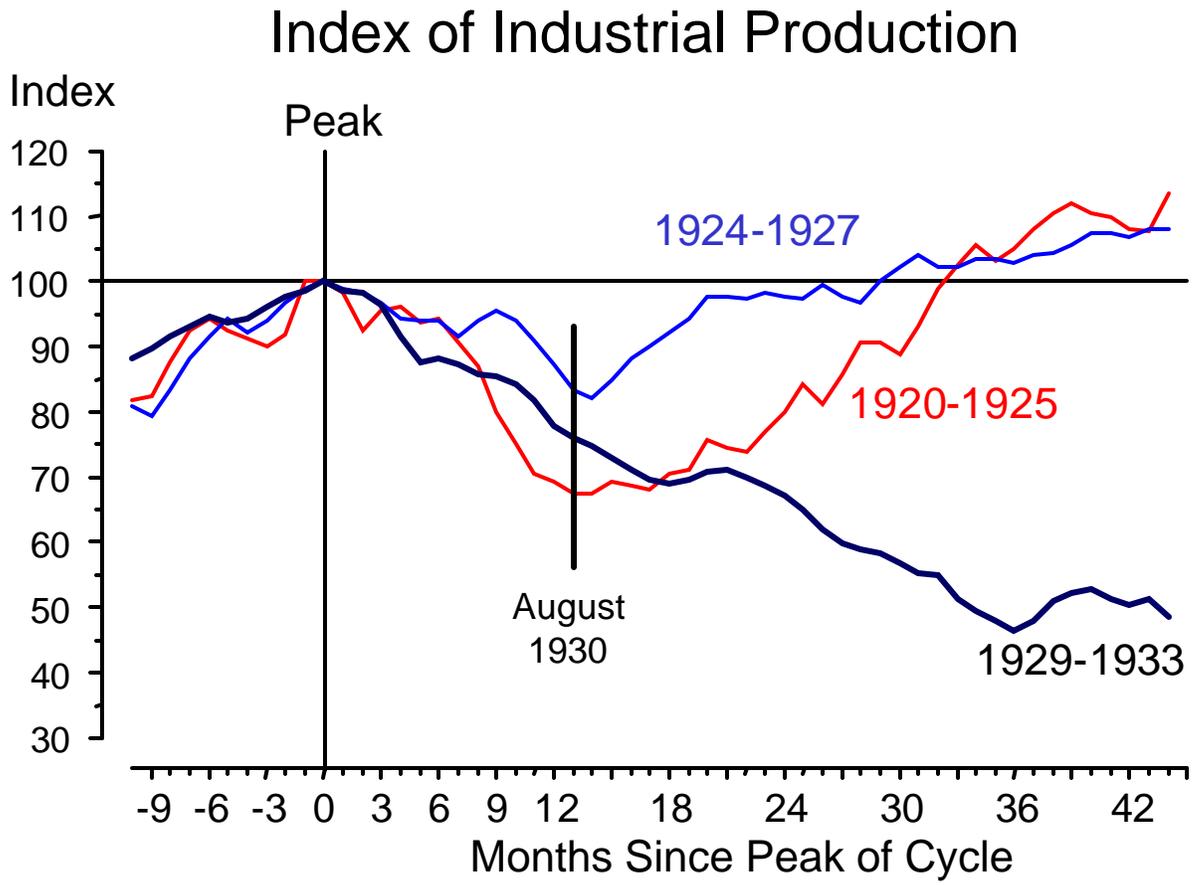


Figure 4

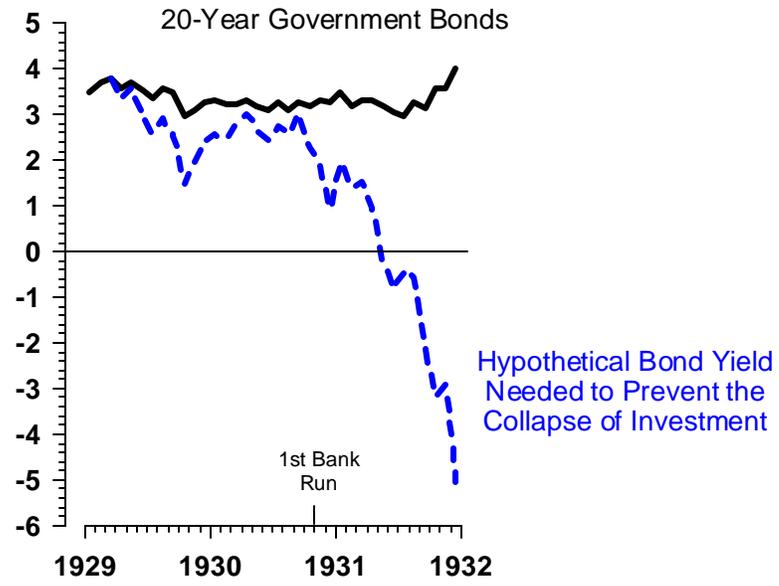


Figure 5

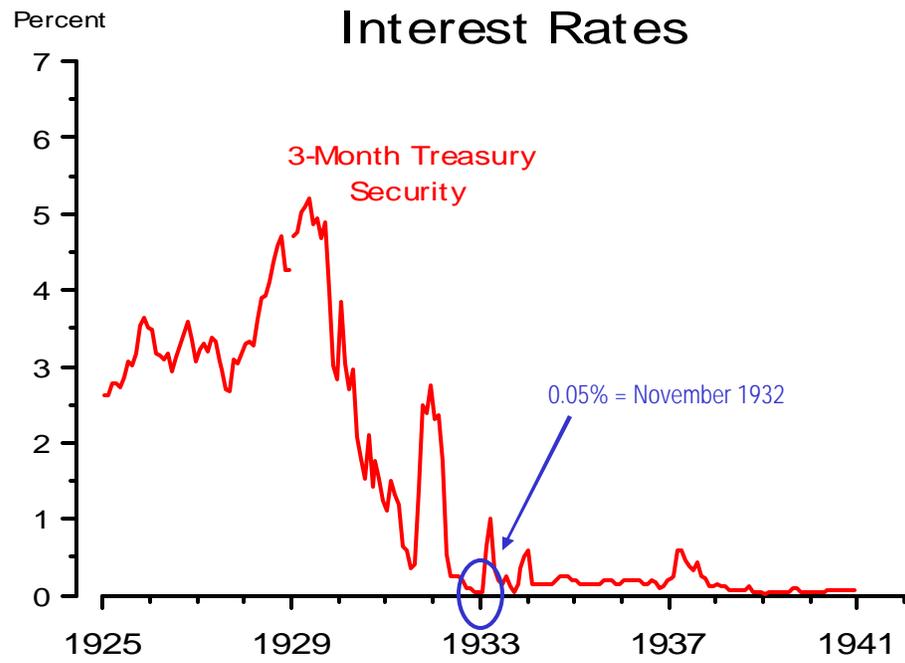


Figure 6

Data Appendix

Selected interest rates -- bond and security yields, bank loans, and the Federal Reserve discount rate: 1919-1941

Percent per annum

		Yields on securities and bonds							
		U.S. Treasury		Corporate bonds		Government securities Adjusted yields		Loan rates	
		Short-term securities	Long-term bonds	Aaa-rated	Baa-rated	Three month	20-year	Bank loans	FRB NY discount rate
Year	Month	Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8
1919	1	----	4.63	5.35	7.12	----	----	5.80	4.56
1919	2	----	4.70	5.35	7.20	----	----	5.67	4.56
1919	3	----	4.73	5.39	7.15	----	----	5.70	4.56
1919	4	----	4.72	5.44	7.23	----	----	5.75	4.56
1919	5	----	4.67	5.39	7.09	----	----	5.65	4.56
1919	6	----	4.69	5.40	7.04	----	----	5.67	4.56
1919	7	----	4.72	5.44	7.06	----	----	5.73	4.56
1919	8	----	4.78	5.56	7.13	----	----	5.72	4.56
1919	9	----	4.73	5.60	7.27	----	----	5.72	4.56
1919	10	----	4.71	5.54	7.34	----	----	5.77	4.56
1919	11	----	4.81	5.66	7.54	----	----	5.75	4.74
1919	12	----	4.90	5.73	7.77	----	----	5.84	4.75
1920	1	4.500	4.93	5.75	7.78	----	----	6.02	5.11
1920	2	4.500	5.05	5.86	7.94	----	----	6.13	6.00
1920	3	4.750	5.09	5.92	7.97	----	----	6.24	6.00
1920	4	5.250	5.28	6.04	8.17	----	----	6.43	6.00
1920	5	5.500	5.58	6.25	8.39	----	----	6.47	6.00
1920	6	5.750	5.54	6.38	8.39	----	----	6.63	7.00
1920	7	5.810	5.57	6.34	8.52	----	----	6.81	7.00
1920	8	5.830	5.67	6.30	8.39	----	----	6.79	7.00
1920	9	5.810	5.43	6.22	8.14	----	----	6.87	7.00
1920	10	5.750	5.08	6.05	7.99	----	----	6.87	7.00
1920	11	5.750	5.21	6.08	8.21	----	----	6.93	7.00
1920	12	5.880	5.40	6.26	8.56	----	----	6.79	7.00
1921	1	5.670	5.23	6.14	8.50	----	----	6.93	7.00
1921	2	5.300	5.28	6.08	8.42	----	----	6.94	7.00
1921	3	5.380	5.27	6.08	8.55	----	----	6.91	7.00
1921	4	5.200	5.24	6.06	8.53	----	----	6.90	7.00
1921	5	5.160	5.25	6.11	8.52	----	----	6.89	6.56

1921	6	4.990	5.27	6.18	8.56	----	----	6.81	6.25
1921	7	4.600	5.26	6.12	8.48	----	----	6.72	5.82
1921	8	4.750	5.22	5.99	8.51	----	----	6.60	5.50
1921	9	4.750	5.12	5.93	8.34	----	----	6.55	5.35
1921	10	4.210	4.83	5.84	8.34	----	----	6.47	5.00
1921	11	4.030	4.64	5.60	7.88	----	----	6.32	4.53
1921	12	3.900	4.47	5.50	7.61	----	----	6.16	4.50
1922	1	3.900	4.45	5.34	7.70	----	----	6.02	4.50
1922	2	3.810	4.50	5.29	7.55	----	----	5.91	4.50
1922	3	3.550	4.41	5.23	7.45	----	----	5.82	4.50
1922	4	3.210	4.28	5.15	7.14	----	----	5.67	4.50
1922	5	3.250	4.26	5.13	6.89	----	----	5.53	4.50
1922	6	3.250	4.24	5.08	6.97	----	----	5.46	4.35
1922	7	3.200	4.14	5.00	6.89	----	----	5.46	4.00
1922	8	3.130	4.12	4.96	6.85	----	----	5.27	4.00
1922	9	3.340	4.19	4.93	6.75	----	----	5.21	4.00
1922	10	3.710	4.30	4.97	6.78	----	----	5.24	4.00
1922	11	3.660	4.33	5.09	6.98	----	----	5.35	4.00
1922	12	3.650	4.32	5.08	7.02	----	----	5.38	4.00
1923	1	3.660	4.32	5.04	6.98	----	----	5.32	4.00
1923	2	3.650	4.33	5.07	6.97	----	----	5.37	4.11
1923	3	4.120	4.38	5.18	7.09	----	----	5.43	4.50
1923	4	4.130	4.39	5.22	7.17	----	----	5.56	4.50
1923	5	3.950	4.37	5.16	7.17	----	----	5.56	4.50
1923	6	3.840	4.34	5.15	7.21	----	----	5.50	4.50
1923	7	3.910	4.34	5.14	7.34	----	----	5.55	4.50
1923	8	3.860	4.35	5.08	7.38	----	----	5.58	4.50
1923	9	4.010	4.36	5.12	7.38	----	----	5.61	4.50
1923	10	4.220	4.40	5.11	7.46	----	----	5.61	4.50
1923	11	3.940	4.37	5.09	7.40	----	----	5.60	4.50
1923	12	3.880	4.35	5.09	7.38	----	----	5.53	4.50
1924	1	3.760	4.30	5.09	7.24	----	----	5.56	4.50
1924	2	3.540	4.28	5.09	7.14	----	----	5.42	4.50
1924	3	3.570	4.28	5.10	7.08	----	----	5.41	4.50
1924	4	3.380	4.23	5.08	7.03	----	----	5.36	4.50
1924	5	2.290	4.15	5.04	6.97	----	----	5.29	4.00
1924	6	2.440	3.98	4.99	6.82	----	----	5.12	3.68
1924	7	1.920	3.94	4.95	6.67	----	----	4.95	3.50
1924	8	1.900	3.91	4.95	6.69	----	----	4.78	3.11
1924	9	2.140	3.92	4.95	6.73	----	----	4.84	3.00
1924	10	2.410	3.87	4.92	6.62	----	----	4.88	3.00
1924	11	2.580	3.90	4.94	6.54	----	----	4.78	3.00
1924	12	2.570	3.96	4.95	6.46	----	----	4.86	3.00
1925	1	2.610	3.96	4.95	6.44	----	----	4.80	3.00
1925	2	2.620	3.95	4.95	6.36	----	----	4.88	3.04
1925	3	2.780	3.96	4.91	6.36	----	----	4.97	3.50

1925	4	2.780	3.93	4.87	6.41	----	----	4.97	3.50
1925	5	2.730	3.87	4.83	6.30	----	----	4.93	3.50
1925	6	2.860	3.79	4.83	6.18	----	----	4.93	3.50
1925	7	3.060	3.79	4.87	6.20	----	----	4.95	3.50
1925	8	3.010	3.85	4.90	6.24	----	----	4.95	3.50
1925	9	3.170	3.85	4.87	6.20	----	----	5.03	3.50
1925	10	3.530	3.82	4.85	6.17	----	----	5.08	3.50
1925	11	3.650	3.79	4.84	6.17	----	----	5.10	3.50
1925	12	3.510	3.80	4.85	6.15	----	----	5.13	3.50
1926	1	3.490	3.77	4.82	6.09	----	----	5.09	3.89
1926	2	3.180	3.71	4.77	6.02	----	----	5.12	4.00
1926	3	3.140	3.71	4.79	6.05	----	----	5.10	4.00
1926	4	3.080	3.70	4.74	5.98	----	----	5.12	3.87
1926	5	3.170	3.67	4.71	5.86	----	----	5.08	3.50
1926	6	2.930	3.67	4.72	5.80	----	----	4.96	3.50
1926	7	3.110	3.68	4.71	5.79	----	----	4.91	3.50
1926	8	3.270	3.70	4.72	5.81	----	----	4.99	3.81
1926	9	3.420	3.70	4.72	5.79	----	----	5.13	4.00
1926	10	3.580	3.68	4.71	5.81	----	----	5.19	4.00
1926	11	3.350	3.62	4.68	5.77	----	----	5.14	4.00
1926	12	3.070	3.56	4.68	5.68	----	----	5.16	4.00
1927	1	3.230	3.51	4.66	5.61	----	----	5.08	4.00
1927	2	3.290	3.48	4.67	5.59	----	----	5.04	4.00
1927	3	3.200	3.37	4.62	5.54	----	----	4.99	4.00
1927	4	3.390	3.35	4.58	5.48	----	----	5.00	4.00
1927	5	3.330	3.31	4.57	5.50	----	----	5.02	4.00
1927	6	3.070	3.34	4.58	5.55	----	----	4.99	4.00
1927	7	2.960	3.36	4.60	5.55	----	----	4.96	4.00
1927	8	2.700	3.32	4.56	5.48	----	----	4.90	3.56
1927	9	2.680	3.30	4.54	5.42	----	----	4.89	3.50
1927	10	3.080	3.29	4.51	5.38	----	----	4.90	3.50
1927	11	3.040	3.23	4.49	5.35	----	----	4.87	3.50
1927	12	3.170	3.17	4.46	5.32	----	----	4.91	3.50
1928	1	3.310	3.18	4.46	5.35	----	----	4.89	3.50
1928	2	3.330	3.19	4.46	5.33	----	----	4.87	3.97
1928	3	3.270	3.17	4.46	5.32	----	----	4.94	4.00
1928	4	3.620	3.20	4.46	5.33	----	----	5.02	4.00
1928	5	3.900	3.24	4.49	5.42	----	----	5.16	4.23
1928	6	3.920	3.29	4.57	5.55	----	----	5.35	4.50
1928	7	4.120	3.42	4.61	5.58	----	----	5.56	4.81
1928	8	4.360	3.48	4.64	5.61	----	----	5.64	5.00
1928	9	4.570	3.46	4.61	5.59	----	----	5.75	5.00
1928	10	4.700	3.47	4.61	5.58	----	----	5.76	5.00
1928	11	4.260	3.38	4.58	5.55	----	----	5.75	5.00
1928	12	4.260	3.45	4.61	5.60	----	----	5.82	5.00
1929	1	4.660	3.52	4.62	5.63	4.72	3.51	5.84	5.00

1929	2	4.390	3.62	4.66	5.66	4.75	3.70	5.84	5.00
1929	3	4.600	3.74	4.70	5.79	5.03	3.79	5.91	5.00
1929	4	4.800	3.64	4.69	5.80	5.09	3.58	5.97	5.00
1929	5	5.090	3.64	4.70	5.80	5.19	3.71	6.02	5.00
1929	6	4.800	3.69	4.77	5.94	4.86	3.54	6.03	5.00
1929	7	4.550	3.64	4.77	5.95	4.94	3.35	6.04	5.00
1929	8	4.700	3.71	4.79	6.04	4.69	3.60	6.12	5.74
1929	9	4.580	3.70	4.80	6.12	4.89	3.50	6.19	6.00
1929	10	4.370	3.61	4.77	6.11	4.00	2.96	6.21	6.00
1929	11	3.470	3.35	4.76	6.03	3.01	3.10	6.08	4.73
1929	12	3.030	3.36	4.67	5.95	2.82	3.26	5.94	4.50
1930	1	3.390	3.43	4.66	5.92	3.84	3.31	5.87	4.50
1930	2	3.360	3.41	4.69	5.89	3.04	3.23	5.66	4.11
1930	3	2.950	3.29	4.62	5.73	2.71	3.24	5.53	3.71
1930	4	3.000	3.37	4.60	5.70	2.96	3.31	5.30	3.50
1930	5	2.410	3.31	4.60	5.72	2.07	3.17	5.17	3.02
1930	6	1.890	3.25	4.57	5.78	1.78	3.11	5.08	2.82
1930	7	1.830	3.25	4.52	5.77	1.54	3.26	4.93	2.50
1930	8	1.530	3.26	4.47	5.73	2.09	3.12	4.88	2.50
1930	9	1.770	3.24	4.42	5.65	1.42	3.28	4.81	2.50
1930	10	1.740	3.21	4.42	5.94	1.76	3.19	4.81	2.50
1930	11	1.400	3.19	4.47	6.25	1.53	3.30	4.73	2.50
1930	12	1.480	3.22	4.52	6.71	1.25	3.28	4.72	2.37
1931	1	1.240	3.20	4.42	6.41	1.10	3.50	4.73	2.00
1931	2	1.060	3.30	4.43	6.38	1.50	3.19	4.74	2.00
1931	3	1.380	3.27	4.39	6.44	1.33	3.31	4.70	2.00
1931	4	1.490	3.26	4.40	6.72	1.20	3.30	4.66	2.00
1931	5	0.880	3.16	4.37	7.15	0.65	3.17	4.60	1.61
1931	6	0.550	3.13	4.36	7.36	0.60	3.06	4.61	1.50
1931	7	0.410	3.15	4.36	7.08	0.35	2.98	4.56	1.50
1931	8	0.420	3.18	4.40	7.47	0.40	3.29	4.53	1.50
1931	9	0.450	3.25	4.55	8.07	1.37	3.16	4.53	1.50
1931	10	1.700	3.63	4.99	9.04	2.50	3.56	4.72	2.76
1931	11	1.770	3.63	4.94	8.93	2.40	3.57	4.99	3.50
1931	12	2.410	3.93	5.32	10.42	2.75	4.01	5.00	3.50
1932	1	2.480	4.26	5.20	9.13	2.30	4.14	5.10	3.50
1932	2	2.420	4.11	5.23	8.87	2.37	3.73	5.13	3.43
1932	3	2.250	3.92	4.98	8.83	1.75	3.77	5.14	3.00
1932	4	1.110	3.68	5.17	10.46	0.55	3.46	5.11	3.00
1932	5	0.310	3.76	5.36	11.63	0.25	3.78	5.08	3.00
1932	6	0.340	3.76	5.41	11.52	0.25	3.49	5.09	2.88
1932	7	0.220	3.58	5.26	10.79	0.25	3.46	5.00	2.50
1932	8	0.140	3.45	4.91	8.22	0.20	3.42	5.05	2.50
1932	9	0.030	3.42	4.70	7.61	0.10	3.28	4.95	2.50
1932	10	----	\1 3.43	4.64	7.87	0.10	3.29	4.92	2.50
1932	11	----	\1 3.45	4.63	8.24	0.05	3.22	4.81	2.50

1932	12	0.040	3.35	4.59	8.42	0.05	3.15	4.86	2.50
1933	1	0.070	3.22	4.44	8.01	0.05	2.96	4.83	2.50
1933	2	0.010	3.31	4.48	8.37	0.63	3.42	4.80	2.50
1933	3	1.340	3.42	4.68	8.91	1.00	3.34	5.30	3.44
1933	4	0.450	3.42	4.78	9.12	0.35	3.22	5.00	3.10
1933	5	0.290	3.30	4.63	7.74	0.20	3.17	4.92	2.90
1933	6	0.070	3.21	4.46	7.07	0.15	2.95	4.86	2.50
1933	7	0.190	3.20	4.36	6.62	0.25	3.14	4.72	2.50
1933	8	0.010	3.21	4.30	6.77	0.12	3.01	4.68	2.50
1933	9	0.040	3.19	4.36	7.27	0.05	3.01	4.61	2.50
1933	10	0.090	3.22	4.34	7.49	0.15	3.13	4.54	2.31
1933	11	0.220	3.46	4.54	7.98	0.35	3.29	4.45	2.00
1933	12	0.290	3.53	4.50	7.75	0.50	3.58	4.45	2.00
1934	1	0.250	3.50	4.35	7.01	0.60	3.53	4.50	2.00
1934	2	0.080	3.32	4.20	6.27	0.15	3.24	4.39	1.52
1934	3	0.010	3.20	4.13	6.26	0.15	2.91	4.36	1.50
1934	4	0.179	3.11	4.07	6.01	0.15	3.07	4.37	1.50
1934	5	0.138	3.02	4.01	6.05	0.15	2.72	4.31	1.50
1934	6	0.070	2.98	3.93	6.06	0.15	2.67	4.22	1.50
1934	7	0.072	2.92	3.89	6.13	0.15	2.58	4.12	1.50
1934	8	0.198	3.03	3.93	6.49	0.20	2.78	4.11	1.50
1934	9	0.270	3.20	3.96	6.57	0.25	3.16	4.09	1.50
1934	10	0.208	3.10	3.90	6.40	0.25	2.95	4.10	1.50
1934	11	0.217	3.07	3.86	6.37	0.25	2.92	4.03	1.50
1934	12	0.143	3.01	3.81	6.23	0.20	2.68	3.98	1.50
1935	1	0.136	2.88	3.77	5.98	0.20	2.48	3.90	1.50
1935	2	0.114	2.79	3.69	5.95	0.15	2.24	3.87	1.50
1935	3	0.154	2.77	3.67	6.20	0.15	2.67	3.80	1.50
1935	4	0.169	2.74	3.66	6.13	0.15	2.66	3.75	1.50
1935	5	0.145	2.72	3.65	5.94	0.15	2.59	3.74	1.50
1935	6	0.128	2.72	3.61	5.77	0.15	2.62	3.68	1.50
1935	7	0.065	2.69	3.56	5.67	0.15	2.69	3.65	1.50
1935	8	0.101	2.76	3.60	5.58	0.20	2.48	3.65	1.50
1935	9	0.214	2.85	3.59	5.53	0.20	2.81	3.62	1.50
1935	10	0.189	2.85	3.52	5.54	0.20	2.77	3.63	1.50
1935	11	0.135	2.83	3.47	5.43	0.15	2.79	3.59	1.50
1935	12	0.089	2.83	3.44	5.30	0.15	2.74	3.56	1.50
1936	1	0.099	2.80	3.37	5.00	0.20	2.72	3.53	1.50
1936	2	0.081	2.77	3.32	4.80	0.20	2.71	3.52	1.50
1936	3	0.113	2.71	3.29	4.86	0.20	2.65	3.50	1.50
1936	4	0.099	2.68	3.29	4.91	0.20	2.62	3.42	1.50
1936	5	0.182	2.66	3.27	4.94	0.20	2.63	3.41	1.50
1936	6	0.226	2.66	3.24	4.90	0.15	2.73	3.39	1.50
1936	7	0.141	2.65	3.23	4.84	0.15	2.73	3.43	1.50
1936	8	0.182	2.61	3.21	4.74	0.20	2.66	3.34	1.50
1936	9	0.155	2.60	3.18	4.62	0.18	2.71	3.33	1.50

1936	10	0.132	2.62	3.18	4.54	0.10	2.76	3.36	1.50
1936	11	0.095	2.53	3.15	4.52	0.11	2.69	3.34	1.50
1936	12	0.209	2.51	3.10	4.53	0.20	2.74	3.31	1.50
1937	1	0.360	2.47	3.10	4.49	0.22	2.72	3.30	1.50
1937	2	0.384	2.46	3.22	4.53	0.25	2.67	3.29	1.50
1937	3	0.583	2.60	3.32	4.68	0.60	3.03	3.28	1.50
1937	4	0.696	2.80	3.42	4.84	0.60	2.96	3.32	1.50
1937	5	0.647	2.76	3.33	4.84	0.45	3.15	3.32	1.50
1937	6	0.561	2.76	3.28	4.93	0.39	3.14	3.23	1.50
1937	7	0.492	2.72	3.25	4.91	0.32	3.05	3.24	1.50
1937	8	0.519	2.72	3.24	4.92	0.42	3.08	3.25	1.42
1937	9	0.530	2.77	3.28	5.16	0.25	3.17	3.25	1.00
1937	10	0.343	2.76	3.27	5.52	0.23	3.19	3.26	1.00
1937	11	0.145	2.71	3.24	5.82	0.12	3.12	3.31	1.00
1937	12	0.104	2.67	3.21	5.73	0.12	3.17	3.26	1.00
1938	1	0.099	2.65	3.17	5.89	0.14	3.12	3.25	1.00
1938	2	0.084	2.64	3.20	5.97	0.12	3.16	3.20	1.00
1938	3	0.074	2.64	3.22	6.30	0.12	3.24	3.22	1.00
1938	4	0.083	2.62	3.30	6.47	0.08	3.14	3.20	1.00
1938	5	0.027	2.51	3.22	6.06	0.08	2.75	3.22	1.00
1938	6	0.023	2.52	3.26	6.25	0.08	2.63	3.25	1.00
1938	7	0.053	2.52	3.22	5.63	0.08	2.68	3.18	1.00
1938	8	0.047	2.51	3.18	5.49	0.08	3.03	3.13	1.00
1938	9	0.096	2.58	3.21	5.65	0.12	2.71	3.17	1.00
1938	10	0.023	2.48	3.15	5.36	0.05	2.64	3.20	1.00
1938	11	0.024	2.50	3.10	5.23	0.05	2.68	3.18	1.00
1938	12	0.007	2.49	3.08	5.27	0.05	2.59	3.25	1.00
1939	1	0.002	2.47	3.01	5.12	0.01	2.56	3.23	1.00
1939	2	0.004	2.44	3.00	5.05	0.05	2.55	3.18	1.00
1939	3	0.005	2.34	2.99	4.89	0.05	2.50	----	1.00
1939	4	0.019	2.30	3.02	5.15	0.05	2.44	----	1.00
1939	5	0.006	2.17	2.97	5.07	0.05	2.32	----	1.00
1939	6	0.006	2.13	2.92	4.91	0.05	2.54	----	1.00
1939	7	0.017	2.16	2.89	4.84	0.05	2.44	----	1.00
1939	8	0.058	2.21	2.93	4.85	0.10	2.55	----	1.00
1939	9	0.101	2.65	3.25	5.00	0.10	2.81	----	1.00
1939	10	0.028	2.60	3.15	4.88	0.05	2.56	----	1.00
1939	11	0.018	2.46	3.00	4.85	0.05	2.45	----	1.00
1939	12	0.010	2.35	2.94	4.92	0.05	2.49	----	1.00
1940	1	----	\1 2.30	2.88	4.86	0.05	2.51	----	1.00
1940	2	0.004	2.32	2.86	4.83	0.05	2.54	----	1.00
1940	3	----	\1 2.25	2.84	4.80	0.05	2.43	----	1.00
1940	4	0.003	2.25	2.82	4.74	0.05	2.45	----	1.00
1940	5	0.042	2.38	2.93	4.94	0.08	2.82	----	1.00
1940	6	0.071	2.39	2.96	5.11	0.08	2.68	----	1.00
1940	7	0.009	2.28	2.88	4.80	0.06	2.65	----	1.00

1940	8	0.019	2.25	2.85	4.76	0.06	2.49	----	1.00
1940	9	0.021	2.18	2.82	4.66	0.06	2.46	----	1.00
1940	10	----	\1 2.10	2.79	4.56	0.06	2.49	----	1.00
1940	11	0.003	1.97	2.75	4.48	0.06	2.46	----	1.00
1940	12	----	\1 1.89	2.71	4.45	0.06	2.39	----	1.00
1941	1	----	1.99	2.75	4.38	----	----	----	1.00
1941	2	----	2.10	2.78	4.42	----	----	----	1.00
1941	3	----	2.01	2.80	4.38	----	----	----	1.00
1941	4	----	1.96	2.82	4.33	----	----	----	1.00
1941	5	----	1.92	2.81	4.32	----	----	----	1.00
1941	6	----	1.91	2.77	4.31	----	----	----	1.00
1941	7	----	1.90	2.74	4.28	----	----	----	1.00
1941	8	----	1.94	2.74	4.27	----	----	----	1.00
1941	9	----	1.94	2.75	4.30	----	----	----	1.00
1941	10	----	1.88	2.73	4.28	----	----	----	1.00
1941	11	----	1.85	2.72	4.28	----	----	----	1.00
1941	12	----	1.96	2.80	4.38	----	----	----	1.00

SOURCES

Column 1 to Column 4. U.S. Federal Reserve System, Board of Governors, *Banking and Monetary Statistics: 1914-1941* (September 1943), table 122 (Column 1) and table 128 (Column 2 to Column 4), except Column 1, 1934:1 to 1934:3, which were provided by the Federal Reserve Board to the National Bureau of Economic Research, *Macrohistory Data Base*, Daniel Feenberg, Jeffrey Miron, Hanna Stern, and Esther D. Reichner.

Column 5 and Column 6. Stephen G. Cecchetti, "The Case of the Negative Nominal Interest Rates: New Estimates of the Term Structure of Interest Rates during the Great Depression," *Journal of Political Economy* (December 1988), Table A1.

Column 7. 1919-1929, *Banking and Monetary Statistics: 1914-1941* (September 1943), Table 124; 1930-1939, provided by the Federal Reserve Board to the National Bureau of Economic Research, *Macrohistory Data Base*.

Column 8. NBER *Macrohistory Data Base*. According to the NBER the original sources were the Federal Reserve Board, "Discount Rates of Federal Reserve Banks, 1914-1921," (1922) and *Annual Reports* for 1931-1942.

FOOTNOTE

\1 Negative.

DETAILED DESCRIPTION

Column 1. During the Great Depression the business environment became increasingly pessimistic. The demand for loans fell and banks were often unwilling to take risks by lending to customers with uncertain prospects. As a consequence the supply of short-term open-market paper (commercial notes, bankers' acceptances, and brokers' call loans) declined sharply and banks increasingly invested in securities issued by the U.S. government. For the period 1920:1 to 1934:3, Column 1 represents the average daily yields per annum on 3- to 6-month Treasury notes and certificates, except that for 1920:1 to 1921:12, the figures represent daily yield for the week nearest the 15th of each month. The series was discontinued in 1934 because the yields were continuously negative. Yields were also negative for October and November of 1932. The negative observations were reported in the original source merely as "negative." Beginning with 1934:4 the series is continued with the new issue rate on Treasury Bills. Bills are sold on a discount basis rather than with a fixed coupon. They were first introduced in 1929, but initially offerings of bills were irregular. A continuous series is available in the source beginning in 1931. Interest on Treasury bills was tax exempt before 1941. Because of the change in tax status, the series here is carried only to the end of 1940. On the negative interest rates see Cecchetti (1988).

Column 2. The U.S. bond yield represents for the period from January 1919 to mid-October 1925 an unweighed average of daily figures for bonds exceeding 8 years in maturity. After October 14 only bonds of 12 years or more to maturity were included. Before July 1928 the two series were identical. If a callable issue is selling above par, the maturity of the bond is taken to be the call date. For further detail see the *Federal Reserve Bulletin* for December 1938.

Column 3 and Column 4. Two series are provided for the yields on corporate bonds. Column 3 is for high-grade bonds, rated Aaa by Moody's Investor Service. Column 4 is for higher risk bonds, rated Baa by Moody's. Because of the risk of default, purchasers of corporate bonds were promised a substantially higher yield than purchasers of U.S. bonds. The gap between the corporate bond yields and those of U.S. bonds is a measure of the implied risk of default.

Column 5 and Column 6. Cecchetti points out that the yields on government securities presented in Column 1 and Column 2 are distorted, particularly at short maturities, because holders had the right to purchase newly-issued security at par at a future date. During most of the 1920s new issues were given coupon rates that caused them to sell above par. Thus the prices of existing issues were higher than they would have otherwise been, thus depressing the calculated yields. Cecchetti makes an adjustment for the "exchange privilege premium" and then uses a curve fitting technique to estimate the adjusted term structure of interest rates. These series present Cecchetti's estimates of the yield at 3-months to maturity (bond yield equivalent) and at 20 years to maturity.

Column 7 The interest rates charged by banks on loans made to their customers are based on quotations from 22 cities through 1924, for 34 cities for 1925-1928, and for 36 cities

thereafter. The series was discontinued in 1939. The rates charged in these large cities are thought to be considerably lower than the average charged in smaller cities or by rural banks.

Column 8. A major innovation of the Federal Reserve Act was to provide a mechanism by which member banks could borrow reserves from the System by using short-term commercial and agricultural paper as collateral. The Federal Reserve discount rate is the rate charged member banks by the Federal Reserve for loans backed by discountable paper. The figures presented were calculated by the National Bureau of Economic Research by taking a simple average of the discount rates for commercial, agricultural, and livestock paper and weighting them by the number of days in each month that the each rate was in force. See *Banking and Monetary Statistics: 1914-1941* (pp. 422-424) for more detail.

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