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CAPITALIZING PATRIOTISM:
THE LIBERTY LOANS OF WORLD WAR I

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ABSTRACT

In World War I the Secretary of the Treasury, William Gibbs McAdoo, hoped to create a broad market for government bonds, the famous Liberty Loans, by following an aggressive policy of "capitalizing patriotism." He called on everyone from Wall Street bankers to the Boy Scouts to volunteer for the campaigns to sell the bonds. He helped recruit the nation's best known artists to draw posters depicting the contribution to the war effort to be made by buying bonds, and he organized giant bond rallies featuring Hollywood stars such as Douglas Fairbanks, Mary Pickford, and Charlie Chaplin. These efforts, however, enjoyed little success. The yields on the Liberty bonds were kept low mainly by making the bonds tax exempt and by making sure that a large proportion of them was purchased directly or indirectly by the Federal Reserve. Patriotism proved to be a weak offset to normal market forces.

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1. The Liberty Bonds¹

When World War I began the Secretary of the Treasury, William Gibbs McAdoo, turned initially to the record of Lincoln's Secretary of the Treasury, Samuel Chase, for lessons on how to finance a major war.² In the end, however, McAdoo rejected Chase's methods. To start with, McAdoo believed that Chase had made a major error in turning over the marketing of the government's securities to a private firm, Jay Cooke and Company. McAdoo would make no such mistake. He expected bankers, insurance executives, and ordinary citizens to donate their services to the government. Moreover, while he acknowledged that Jay Cooke and Company had succeeded to some degree in marketing bonds to middle class Americans, McAdoo thought that he could push Cooke's policy much further. Britain and Germany had already undertaken noisy "drives" aimed at selling bonds, especially to middle class and working class investors, Noyes (1926, 181-2). And McAdoo enthusiastically adopted the same strategy.

McAdoo crisscrossed the country on an exhausting speaking tour urging the public to express its support for the war by buying bonds, and he arranged rallies at

¹ We must thank our colleagues, Michael Bordo and Eugene White, and Kim Oosterlinck, who was visiting Rutgers while we were working on this paper, for numerous helpful discussions of war finance. We must also thank the participants in a session at the American Economic Association meetings in the of Fall 2004, and in particular our discussant Paul Rhode and the chair of the session Gavin Wright, for their comments. Martha Olney patiently explained the 1917-1919 survey of family saving to us. Subsequent seminars at New York University at a seminar organized by Richard Sylla, and at Pompeu Fabra University at a seminar organized by Hans-Joachim Voth and Allan Taylor, were also very helpful.

² David M. Kennedy (2004, 100) suggests that McAdoo turned to Chase's experience, rather than to that of our European allies and enemies, because of "an almost instinctual sense of the uniqueness of American society." But this only accounts for the direction in which McAdoo's thoughts initially ran.

which movie stars such as Douglas Fairbanks, Mary Pickford, and Charlie Chaplin exhorted the crowd to buy bonds. (Kennedy 1980, 105). In the closing week of the campaign for the Fourth Liberty loan \$4,800,000 was raised from an audience at Carnegie Hall who heard Enzo Caruso and other stars perform (Noyes 1926, 185). But it wasn't just stars. Everyone who could, was asked to sell bonds. The Boy Scouts were enlisted under the slogan "Every Scout to Save a Soldier." Even the names of the bonds reflected the emphasis on patriotism. While one of the most popular Civil War issues was known prosaically as the 5-20 (callable after 5 years, redeemed at 20), the World War I debt consisted of four "Liberty loans," and a final issue of "Victory loans" after the armistice.

The campaign attempted to create strong social pressures to buy bonds. When, for example, the Comptroller of the Currency learned that a national bank charter had been granted to six applicants from a "certain western state" who had between them bought only \$200 worth of Liberty bonds, the charter was revoked. (Whittlesey 1950, 175).

Much of the campaign to sell the Liberty Bonds was developed by the government's Committee on Public Information created on April 13, 1917. Its Division of Pictorial Publicity, created on April 22, produced many of the famous Liberty Bond Posters. The Division was headed by Charles Dana Gibson, who's "Gibson's Girls" had become an American icon. Gibson explicitly rejected an appeal to the material side of American life and believed that "war art 'must appeal to the heart,'" Vaughn (1980, 150).

As the war wore on the emphasis shifted toward greater reliance on emotional appeals. The campaign to sell the Fourth Liberty loan, although making some appeals to financial self-interest, explicitly emphasized the bestiality of the Germans. It is not

always clear which posters were put out by official government agencies. But one poster issued by the Division of Advertising of the Committee for Public Information for the Fourth loan showed German soldiers abusing women and children in Belgium and argued that “Such a civilization is not fit to live,” Vaughn (1980, 165) Another official poster for the Fourth loan, “Remember Belgium,” showed a German soldier bayoneting an obviously defenceless woman. The caption explained that “You can floor an Uhlan [lancer] with lead, but only gold can floor Berlin” and that “You can overwhelm the mad Wolf of Wilhelmstrasse with the crushing wrath of billions,” Vaughn (1980, 166).

Four examples of the famous Liberty loan posters are reproduced below. The first three rely on emotional appeals. The third in particular may be the sort of thing that Warren Harding, then a Senator from Ohio, had in mind when he complained that the campaign for the First Liberty loan was “hysterical and unseemly.”³ The fourth poster, on the other hand, shows an appeal to self interest.

We are unlikely to witness anything like the Liberty Bonds again. True, there was a brief flurry of interest in issuing war bonds after the 9/11 attacks. Both houses of Congress passed legislation that would have created “Freedom Bonds.” The administration, however, although sympathetic with sentiment behind the legislation, was opposed to issuing freedom bonds because the United States was in a recession. Encouraging saving, the administration believed, would be counterproductive. The Treasury did inscribe a variation of its standard EE Savings Bonds as “Patriot Bonds.”⁴ But interest in Freedom bonds or Patriot bonds faded quickly.

³ *New York Times*, June 19, 1917, p. 3.

⁴ See *The New York Times*, October 26, 2001, p. C7, and December 2, 2001, p. BU6.

The broader question, however, of whether social pressures can be used to supplement financial incentives is a hardy perennial. It is therefore worth knowing how effective the campaigns really were. What price, to put it differently, were investors willing to pay to help make the world safe for democracy?

Historians have generally viewed the campaigns as successful. Indeed, the apparent success of irrational emotional appeals during the war convinced many observers, such as the influential columnist Walter Lippman, of the basic irrationality of the public, Vaughn (1980, 191). Historians also see the effort to sell bonds to the middle and working classes as a uniquely successful effort that, unfortunately, helped prepare the way for the stock market boom and crash of the 1920s by teaching people how to invest in stocks and bonds.

In short, the campaign to sell the Liberty bonds provides a unique natural experiment in which to examine the powers and the limits of non-pecuniary social pressures.

2. Taxes, Bonds, or Greenbacks?

To put the Liberty bonds and the campaigns to sell them into perspective, and explain why they came to have a leading role in the financing of the war, it is useful to briefly recount the contemporary debate over how to finance the war. It would take us too far afield to go over all the arguments made within the Administration, within Congress, and in the press that influenced the choices finally made. However, we can get a good idea of how contemporaries viewed the issues if we look at the debate among the leading economists over the best method of financing the war.

There are economists knew, three ways to finance a war – taxes, borrowing, and printing money. There was general agreement that printing money was wrong because it would produce inflation.⁵ The Civil War, and the experience in other wartime economies, had revealed the danger of the printing press. Printing money was at best a stopgap to be used until an appropriate means of finance could be put in place. But the choice between taxes and borrowing was far from obvious.

The economists of 1917 were acutely aware, moreover, that they were the heirs to a tradition, the “classical” or “English” tradition, which favored taxes over borrowing. As originally set out by David Hume (1970 [1752], 91-2)⁶ and Adam Smith (1979 [1776], 919-20) the case for taxes was political rather than economic. Smith’s splendid and timely statement of the case is worth quoting.

The ordinary expense of the greater part of modern governments in time of peace being equal or nearly equal to their ordinary revenue, when war comes they are both unwilling and unable to increase their revenue in proportion to the increase of their expense. They are unwilling for fear of offending the people, who, by so great and so sudden an increase of taxes, would soon be disgusted with the war; and they are unable from not well knowing what taxes would be sufficient to produce the revenue wanted. The facility of borrowing delivers them from the embarrassment which this fear and inability would otherwise occasion. By means of borrowing they are enabled, with a very moderate increase of taxes, to raise, from year to year, money sufficient for carrying on the war, and by the practice of perpetually funding they are enabled, with the smallest possible increase of taxes, to raise annually the largest possible sum of money.

⁵ Many economists made a sharp distinction between loans financed by money creation and loans financed by sales to the general public. Wilson and McAdoo, however, seem to have believed that loan finance in general was inflationary. Wilson warned against the inflationary dangers from relying entirely on loan finance in his war message of April 2, 1917, Noyes (1927, 197-8).

⁶ Although Hume’s essay first appeared in 1752, the argument against bond-finance was not included until an edition published in 1770.

In this passage Smith goes on to explain how bond-finance encourages war by hiding the true costs of war.

In great empires the people who live in the capital, and in the provinces remote from the scene of action, feel, many of them, scarce any inconveniency from the war; but enjoy, at their ease, the amusement of reading in the newspapers the exploits of their own fleets and armies. To them this amusement compensates the small difference between the taxes which they pay on account of the war, and those which they had been accustomed to pay in time of peace. They are commonly dissatisfied with the return of peace, which puts an end to their amusement, and to a thousand visionary hopes of conquest and national glory from a longer continuance of the war.

Later economists in the classical school maintained the antipathy toward borrowing, although John Stuart Mill, as might be expected, took a more moderate stance. Mill emphasized the dangers of borrowing, but thought that some borrowing would be acceptable. The interest rate would show whether borrowing had been held to a prudent level: an increase in interest rates would be the sign that borrowing had reached an excessive level. (Mill, 1940 [1848], 873-6).

On the eve of American entrance into the war, Oliver M.W. Sprague – a professor at Harvard and one of America's leading monetary economists – was given the task of discussing the optimal means of financing a major war at the annual meetings of the American Economic Association. Sprague, in line with the classical tradition, made a strong case for taxation. Borrowing, according to Sprague, was unjust.

The injustice of treating those who furnish the funds for war more generously than those who risk life itself will not be questioned. Consider for a moment the contrast under the borrowing method of war finance of a soldier in receipt of an income of \$2500 before a war and his neighbor who remains at home in continued receipt of a similar amount. The civilian reduces his expenditures in every possible way and subscribes a total of \$4000 to war loans. He is rewarded with a high rate of interest to which his

soldier neighbor must contribute his quota in higher taxes if he is fortunate enough to return from the front. (Sprague 1917, 204)

Would high taxes reduce output?

Taxation on this onerous scale [sufficient to finance s major war] would virtually eliminate the ordinary economic motives for effort and sacrifice. What would be the effect on production? There is no experience whatsoever on which to base a judgment. I venture to think, however, that no serious difficulties would be encountered when millions of men were fighting in the trenches in a great war in which a people believed that its vital interests were at stake.(Sprague 1917, 208).

In other words, Sprague recognized that high taxes might discourage effort, but thought that this effect could be offset during a war by patriotism. Four leading economists commented on Sprague’s paper, (Miller, Lutz, Lincoln, Urdahl, and Sprague, 1917). In general, Sprague’s discussants agreed that tax-finance was best. Miller, however, worried that relying entirely on taxes would weaken the “motive to industry.”⁷

At a conference held a few months later (and after the declaration of war and the passage of the War Revenue Act) one can find more acceptance of the need to borrow. Edwin R.A. Seligman (1918) thought that taxes should be raised, but that possible adverse effects on consumption and investment should be kept in mind. For Seligman financing 25 or 35 percent through taxes was about right. Even Sprague (1918) recognized that the war was going to be financed mainly (perhaps 75 percent) by debt whatever he or other economists might say. But he still believed that it would have been

⁷ Henry C. Adams (1918) agreed that a balance had to be struck between taxation and borrowing, a position based on a much earlier study of the War of 1812 and the Civil War, (Adams 1886).

better to finance it 75 percent by taxes. Greater reliance on taxes would have reduced consumption and speeded conversion.⁸

The debates among the economists were echoed by the debates among the public. The socialists thought that all of the war could be financed by the appropriation of all incomes over \$10,000 per year. The *Wall Street Journal*, as might be expected, advocated reducing the income tax exemption from \$4000 to \$1000. The *Journal* thought that considerable reliance should be placed on bonds. It was a matter of equity: “It is not right that the present generation should bear the whole burden of a conflict fought for the freedom of our children’s children.”⁹

McAdoo rejected the extreme view that all of the war should be financed by taxes. He saw a trade-off between taxes and bonds: excessive reliance on taxation would frighten the wealthy and reduce support for the war; excessive reliance on bonds would be inflationary. Given this tradeoff, the practical matter became one of naming the optimal percentage to be financed by each. McAdoo, according to his *Memoirs*, initially thought that a 50-50 split was about right. J.P. Morgan, America’s leading investment banker, when questioned by McAdoo, advised financing 20 percent through taxes. Later McAdoo thought that financing 33 percent through taxes would do.

Davis Rich Dewey (1931, 506-7) summed up the outcome of the debate this way.

Some indeed advocated a policy of “pay as you go” and even proposed a conscription of wealth, if necessary to meet the war costs. Others favored a more equal division between taxes and loans. These views, however, did not prevail. There was fear of “frightening capital” and arousing popular

⁸ In recent years the classical fear of debt finance has eroded further. Following the lead of Robert J. Barro (1987, 1989) economists tend to emphasize the advantages of smoothing taxes over time through the use of debt.

⁹ This paragraph including the quotation from the *Journal* is based on Kennedy (2004, 16-17).

discontent which would retard the progress of military and naval plans. Although no exact ratio was formally adopted. There slowly developed an accepted conviction that taxation should provide at least one-third of the costs of the war.

As it turned out, about 25 percent of the war was financed through taxation.

When it came to practical details about what the types of instruments to market and how to market them, the economists were less helpful, although they did offer some advice. Arthur Cecil Pigou was the leading British economist of the day, after Marshall. After the war Pigou (1941 [1921], 92-4) offered what he considered to be three decisive objections to allowing interest rates to increase in wartime. (1) Higher rates, in particular rates that rise above rates in enemy countries, might be seen as a sign of weakness. (2) Higher rates might not stimulate much additional savings, and in any case would store up problems for future finance ministers. (3) Higher rates, like loans themselves, may be viewed as inequitable, as allowing the rich to “make a good thing out of war.” It seems likely that concerns such as these, although not necessarily derived from economists, explain the determined effort made in the United States and in Britain to keep rates down during the war and to disguise increases.

Irving Fisher was perhaps the leading American economist of the day, certainly the one that we know best. Fisher (1918) accepted the need for issuing bonds, and made three points about how patriotic citizens should respond. (1) People should buy them by reducing their own consumption, not by borrowing from banks. (2) People should hold them, and not resell them unless the need was strong. (3) It was important that poor people invest in bonds so that after the war we wouldn't be in the position of taxing the poor in order to pay the interest and principal on bonds owned by the rich. All of these points were stressed in the Liberty bond campaigns.

3. Issuing the Liberty Bonds

There were, as shown in Table 1, four issues of Liberty bonds during the war, and one issue of Victory bonds afterwards. McAdoo might have chosen to sell bonds continuously. In other words, he might have simply opened the bond selling window of the Treasury and urged the public to buy bonds, as was done for short-term instruments in the United States, and as was done for longer-term instruments in France. McAdoo chose, however, to offer the bonds in separate blocks. The Treasury announced in advance the amount to be offered. Then on a particular day the subscription books were opened and offers for the bonds were accepted or rejected. This system allowed the Treasury to create public drives for the bonds and use patriotism to whip up enthusiasm. Would American people show their support for the war by buying all of the bonds? Each region of the country, moreover, was given a quota, creating a basis for additional competition. Which region of the country would be the most patriotic and exceed its quota the most?

Perhaps the most controversial feature of the bonds was their exemption from taxes. The first issue was exempt from normal (peacetime) income taxes and from the wartime surtax which would be, it was hoped, temporary. The exemption drew considerable criticism: The Wilson administration, nominally a progressive democratic administration, was raising taxes on the wealthy with one hand, and then creating a huge loophole with the other. The surtax exemption for the second and third bonds was therefore limited to the interest on the first \$5,000.00 worth of bonds at face value. When it came to planning the fourth issue, however, concerns about finding a market led to backtracking. The limit to the exemption from the surtax was raised to \$30,000.00, and

provision was made to extend the surtax exemption to interest on the second and third issues, provided specified amounts of the fourth issue were purchased.

The coupons were chosen by McAdoo in conjunction with his advisors. They represented the yield that McAdoo thought was consistent with the sale of the bonds at par. Figure 1 shows these coupons, and the market rates on AAA industrial bonds, Moody's highest rated bonds, and on municipal bonds, which were safe and tax exempt.¹⁰ It is evident that McAdoo priced the Liberty bonds to sell as financial investments. The coupon on the Liberty bonds came within a few basis points of the yield on municipals. One can see a slight narrowing of the spread between the coupon and the yield on municipals, reflecting the change in the tax status of successive issues. But it is clear, even from the start, that McAdoo did not expect that investors would buy bonds that yielded far less than comparable assets.¹¹ His faith in his ability to capitalize patriotism was qualified from the start by a realization that the market would be interested first and foremost in financial returns.

4. A Natural Experiment

The price of the Liberty Bonds can reveal a good deal more about the effectiveness of the bond selling campaigns. In equilibrium the net advantages of holding

¹⁰ Municipal bonds were presumed to be exempt from Federal taxes including the income tax under an 1895 Supreme Court ruling. However, the recent passage of the constitutional amendment authorizing the income tax meant that the question of tax exemption might be revisited. (Bogart, et al, 1919, pp. 86-87).

¹¹ Benjamin Klein's (1974, 947) estimates of the competitive yield on deposits was 3.85 in 1917, 4.89 in 1918, and 4.48 in 1919; again, figures in line with the coupons on the liberty bonds.

government bonds must be equal at the margin to the net advantages of holding other securities. Thus, we can write the following equation.

$$(1) \quad I_l + U(P) + U(S) = I_c$$

where I_l is the yield of the Liberty bonds. $U(P)$ is the marginal value to a bond holder of the satisfaction from contributing to the war effort; in other words the utility from being patriotic. $U(S)$ is the marginal value to the bond holder of other advantages of holding government bonds: their greater security, liquidity, tax advantages, and eligibility as security for loans from the Federal Reserve. And I_c is the yield on a private sector alternative, for example AAA rated industrial bonds. Thus, the spread between corporates and Liberties will tell us about the sacrifice that the marginal investor was willing to make in the name of patriotism.

The government, of course, can exploit the patriotic motive for buying Liberty bonds by issuing more and driving $U(P)$ towards zero. So a finding that $I_l - I_c$ is small may mean simply that the government has fully exploited the potential of patriotism. For this reason the opening and middle of the war do not provide good natural experiments with which to test the role played by patriotism.

This is illustrated in Figure 2. In the absence of a patriotic demand, the Treasury could sell the "initial amount" of bonds (each bearing a coupon of, say, 3.5%) at price A. A surge of patriotism, other things equal, would increase demand for these bonds and lift the price to B. But if the Treasury fully exploits this surge in demand by increasing supply accordingly, the price will remain at A. This is the policy it would follow if it was attempting to prevent increases in interest rates, say, to avoid the suggestion, as Pigou put it, "that the rich were making a good thing out of the war."

The end of the war, on the other hand, does provide a natural experiment. Now patriotism subsides and the demand curve shifts back to the initial level. But the amount of bonds outstanding is not reduced and their price falls to C. History, of course, is not as neat as these supply and demand curves suggest. There will be additional issues of bonds once the war ends, the patriotic motive for holding bonds will not disappear completely, and other events, such as changes in tax rates, will affect returns in the bond market. Nevertheless, the response of the bond market to the end of World War I will, we believe, yield some important information about the role of patriotism.

The main reason that the end of World War I works well as a natural experiment is that it marked an abrupt change in economics, politics, and public opinion. Until a few months prior to the Armistice the German army was fighting hard and successfully in France, and the issue was in doubt.¹² In the Civil War or World War II, by way of contrast, enemy forces were in retreat for a long time before the final end of the war. The transition from uncertainty to certainty about victory, in other words, occurred slowly.¹³

When it came time after the Armistice to issue the Victory Bonds, according to Gilbert (1970, 136), “the Treasury was told that there could be no further appeals to patriotism and that the problem must be approached in a ‘distinctly cold-blooded fashion.’” It is true that some of the old hoopla was rolled out to help sell the Victory bonds, but Victory bonds did not have the Committee on Public Information behind them. According to the Chair of the Committee, George Creel (1972 [1920], 150),

¹² Martin Gilbert (1994, 454 – 96) in two chapters, the “turn of the tide” and “the collapse of the central powers,” provides a balanced and detailed account of August through November 1918.

¹³ The campaigns to sell bonds in World War II, described in detail Lawrence R. Samuel (1997) excellent account, were even larger than in World War I.

“Within twenty-four hours from the signing of the armistice orders were issued for the immediate cessation of every domestic activity of the Committee on Public Information.” The Committee on Public Information, moreover, was not an outlier. Virtually the entire government apparatus that had been assembled to run the war economy was scrapped the moment the war ended, reflecting the public’s desire to get the whole experience over with, Lauterbach (1942).

The Republicans made strong gains in the fall 1919 Congressional elections, winning majorities in both the House and Senate. The issues separating the parties were complex, including differences on trade, agricultural, and the proposed League of Nations. Nevertheless, it is clear that there was also a general turn away from wartime Progressivism, and from wartime demands for patriotic sacrifice.

The main economic effect of Republican gains from the point of view of investors would be to increase the likelihood that high wartime taxes would be cut soon, reducing the progressivity of the income tax. This is what in fact was done under Treasury Secretary Mellon in the early 1920s.¹⁴ This change, therefore, would also work toward reducing the demand for and increasing the yields on the Liberty bonds, and reducing the spread between yields on non-tax-exempt securities and on the Liberty bonds. A finding that the yields on Liberty bonds rose, or that the spreads narrowed, would be open to multiple interpretations. But a finding that yields and spreads remained steady would point strongly toward a small role for wartime patriotism because the effects of the Republican ascendancy were working in the same direction as the decline in patriotism.

¹⁴ Gene Smiley and Richard H. Keen (1995) describe the fight over tax rates in the 1920s.

In November 1920 Republican Warren G. Harding was elected President in a landslide over Democrat James M. Cox. Harding's victory reiterated the move away from wartime Progressivism presaged by the Congressional elections, as suggested by Harding's famous call for "a return to normalcy." Harding, as we noted above, had complained during the war that the campaign for the first Liberty Loan was "hysterical and unseemly." So it was implausible that he would make such appeals in peacetime to support the market for Liberty bonds. It is hard to imagine, to sum up, that there were still large numbers of investors buying and holding Liberty bonds for patriotic motives after Harding's ascendancy.¹⁵

Figure 3 plots the yield on the four Liberty bonds before and after the Armistice, along with the Municipal bond rate. The lowest line plots the yield to maturity on the First Liberty Bonds. The First Liberty bonds fell below par, although only a bit, shortly after they were issued (the period in the chart where the yield rises above 3.50). The fall may have been due in part to the inherent limits of social pressure. When the bonds were offered people could display their patriotism by announcing their purchase and by pointedly asking others how many Liberty bonds they have bought. After the initial offering, it was hard to prevent people from selling bonds and readjusting their portfolio. Few people were likely to go around asking their neighbors how many bonds they had sold. Note our third poster which calls on workers to "Buy Liberty Bonds and *Keep Them*" (my italics). Mainly, however, the fall in the price of Liberty bonds was probably due to the general rise in rates that can be seen also in the municipal bond rates.

¹⁵ The Republican ascendancy might have strengthened confidence in balanced budget and gold standard orthodoxies that were good for bonds. But these had been articles of faith for decades and expectations about them were unlikely to have been volatile.

The major difference that tax exemption could make is shown by the large spreads between the yields on the First Liberty bonds, which were fully tax exempt, and on the second, third, and fourth Liberty bonds, which were partly subject to taxation.

The real test of patriotism, however, as we noted above, is what happens after the Armistice. If people were holding government bonds mainly for patriotic reasons, we would expect them to begin selling them and adjusting their portfolios. If this process was well understood by the market, then prices would adjust immediately. The Armistice, however, appears to have had a little effect on the yields of the Liberty bonds. The yields were remarkably stable for the following year. As noted above, the turn toward the Republicans in the 1918 elections might have created expectations of a reduction in the high wartime progressivity of the income tax. On these grounds one would expect a narrowing of the spread between the yields on the First Liberty bonds, which were fully tax exempt, and the yields on subsequent issues which were only partly exempt. But this does not seem to have happened, suggesting that the likelihood of sharp cuts still appeared low. Figure 3, in other words reveals a calm market; a market that took the end of the war in stride.

Figure 4 takes a longer view. It plots the returns for the First Liberty bond, for the fourth Liberty bond, and for a group of municipal bonds. The rates on all three remained stable until the first postwar recession. The yield on the First Liberty bond, moreover, varied little after this sharp recession, returning to about the level at issue. Again, there seems to be little evidence that a large reservoir of patriotism was being unwound during the “return to normalcy.”

Although Figures 3 and 4 seem to rule out large changes, small changes in the spreads between the series are hard to read. For this reason it is useful to look at Figure 5 which plots the spread between the yields on AAA corporates and on the First Liberty loan, and by way of contrast the spread between the yield on BAA corporates and AAA corporates. The spread between the corporates and the Liberty Bond should reflect the patriotism premium and the safety premium – in other words $U(P) + U(S)$ in equation (1). The spread between the BAA and AAA rates reflects a similar difference in risk, call it $U(S')$, but no difference in patriotism.

After the armistice the patriotic motive for holding Liberty bonds, if it was present, would have declined substantially. Some bond holders may have continued to heed Uncle Sam's plea to hold on to their bonds; but others, surely, would have assumed that with the war safely won, they could begin to diversify their portfolios. Therefore, we would expect the AAA-First-Liberty-Loan spread to narrow. And consistent with this prediction we see a small and brief decline in the spread. The spread then rose a bit, the opposite of what we would expect from a decline in the patriotism premium. The increase is clearly associated with the recession of 1920-1921. This recession, although brief, was relatively severe, and the rise in the spread probably reflects a rise in default risks produced by the recession.

The onset of the recession, which the National Bureau dates as January 1920, was accompanied by substantial and controversial increases in the discount rate at the Federal Reserve in December 1919 and January 1920. The increase in January, from 4.75 percent to 6 percent, was unprecedented (Friedman and Schwartz 1963, 230-1). There is also a small increase in the AAA-Liberty spread in late 1923, probably associated with the

second postwar recession which the National Bureau dates from May 1923 to July 1924. Thus it would appear that whatever narrowing of the AAA-Liberty spread occurred over the long-run was probably due more to a narrowing risk premium – the cause, presumably, of the similar long-run decline in the BAA-AAA spread – rather than of any erosion of a large patriotism premium.

Our conclusions about the effectiveness of the Liberty bond campaigns based on examining the charts can be tested formally. Table 3 shows regressions for the First and Fourth Liberty bonds.¹⁶ The regressions include three variables designed to measure conditions in financial markets. (1) The AAA rate was included to measure general market conditions. (2) The municipal rate was included to measure the effect of the postwar reductions in tax rates. (3) The Federal Reserve discount rate was included to measure the effect of monetary policy. To measure the impact of the Armistice we tried two variables. (1) “Rapid Adjustment” takes the value zero before November 1918 and the value one from November 1918 forward. (2) “Gradual Adjustment” starts at .001 in November 1918 and rises at a constant rate until it reaches 1.00 in December 1929.¹⁷

On economic grounds one would not expect there to be a unit root in the yields. There is a zero lower bound on interest rates, and the gold standard, which the United States maintained through out, set a limit on the inflation premium. The Augmented Dickey Fuller tests, however, perhaps because of their weak power, generally failed to reject the hypothesis of a unit root. For that reason we estimated the basic equation over a number of samples and in a number of ways to account for the possibility of a unit root,

¹⁶ The prices of the second and third Liberty bonds tracked the fourth Liberty bonds closely. The Victory loans (the fifth loans) were short-term.

¹⁷ We tried several versions of the “gradual adjustment” variable. The results were similar to those reported in the tables.

or autocorrelation in the residuals: in levels, first differences, levels with a lagged dependent variable, and in levels with an AR(1) adjustment for autocorrelation.¹⁸

Table 3a shows the results for the yield on the First Liberty loan for the full sample (the results for shorter samples were similar) and for the four estimation methods. There is some evidence from the regressions in levels that the Armistice may have had an impact: “Rapid Adjustment” is significant when the regression is estimated in levels and when an auto-correlation adjustment is included, although not when the dependent variable is lagged one period. Gradual Adjustment also turns out to be significant when the equation is estimated in levels and when an auto-correlation adjustment is included. The coefficients, however, are small. The largest estimate is only 15 basis points. First differencing the data produces more plausible coefficients on the fundamentals: the coefficient on the AAA rate is positive. When the equation is estimated in first differences, however, the coefficients on Rapid Adjustment and Gradual Adjustment are small and not significantly different from zero.

Table 3b shows the results of similar regressions for the Fourth Liberty loan. Rapid adjustment is significant when the equation in levels is estimated with an AR(1) adjustment and when the equation is estimated in first differences. Gradual adjustment is significant when the equation is estimated in levels without an adjustment for serial correlation or when it is estimated in levels and a lagged dependent variable is included. But the coefficient is small in all of the equations. The largest estimate, when Gradual Adjustment is included in the simple OLS equation in levels, is 23 basis points. The other estimates are smaller.

¹⁸ Higher order autocorrelation terms were insignificant.

It is also useful to ask whether the volume of sales changed dramatically with the Armistice. Suppose some investors decided to sell their Liberty bonds because they no longer had a patriotic reason to hold them, but others decided to buy them, perhaps because the latter thought that highly liquid investments made sense until more was known about the shape of the postwar economy. Under these assumptions one would see little movement in the price of bonds, but lots of movement in the volume of sales.

Figure 6 shows the volume of sales for the first and fourth Liberty bonds from 1917 through 1923. Evidently, the Armistice did not produce a sharp realignment in the holding of Liberty bonds. Instead, monthly sales of Liberty bonds settled down to a mostly stable rate in the postwar era. The one exception was in December 1920, when there was a sharp spike in sales. *The New York Times* attributed this spike to concerns about the revival of the War Finance Corporation (its debt might compete with the Liberty bonds) and to income tax considerations (losses had to be realized to count against income). The *Times* thought that many of the income tax sales were being matched with purchases.¹⁹ If the *Time's* interpretation is right it suggests that the volume of sales would respond quickly when financial reasons for holding bonds changed. The Armistice and the concurrent reduction in the patriotic motive for holding bonds, evidently, did not have a similar effect.

5. Sales to Low Income Savers

The denominations of the bonds suggest that a large percentage was sold to wealthy individuals or institutional investors. Such investors, of course, may well have

¹⁹ *New York Times*, December 17, 1920, p. 33; December 21, 1920, p. 28.

been motivated by patriotism. But this finding does suggest that McAdoo's attempt to market the Liberty Bonds to working class or middle class investors enjoyed modest success, at least as far as the goal of financing the war was concerned. Table 2 shows a snapshot of the denominational structure of the bonds outstanding on June 30, 1920. The modal bond was the \$1000 bond, which was close to a \$50,000 bond in today's money: Possible for a middle class family, but one would think not in large amounts. The smaller denominations, \$50 and \$100, seem more plausible for middle class investors, and constituted about 20 percent of the outstanding debt. This does not mean, however, that all of these bonds were held by middle class investors. A number of large corporations bought these denominations so that they could make dividend payments with them, Gilbert (1970, 128).

Another attempt to sell war bonds in small denominations to the young and poor was modelled on a British program. "War Savings Certificates," were first issued in January 1918. They sold for \$4.12 (about \$60 in today's money using the CPI) and were worth \$5.00 at maturity in January 1923. The price increased one cent per month until sales were stopped in December 1918. The interest works out to about 4.5 percent. For those who did not have \$4.12 on hand, savings stamps costing \$.25 could be purchased. Each stamp was pasted on a special board, and when the buyer had enough it could be exchanged for a war savings certificate. The "War Savings Certificate" under various names became a permanent feature of the financial landscape. It was continued after the war, used in World War II, and continued in various guises since.

The purpose of the war savings certificates in World War I, as in its later reincarnations, was to provide a vehicle for people of limited means, especially young

people, to express their patriotism and at the same time to teach them the value of thrift. In American high schools young women were encouraged to knit for the war effort, and young men to buy savings stamps. The program contributed a modest amount to the actual financing of the war. At the end of August 1919, the total amount of debt issued to finance the war amounted to \$26.4 billion. Of this amount \$0.93 billion consisted of war savings certificates, about 3.5 percent of the total, (Schultz and Caine 1937, p. 540). It could be argued, however, that the War Savings Certificates represented additional real savings, as opposed to other issues that were partly monetized, and these were real savings that might not otherwise have been available.

We can derive an idea of how the portion of bonds purchased by individuals was distributed from a government survey of nearly 13,000 households. This survey was undertaken because of the concern about how families were being affected by wartime inflation. It was coded by Martha Olney (1995) and provides a remarkably detailed account of how a representative sample of urban families spent their money during the war years. Figure 7 shows the cumulative percentage of the total bond issues purchased by the households in the sample when they are arranged by household income. For example, the point plotted above 20%, 7.37%, shows that the lowest 20% of the households in the sample by income purchased 7.37% of the total amount of bonds purchased by all households in the sample. The curve shows the strong relationship between income and bond purchases, although it also shows that even the lowest income classes were drawn into the program, as McAdoo hoped, and did purchase some bonds.²⁰

²⁰ The curve includes war stamps with Liberty bonds. Excluding them would not change the visual impact of the figure.

The sample coded by Olney, it should be noted, while it was intended to be representative of ordinary Americans, did not include the institutions and very wealthy individuals who bought most of the bonds. This can be seen from the following calculation. The coded sample of households purchased \$745,746 worth of Liberty bonds.²¹ When blown up by an estimate of the total number of households in 1918-1919 one gets a figure of \$1,655,783,620 as the amount purchased by all households. This constituted about 7.72 percent of the total amount of Liberty Bonds sold. Therefore, about 92.3 percent of the Liberty bonds must have been sold to institutions, such as banks, and to very wealthy individuals who were not included in the sample. The lowest 20 percent of households by income in the sample probably, therefore, purchased about .6 percent of the total issue (7.37 percent x 7.72 percent), a respectable amount, an amount that may have been important for morale by demonstrating their support for the war, but clearly not a key to the financing the war.

Moreover, showing that relatively poor savers did buy war savings stamps and Liberty bonds, does not prove that patriotism was the overriding motive. Wages were up and the Liberty Bonds offered a good return compared with savings deposits in banks. The Liberty bonds, moreover, could be purchased on an instalment plan. The lowest denomination of the Fourth Liberty Bond (\$50), for example, could be purchased by making a down payment of \$4.00 and then paying \$2.00 per week for 23 weeks.

6. How Were Nominal Rates Kept Down During the War?

²¹ The coded sample also purchased \$109,196 in War Savings Stamps.

If patriotism played a negligible role in increasing the demand for bonds, then how were nominal rates kept so low during the war, given the huge increase in the supply of bonds, and the rapid inflation? A full accounting is outside the scope of this paper. We can, however, suggest several factors that appear to have played a role.

(1) As we have already noted, the bonds were exempt from state and local taxes and were exempt or partially exempt from Federal taxes. Investors in high tax brackets had a strong financial incentive to buy them. During the early 1920s Treasury Secretary Andrew Mellon argued that holding tax-exempt bonds by wealthy individuals was a major source of tax avoidance, and he argued for cuts in marginal federal tax rates to reduce tax avoidance. To be sure, Mellon and his allies were mainly concerned that new issues of tax exempt state and municipal bonds would finance projects that would compete with private enterprise. But some of the avoidance they sought to reduce may have utilized the Liberty bonds. Work by Smiley and Keehn (1995) supports Mellon's argument.

(2) The issue of new private bonds was curtailed during the war. A government agency, The Capital Issues Committee, was given the authority to prohibit issues that it considered inappropriate. But chances are that a considerable amount of private investment would have been deferred until after the war in any case because of the uncertainties created by the war.

(3) As Allan H. Meltzer (2003, 88-9) has noted, many bond holders may have expected the price level to return to its prewar level after the war. The bonds contained a gold clause, and it might have been assumed that after the war the world would return to the gold standard and that wartime inflation would be wrung from the system as it was

after the Civil War. In other words, investors in Liberty bonds might reasonably have expected to gain from postwar deflation. Investors who bought bonds on this expectation were in for a disappointment. The price level rose every year from 1914 to 1920. The price level then fell during the 1920-21 recession, but the price level never returned to the 1914 level. Investors who bought Liberty bonds in 1918 and held them until 1929 experienced a loss from price changes (-2.37 percent per year); investors who bought in 1919 and held until 1929 experienced a small gain from price changes (+.27 percent per year).²²

(4) The Federal Reserve directly or indirectly monetized a good portion of the new debt. Milton Friedman and Anna J. Schwartz (1963, 216) put it this way.

The Federal Reserve became to all intents and purposes the bond-selling window of the Treasury, using its monetary powers almost exclusively to that end. Although no “greenbacks” were printed, the same result was achieved by more indirect methods using Federal Reserve notes and Federal Reserve deposits.

How much was involved? Between June of 1916 and June of 1919, the Federal Debt increased by \$24.3 billion (from \$1.2 billion to \$25.5 billion). High-powered money (which includes mainly Federal Reserve notes and deposits) increased by \$2.1 billion, according to Friedman and Schwartz (1963, 801-2). So the increase in high-powered money could account only for about 10% of the increase in the Federal debt.

But commercial banks also contributed to the monetization of the debt. They did so by purchasing bonds for their own portfolios and by lending money that borrowers then used to purchase bonds. Generally the banks lent at the coupon rate or at a slight advance over the coupon rate. Obviously, these were relatively secure loans since the

²² The price level used in the calculations is the GDP deflator from (Johnston and Williamson, 2002) which is based on Balke and Gordon (1989).

Liberty bonds were essentially the collateral for the loan. Since the amount of bonds purchased with newly created money was not matched one for one by bonds held by banks, we cannot produce an accurate estimate of how much of the debt was monetized by examining the balance sheets of the banks.

We can get some sense of the upper bound, however, by looking at the increase in the total stock of money and assuming that all of the money that was created was backed directly or indirectly by government bonds. The increases for M1, M2, M3, and M4, from June 1917 to June 1919 were \$7.03 billion, \$10.02 billion, \$10.68, and \$11.46 billion respectively, (Friedman and Schwartz 1970, 15-17). These figures imply estimates of the share of the increase in the debt that was monetized ranging from 29 percent (M1) through 41 percent (M2), and 44 percent (M3), to 47 percent (M4). Roughly speaking M1 includes demand deposits in commercial banks, M2 adds time deposits in commercial banks, M3 adds postal savings deposits and mutual savings bank deposits, and M4 adds savings and loan shares. Thus, as we move to more inclusive definitions of money we may be including institutions that were less involved in the process of monetizing government debt. Nevertheless, it would appear that as much as 40 percent of the debt was monetized. For the first year of the war (June 1917 to June 1918) the estimates of the share of the debt monetized range from 35 percent (M1), through 49 percent (M2), and 52 percent (M3), to 64 percent (M4).

(5) As Robert Barro's model of Ricardian equivalence suggests, savings may have risen in anticipation of future taxes. Paul Evans (1986) drew attention to the stability of rates in World War I, and other American wars, and suggested, tentatively, that the best

explanation of the stability of rates during the war would need to make use of the ideas suggested by Ricardian equivalence.

Secretary McAdoo argued that his policies, including capitalizing patriotism, had saved taxpayers millions compared with allowing interest rates to rise to market clearing levels, (McAdoo 1931, p. 381). The economics of this claim, however, was dubious, even leaving aside the magnitude of the savings. It sounds like a simple saving of resources: Like eliminating red tape or firing incompetent workers. In fact, the savings, to the extent that they were there, were transfers of dubious legitimacy. By persuading factory workers and Boy Scouts to buy bonds, the government was able to lower the future interest payments paid by the government. Those interest payments would be made from tax revenues, and to the extent that those taxes would have been paid by the wealthy, the net effect was a transfer from the Boy Scouts to the wealthy. To be sure, this argument assumes that workers and Boy Scouts would have found some other way of spending their money that would have added more to their welfare. A case could be made that it was really in the interest of workers and Boy Scouts to save more. Nevertheless, the avowed purpose of the Progressives was to shift the burden of taxation to the wealthy, and the policy of capitalizing patriotism undermined this policy.

This was apparent to many observers when it came to making the bonds tax exempt. In this case it was obvious that what the Treasury gained from lower interest rates, it lost from lower tax revenues. For taxpayers at the margin, that is taxpayers who were indifferent between holding taxable and non-taxable bonds, the gain from exemption would just offset the loss from lower rates. However, for taxpayers in very high tax brackets the gains from tax exemption could be substantial. An example will

make this clear. In January 1920 AAA corporate bonds were yielding 5.55 percent, and the First Liberty bonds were yielding 3.60 percent. Therefore, someone in a 35 percent bracket would have been indifferent between the securities as far as after-tax yield was concerned ($5.55 * [1 - .35] \approx 3.60$). The highest bracket in 1920, however, was 73 percent for taxpayers earning more than one million. For them, First Liberty bonds were equivalent to taxable bonds yielding 13.33 percent, higher than the yield on many junk bonds ($13.33 * [1 - .73] \approx 3.60$).²³ To be sure, there already existed a fairly safe tax-exempt alternative to Liberty bonds: municipal bonds. The municipals might have gained more from the imposition of very high tax rates during the war if the Liberty bonds had been taxable. Taking the sting out of very high tax brackets and punishing municipalities were not, one would think, major Progressive priorities.

7. Then Why Do It?

It appears that appeals to patriotism had a small effect on the financing of the war, and that the attempt to conceal the limited effect of patriotism led to the adoption of tax exemptions that undermined Progressive redistributive priorities. Then why do it? Why enlist everyone from actress Mary Pickford to evangelist Billy Sunday to sell bonds? There appear to have been a number of reasons.

(1) “Everyone else was doing it.” Germany had been the first, it appears, to use a massive public drive to help sell bonds. In Britain the Treasury mocked the first German drive – it showed how desperate the German’s were – but later adopted similar tactics. Eventually, the German Treasury returned the favor and mocked the circus atmosphere in

²³ U.S. Bureau of the Census (1975, 1095).

which bonds were being sold in Britain, (Noyes 1970, 181-2). Following suit made a good deal of sense. Presumably the British and the Germans had found the best way to do things. And since the United States had a larger population and a larger economy than the Germans, following the same policies minimized the chance that mistakes would offset these clear cut advantages.

(2) It might have worked. This was a Progressive Democratic administration going to war in an era when the belief in the primacy of market forces was under attack. It is hardly surprising that Wilson, McAdoo, and their associates would have believed that patriotism could move mountains. The contrast between the Civil War and World War I is particularly telling on this point. Salmon Chase believed passionately in the cause of the Union, but it did not occur to him that he could expand the market for bonds except by appealing to the self-interest of the buyers. If successful in encouraging savings, the WWI campaigns would have reduced the tendency of people to dump private securities to buy war bonds. Capital losses on individual private security holdings, even if not widespread, would have created problems for individual investors and for institutional holders such as banks, trust companies, and insurance companies.

(3) It cost little to stir up patriotism and every little bit extra savings it brought in seemed a plus. The Boy Scouts and other sellers and purchasers of small certificates are a good example. They didn't contribute much to the overall financing of the war. Still, every little bit helped.

(4) There was that important but mysterious factor that goes under the name of "morale." Buying bonds, and urging others to buy them, allowed people to feel that they were participating in the war effort. The bond buying campaigns also allowed racial and

ethnic minorities to reveal their patriotism, which may helped ease inter-group tensions both during and after the war. The bond rallies and similar forms of support, moreover, were a visible sign to the armed forces, and to our enemies, of the public's support for the war. Less specific rallies in support of the war might have had similar effects, but rallies at which people pledged to buy bonds may have carried more weight.²⁴

(5) The structure of the bond issues, a series of five highly publicized sales of specific amounts, introduced a discontinuity in the significance of the amount sold. If the government offers to sell \$1000 worth of bonds, it would seem to matter little from a purely financial point of view whether the public offers to buy \$999 or \$1001. But in the first case the issue is a failure and in the second case a success. The first case shows a lack of public support for the war, and the second enthusiasm -- the issue has been "oversubscribed." Patriotic rallies that raise demand "only" from \$999 to \$1001 therefore could have a large influence on the how the issue was perceived both domestically and abroad. The investment banker Thomas W. Lamont made this point when he addressed a bond rally.

Germany is watching to see whether we are going to make a mighty effort on the very first step of the war. She is going to gauge our ability to fight in the trenches by the way we take hold of this loan. (*New York Times*, June 2, 1917, 3)

This aspect of the problem was also on McAdoo's mind. As he noted in his *Memoirs* when recalling his thinking prior to the issue of the first Liberty Loan:

Suppose hundreds of millions of the bonds were left on our hands? The moral effect of such a failure would be equal to a crushing military disaster. It would not only dishearten our own people, but also the nations across the sea whose fortunes were joined to ours; and it would give our enemies new confidence and courage. (McAdoo 1931, 380).

²⁴ Samuel (1997) covers this aspect of the World War II bond campaigns. We are not aware of an equally thorough study of this aspect of the World War I campaigns.

Although McAdoo professed to fear a shortfall of hundreds of millions, it is obvious that any shortfall would have produced a public relations problem. Cheering at bond rallies appears then to have been a bit like cheering at basketball games. Cheering for the home team, part of the “home court advantage,” may add only a few points to a team’s score. But every little bit helps, and it may mean the difference between winning and losing.

Economists and economic historians are often reproached, with some justification, for putting too much weight on pecuniary motives. Deirdre McCloskey (1998), for one, has provided a long list of economic activities that she believes cannot be understood without bringing in concepts such as shame and social solidarity. Major wars provide natural laboratories in which to test the primacy of financial incentives because major wars inevitably bring a chorus of demands for sacrifices to ensure victory. A close look at the Liberty Bonds, however, suggests that in the field of finance the economist’s confidence in the primacy of financial incentives is well taken.²⁵

²⁵ McCloskey (1998, 309) anticipated this conclusion. On the foreign exchanges, she suggests, pecuniary motives dominate.

Table 1. The Properties of the Liberty Bonds and The Results of the Campaigns						
	First Liberty Loan	Second Liberty Loan	Third Liberty Loan	Fourth Liberty Loan	Fifth Liberty (Victory) Loan	
A. Properties of the Liberty Bonds						
Dated	June 15, 1917	November 15, 1917	May 9, 1918	October 24, 1918	April-May, 1919	
Coupon (percent)	3.50%	4.00	4.25	4.25	4.75	3.75
Callable in (years)	15	10	...	15	3	
Maturity (years)	30	25	10	20	4	
Convertible into subsequent issues that bore a different coupon	Yes	Yes	No	No	Could be converted into 3.75% notes	No
Interest Exempt from "Normal" income tax	Yes	Yes	Yes	Yes	No	Yes

Interest Exempt from the Surtax	Yes	Yes (limited to the income on \$5,000 face value of the bonds)	Yes (limited to the income on \$5,000 face value of the bonds)	Yes (limited to the income on \$30,000 face value until 2 years after the war)	Yes	Yes
Exempt from excess profits, and war profits taxes	Yes	No	No	No	No	No
Additional tax exemptions	No	No	No	Interest on the second and third issues exempt on the minimum of 2.5 times the amount of bonds purchased or \$45,000	Interest on the second, third, and fourth issues exempt on the minimum of 3 times the amount of notes purchased or \$20,000	
Common Features	<p>(1) Interest and Principal were payable in gold coin. (2) The bonds lacked the “circulation privilege.” In other words, National Banks could not use them as backing for bank notes. (3) Banks could use the bonds as collateral for loans from the Federal Reserve. (4) The bonds could be bought on “instalment plans” extending over several months. (5) The bonds were exempt from state and local taxes. (6) The bonds were not exempt from estate and inheritance taxes. However, interest and par value of the principal could be used to pay Federal estate and inheritance taxes provided the bonds were purchased six months prior to death and had a coupon of 4 percent or more. The bonds were regularly used in this way after the war, although up to 1925 the losses to the Treasury on this account were small, Love (1925).</p>					

B. Results of the Campaigns					
Offered on	May 14, 1917	October 1, 1917	April 6, 1918	September 28, 1917	April 21, 1919
Amount Offered (billion \$s)	\$2.000	3.000	3.000	6.000	4.500
Amount Subscribed (billion \$s)	\$3.035	4.618	4.177	6.959	5.250
Rate of Over-subscription (percent)	52%	54	39	16.0	16.66
Subscriptions accepted (billion \$s)	\$2.000	3.809	4.177	6.959	4.5
Number of Subscribers (millions)	4.000	9.400	18.377	22.778	11.803
Average Subscription (\$s)	\$759	491	227	306	445
Share of the Issue in denominations of less than \$10,000 (percent)	42%	40	66	52	60
<p><i>Sources:</i> Schultz and Caine (1937, 533-41); Dewey (1931, 502-510); Gilbert (1970), <i>passim</i>; <i>New York Times</i>, <i>passim</i>.</p>					

Table 2. Denominations of the Liberty Bonds Outstanding on June 30, 1920

Denomination	Denomination in 2003 \$s ^a	Amount	Percentage of all bonds outstanding
\$50	\$2,320	\$1,522,839,700	7.87
100	4,640	2,343,647,200	12.11
500	23,198	1,805,738,000	9.33
1,000	46,396	8,028,471,000	41.49
5,000	231,978	1,399,860,000	7.23
10,000	463,956	3,115,310,000	16.10
50,000	2,319,780	255,850,000	1.32
100,000	4,639,560	879,300,000	4.54
Total		19,351,015,900	100

^a We used per capita real GDP, available at www.eh.net, as the inflator, to convey how hard it would be for the average person to buy one of the bonds.

Source: Gilbert (1970, 141).

Table 3a. Determinants of the Yield on the First Liberty Loan, September 1917 - December 1929

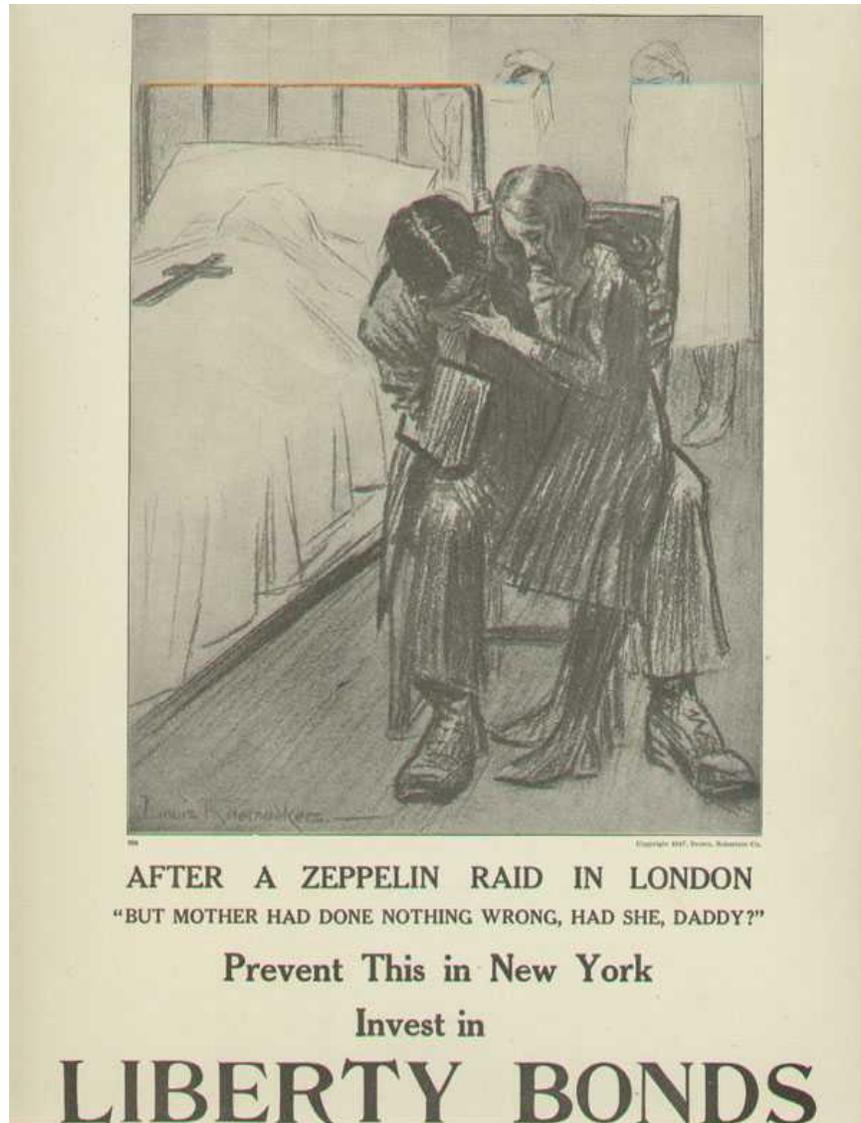
Constant	Lagged dependent variable	AAA	Municipals	Discount rate	Rapid Adjustment to the End of the War	Gradual Adjustment to the End of the War	AR(1)	Adjusted R ²	DW
(Levels-LS)									
1.371 (10.373)		-0.253 (-8.090)	0.690 (11.734)	0.093 (5.449)	0.082 (3.124)			0.910	1.003
1.596 (13.968)		-0.203 (-4.251)	0.566 (10.523)	0.120 (7.841)		0.047 (1.115)		0.905	0.905
(First Differences-LS)									
-0.010 (-0.637)		0.190 (2.253)	0.151 (1.623)	0.073 (2.715)	0.011 (0.675)			0.167	2.322
0.001 (0.243)		0.183 (2.179)	0.153 (1.640)	0.073 (2.720)		-0.010 (-0.444)		0.165	2.322
(Levels-One lag)									
0.766 (5.526)	0.535 (7.454)	-0.091 (-2.649)	0.245 (3.148)	0.061 (4.052)	0.017 (0.708)			0.933	1.729
0.750 (5.378)	0.550 (8.244)	-0.055 (-1.272)	0.197 (3.132)	0.060 (4.133)		0.035 (1.000)		0.933	1.742
(Levels-AR(1))									
1.518 (6.199)		0.075 (0.986)	0.280 (2.856)	0.079 (3.223)	0.106 (1.922)		0.781 (12.943)	0.937	2.128
1.542 (7.275)		0.061 (0.809)	0.298 (3.212)	0.088 (3.737)		0.153 (1.929)	0.700 (10.274)	0.937	2.024
Sources: See the Appendix.									

Table 3b. Determinants of the Yield on the Fourth Liberty Loan, September 1917 - December 1929

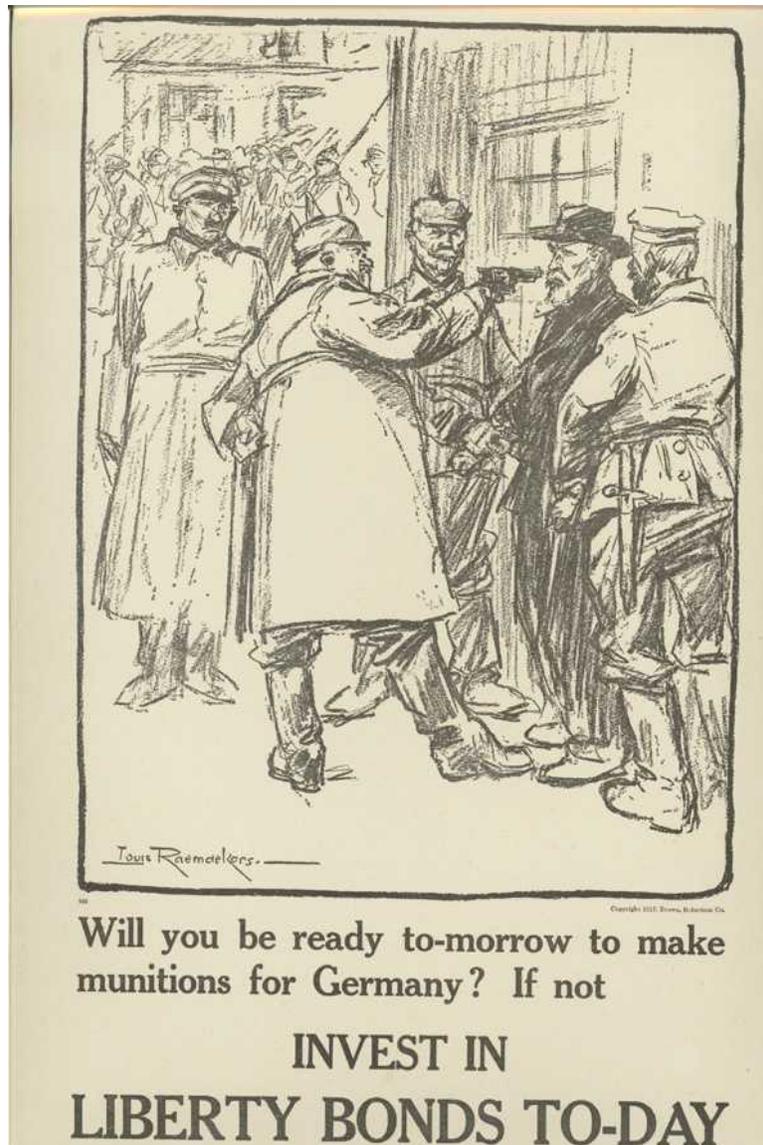
Constant	Lagged Dependent Variable	AAA	Municipals	Discount rate	Rapid Adjustment to the End of the War	Gradual Adjustment to the End of the War	AR(1)	Adjusted R ²	DW
(Levels-LS)									
1.215 (7.191)		0.328 (8.286)	0.258 (3.448)	0.093 (4.271)	-0.079 (-1.657)			0.941	0.628
0.701 (4.815)		0.525 (9.531)	0.183 (2.592)	0.034 (1.638)		0.232 (4.818)		0.949	0.730
(First Differences-LS)									
-0.069 (-1.832)		0.255 (2.693)	0.184 (1.791)	0.071 (2.462)	0.068 (1.800)			0.222	2.322
-0.001 (-0.177)		0.273 (2.867)	0.170 (1.641)	0.065 (2.238)		-0.005 (-0.226)		0.203	2.311
(Levels-One lag)									
0.450 (2.693)	0.780 (8.013)	0.138 (3.443)	-0.093 (-1.234)	0.042 (2.180)	0.013 (0.296)			0.961	1.704
0.375 (2.692)	0.680 (6.785)	0.262 (4.316)	-0.105 (-1.431)	0.026 (1.404)		0.117 (2.628)		0.963	1.670
(Levels-AR(1))									
1.067 (4.387)		0.359 (5.373)	0.214 (2.216)	0.084 (3.262)	0.140 (1.992)		0.720 (11.677)	0.971	2.105
1.124 (4.532)		0.397 (5.038)	0.187 (1.960)	0.082 (3.044)		0.094 (1.114)	0.669 (9.123)	0.970	2.017
Sources: See the Appendix.									

Louis Raemaekers. *After a Zeppelin raid in London: "But Mother Had Done Nothing Wrong, Had She, Daddy?" Prevent this in New York: Invest in Liberty Bonds.* 19" x 12."

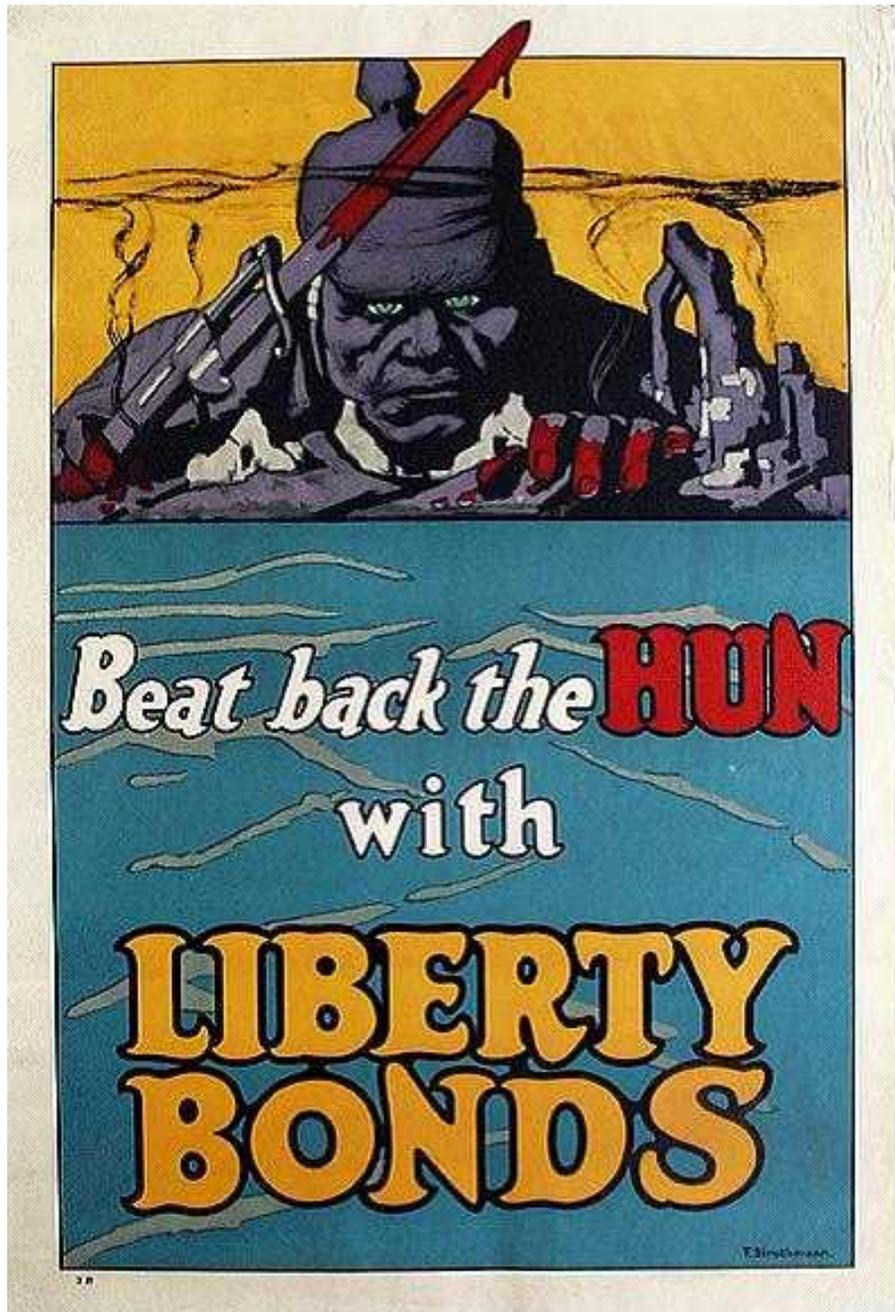
From the Rutgers University Library Collection of Liberty Bond Posters accessed October 5, 2005.



Louis Raemaekers. *Will you be ready to-morrow to make munitions for Germany? If not: invest in Liberty bonds to-day.* [1917?] 19" x 12." From the Rutgers University collection of Liberty Bond Posters, accessed October 5, 2005.



F. Strathmann. *Beat Back the Hun with Liberty Bonds*. Maurice F.V. Doll, "The Poster War: Allied Propaganda of the First World War." The Provincial Museum of Alberta, <http://www.royalalbertamuseum.ca/vexhibit/warpost/english/home.htm>, accessed October 5, 2005.



Anonymous. *Let Uncle Sam take this—and he will pay back this—All he asks you to do is keep your bond: Buy Liberty bonds and keep them: Ask your foreman.* [1918]. 17 5/8" x 11 3/4." From the Rutgers University Library Collection of Liberty Bond Posters.

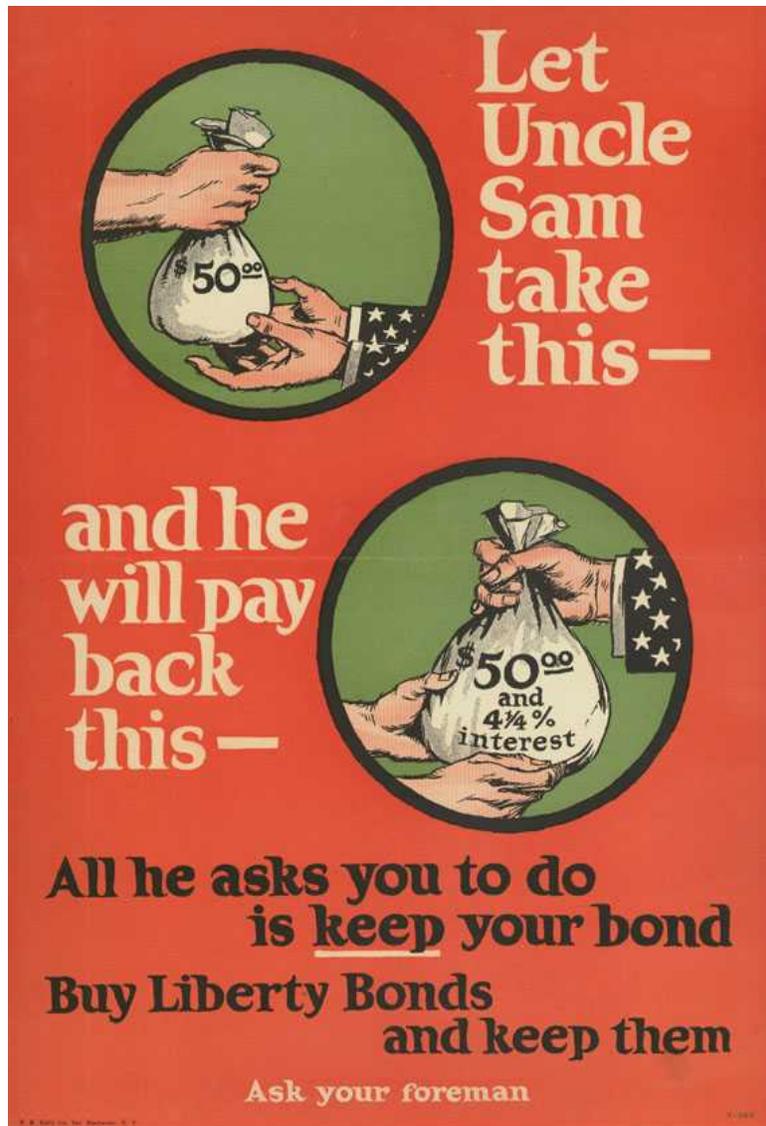


Figure 1
Coupons on the Liberty Loans

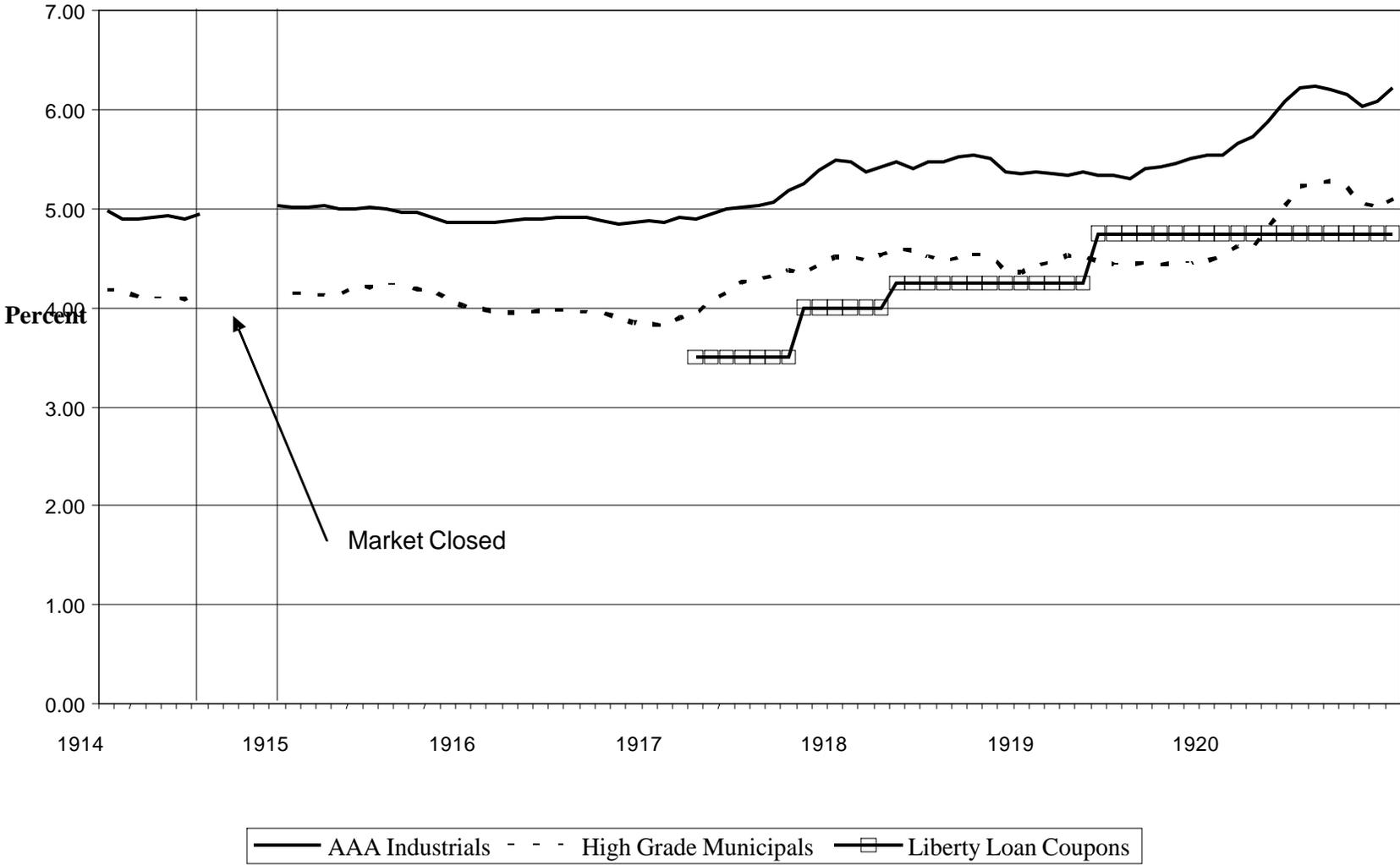


Figure 2. The Supply and Demand for Liberty Bonds

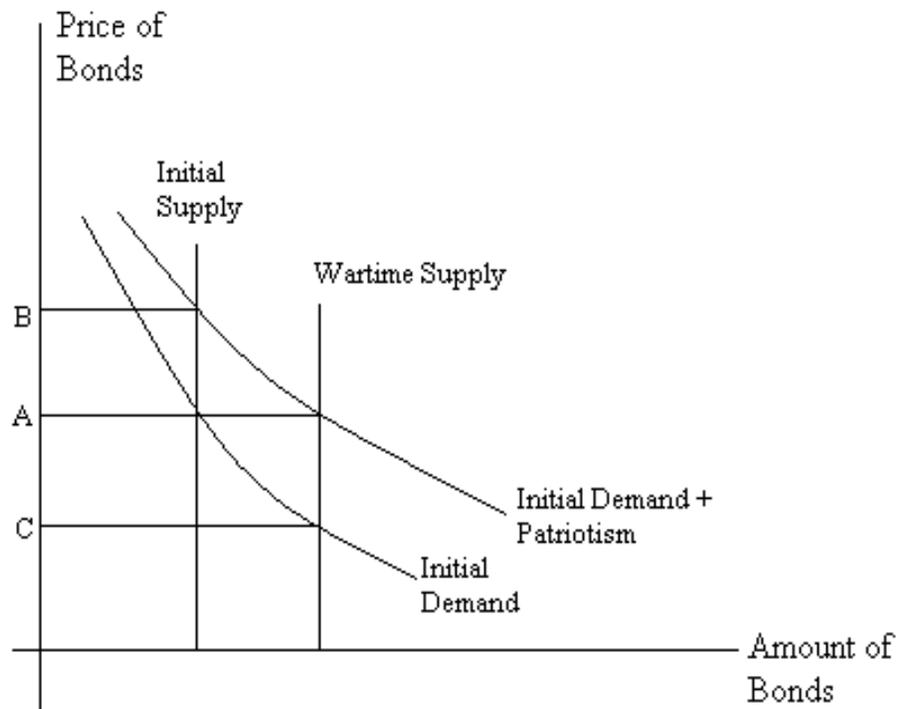


Figure 3
Yields on Selected bonds, June 1917-December 1919

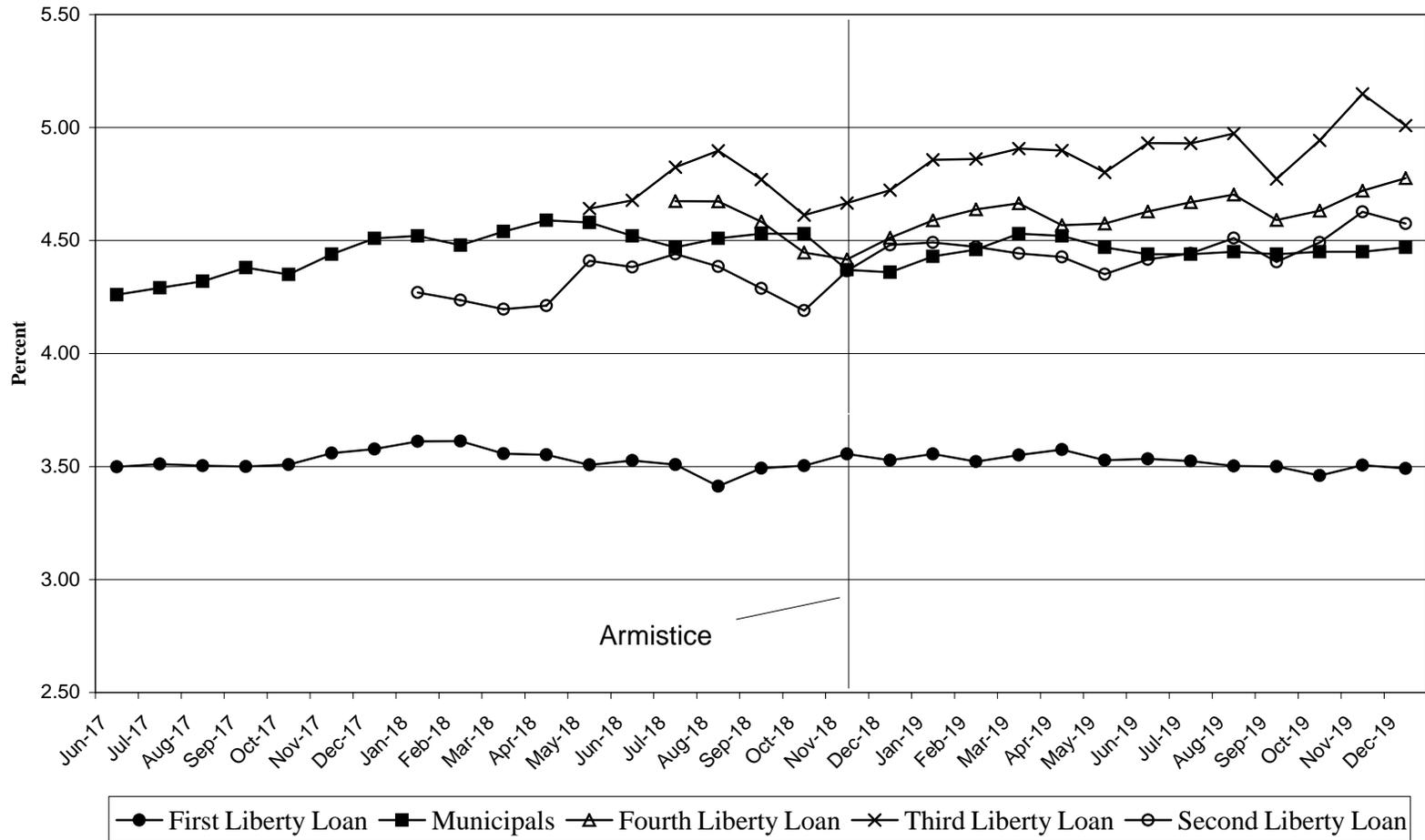


Figure 4
Yields on Selected bonds, June 1917-December 1925

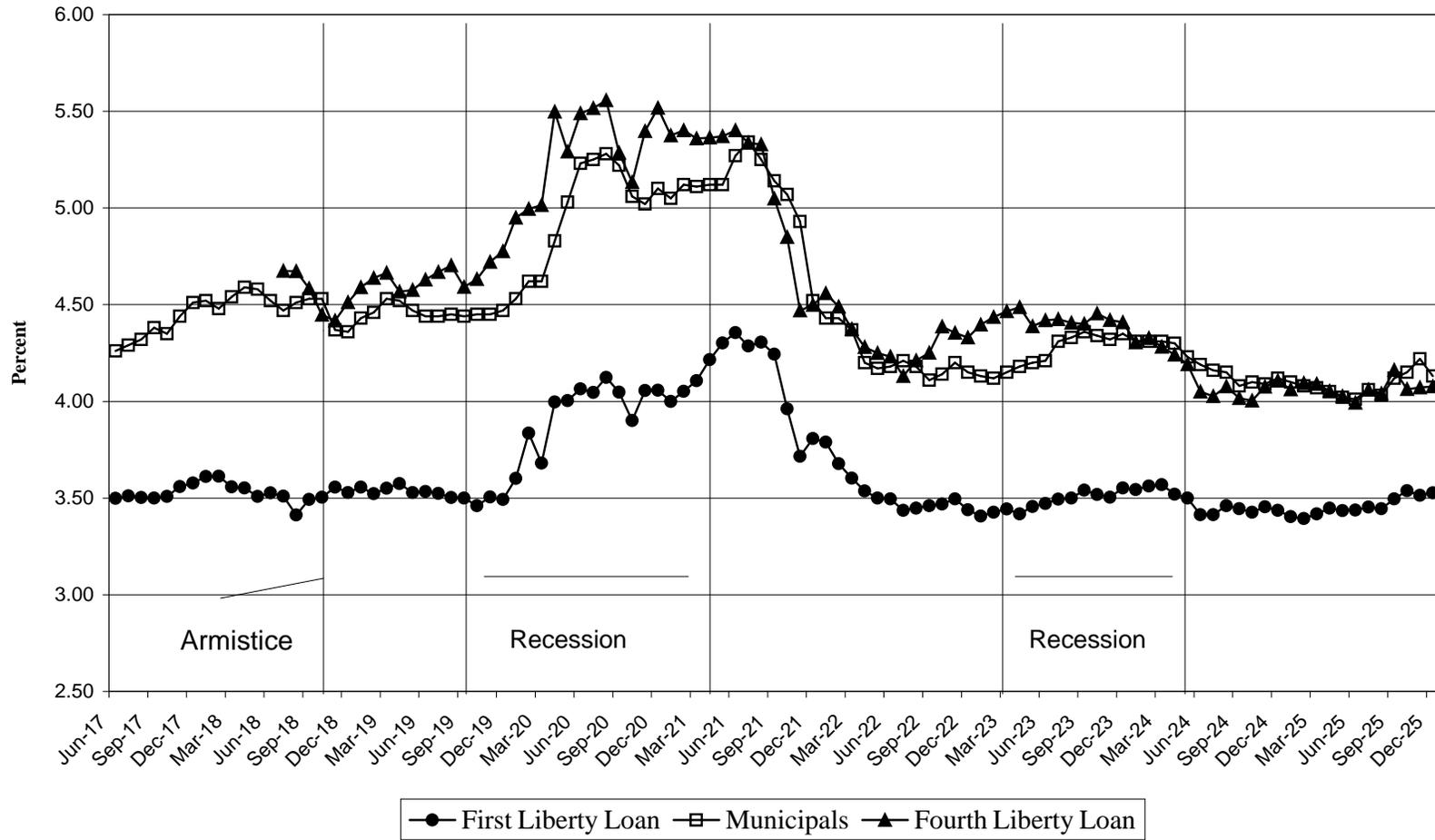


Figure 5
Yield Spreads, September 1917-December 1925



Figure 6. Volume of Sales on the New York Stock Exchange

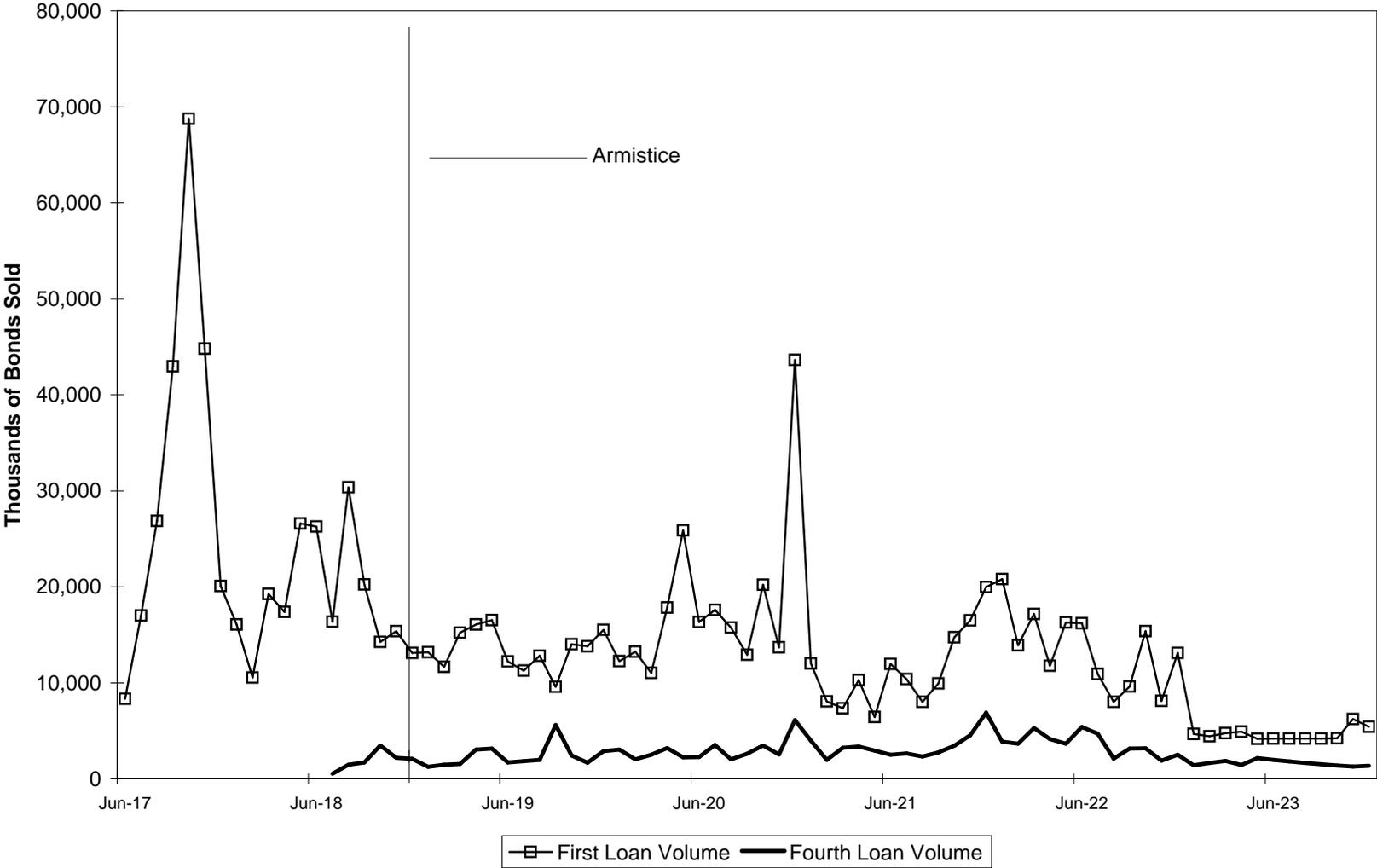
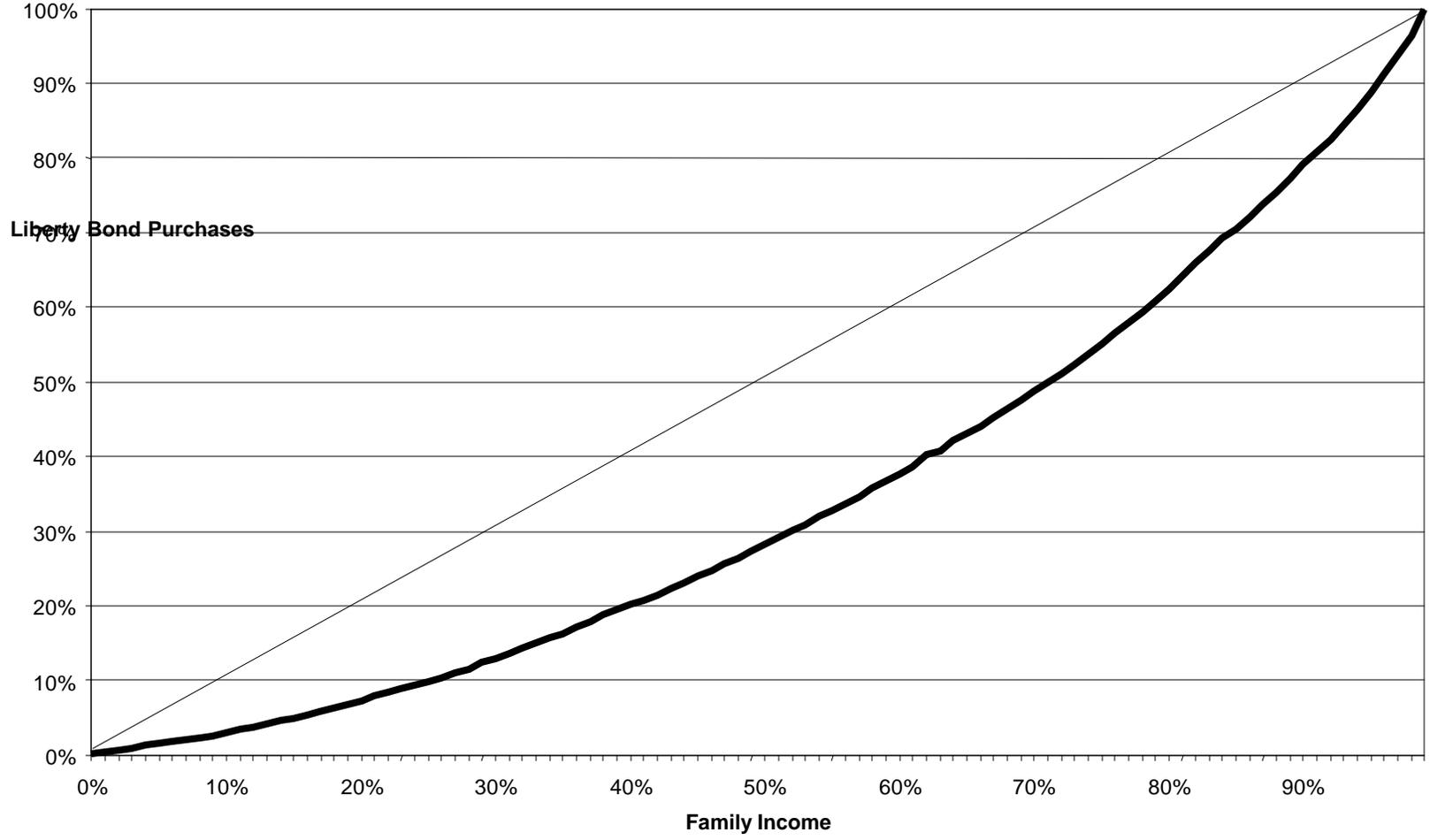


Figure 7
The Distribution of Liberty Bond Purchases by Income Class



Appendix

The Aaa bond rate is the Yield on High Grade Industrial Bonds, Aaa Rating, NBER series m13026. The Municipal bond rate is the Index of Yields of High Grade Municipal Bonds, NBER series m13023. The Federal Reserve discount rate is the Federal Reserve Bank of New York Discount Rate, series m13009. These series are available at www.nber.org. The yields and sales volumes for the Liberty bonds were compiled from the *Commercial and Financial Chronicle*. To compute the yields we used end of month prices and the Excel yield to maturity function. The yields for the First and Fourth Liberty Loans are given in the following table.

Yields to Maturity of the First and Fourth Liberty Loans, 1917-1929												
The First Liberty Loan (3.50% maturing in 1947)												
	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1917	n.a.	n.a.	n.a.	n.a.	n.a.	3.499	3.511	3.503	3.500	3.508	3.558	3.576
1918	3.610	3.612	3.557	3.551	3.507	3.526	3.509	3.413	3.493	3.503	3.555	3.528
1919	3.556	3.522	3.550	3.574	3.528	3.533	3.523	3.502	3.500	3.461	3.505	3.492
1920	3.600	3.832	3.679	3.991	3.998	4.057	3.994	4.117	4.041	3.896	4.049	4.050
1921	3.993	4.046	4.099	4.206	4.291	4.345	4.276	4.234	4.235	3.955	3.712	3.804
1922	3.786	3.676	3.601	3.535	3.500	3.495	3.449	3.449	3.460	3.469	3.495	3.440
1923	3.408	3.428	3.443	3.419	3.456	3.471	3.494	3.500	3.540	3.517	3.504	3.550
1924	3.543	3.560	3.568	3.519	3.500	3.415	3.414	3.461	3.445	3.427	3.454	3.437
1925	3.405	3.395	3.418	3.385	3.436	3.438	3.454	3.446	3.496	3.536	3.514	3.527
1926	3.496	3.430	3.442	3.452	3.452	3.405	3.413	3.425	3.479	3.470	3.475	3.420
1927	3.410	3.395	3.430	3.434	3.434	3.440	3.440	3.425	3.399	3.401	3.416	3.388
1928	3.375	3.389	3.417	3.410	3.462	3.495	3.504	3.542	3.615	3.561	3.527	3.509
1929	3.578	3.654	3.694	3.657	3.782	3.773	3.716	3.693	3.713	3.728	3.566	3.538
The Fourth Liberty Loan (4.25% maturing in 1948)												
1918	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	4.595	4.593	4.519	4.409	4.384	4.461
1919	4.524	4.562	4.583	4.509	4.510	4.510	4.585	4.612	4.522	4.553	4.624	4.668
1920	4.805	4.841	4.856	5.240	5.074	5.231	5.251	5.282	5.065	4.943	5.151	5.245
1921	5.131	5.151	5.115	5.117	5.121	5.144	5.093	5.085	4.866	4.710	4.418	4.440
1922	4.486	4.433	4.344	4.273	4.250	4.236	4.160	4.221	4.251	4.352	4.327	4.310
1923	4.360	4.389	4.425	4.425	4.352	4.375	4.380	4.365	4.361	4.399	4.374	4.366
1924	4.290	4.307	4.273	4.243	4.201	4.106	4.090	4.126	4.082	4.074	4.125	4.148
1925	4.117	4.139	4.137	4.111	4.092	4.069	4.117	4.104	4.120	4.120	4.126	4.130
1926	4.107	4.108	4.095	4.067	4.068	4.077	4.100	4.113	4.121	4.084	4.070	4.063

1927	4.015	4.008	4.007	4.019	4.059	4.032	4.014	4.017	4.016	3.998	3.973	3.997
1928	4.030	4.034	4.056	4.128	4.114	4.123	4.116	4.174	4.167	4.188	4.233	4.235
1929	4.248	4.264	4.360	4.284	4.336	4.326	4.329	4.344	4.384	4.297	4.180	4.156

Source: *Commercial and Financial Chronicle*, various issues.

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