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Financial Market Implications of the Federal Debt Paydown

THE UNITED STATES achieved its third consecutive federal budget surplus—a record $237 billion—in fiscal 2000.[1] This string of surpluses has allowed the Treasury Department to begin to pay off the national debt. After more than tripling from the early 1980s to the mid-1990s, outstanding marketable U.S. Treasury securities fell from just under $3.5 trillion in March 1998 to $3.0 trillion in July 2000. The Office of Management and Budget (OMB) projects that the surpluses will continue, causing the debt held by the public to be fully redeemed by 2012.[2]

Although a remarkable achievement, the paydown of the debt also raises some concerns. U.S. Treasury securities play a central role in the implementation of monetary policy and in the efficient working of financial markets more broadly. By reducing and possibly someday eliminating the stock of these securities, the debt paydown raises questions about how monetary policy will be conducted in the future and how financial markets will adapt to the diminished supply of this key instrument. The

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1. U.S. Treasury, "Monthly Treasury Statement," September 2000.

2. Office of Management and Budget, "Mid-Session Review," June 26, 2000. Debt held by the public includes both marketable and nonmarketable securities and totaled $3.4 trillion as of July 31, 2000. It excludes debt securities held as assets by U.S. government accounts ($2.2 trillion as of July 31, 2000) but includes Federal Reserve holdings.

Treasury's introduction of a debt buyback program in January 2000 and the striking inversion of the Treasury yield curve this year have heightened interest in these questions and spurred discussion as to which assets might be suitable Treasury substitutes.

Treasury securities play several critical roles in financial markets. Because these securities are considered free from default risk and are highly liquid across a wide range of issues, their yields are used as a proxy for risk-free interest rates. These properties, together with the presence of well-developed derivatives markets in which investors can sell Treasuries short, make them a useful reference benchmark and hedging instrument for other fixed-income securities. Their creditworthiness and liquidity also make Treasury securities a popular reserve asset for numerous financial institutions and the primary asset of the Federal Reserve.

Some of the very features that make Treasury securities an attractive benchmark and reserve asset are likely to be adversely affected by the debt paydown. In fact, recent events suggest that the reduced supply of Treasuries may already be disrupting the market and that more such disruptions may be in the offing. In February 2000, for example, the Treasury announced that its one-year bill would henceforth be issued only every thirteen weeks rather than every four weeks. As the last bill auctioned on the old cycle aged, the bill became very expensive to borrow in the market for repurchase agreements (repos). On May 31, for instance, dealers had to lend out funds at a very low 2.25 percent annual rate in order to secure the one-year bill as collateral. The liquidity of the issue in the cash market also suffered, with bid-ask spreads widening and trading volume plunging. At the same time, the issue became extremely expensive relative to other Treasuries of similar maturity.

With the debt paydown under way, market participants are already moving away from Treasury securities as a reference benchmark and hedging device and toward the debt securities of government-sponsored enterprises (such as Fannie Mae) and state-chartered corporations, and toward interest rate swaps.[3] These other instruments are liquid (although not as liquid as Treasuries), the debt securities can be borrowed in reasonably active repo markets, and a futures market was recently introduced for agency securities (and is being discussed for corporate securities). Furthermore, the

3. The benchmark uses of Treasury securities, the implications of the federal debt paydown, and the viability of alternative benchmarks are also discussed in Fleming (2000a).

credit risk in these instruments actually makes them potentially better hedging vehicles than Treasuries, because it can result in them trading at prices that track more closely those of other fixed-income securities that also have credit risk. Agency securities and swaps, in particular, are increasingly used to hedge positions, price new securities, and evaluate existing securities in U.S. fixed-income markets.

The Federal Reserve System has meanwhile taken several measures to adapt its conduct of monetary policy to the debt paydown. At its March 2000 meeting, the Federal Open Market Committee (FOMC) endorsed a "broad-gauge" study of the issues associated with changes in the system's asset allocation.[4] It also disclosed that, until that study's completion, the Fed could rely on temporary operations to meet reserve needs that could not comfortably be met with outright purchases of Treasuries. In fact, the Fed already relies on short-term repos and matched sale-purchase transactions rather than outright purchases and sales of Treasury securities to temporarily add and drain reserves. A declining stock of Treasuries should therefore not cause problems for the implementation of monetary policy.

It is possible, of course, that the projections of the Office of Management and Budget will prove inaccurate. Slower-than-expected growth, higher-than-expected spending, or lower-than-expected revenues could lead to significantly smaller surpluses and a correspondingly slower paydown of the debt. Alan Auerbach and William Gale, for example, are much less optimistic about the future surpluses.[5] Congressional Budget Office projections are more optimistic but assume that some debt will remain outstanding, even if the projected surpluses materialize, since longer-term securities will not be available for redemption.[6]

Even in the absence of funding needs, the government could still choose to issue Treasury securities and use the proceeds to accumulate private sector assets. The government would benefit from low funding costs even as it met market demand for safe and liquid securities, and it would be helping to maintain the infrastructure of the Treasury market for a possible

4. Board of Governors of the Federal Reserve, "Minutes of the Federal Open Market Committee: March 21, 2000" (www.bog.frb.fed.us/fomc/MINUTES/20000321.HTM).

5. Auerbach and Gale (2000).

6. Congressional Budget Office (2000).

return of funding needs in the future. This policy could be implemented by allowing Social Security funds to be invested in non-Treasury instruments, as has been proposed, or it could be implemented through another government entity.[7] Such a policy has its drawbacks, however, for it means that the government would be allocating credit, assuming credit risk, and potentially influencing the institutions in which it invested.

Despite the uncertainties about the magnitude of the debt paydown, it remains likely that much of the outstanding marketable Treasury debt will be paid off over the next decade. Even if the projected surpluses do not fully materialize, the stock of marketable Treasuries has already fallen significantly, and it is on a steep downward trajectory that is unlikely to be reversed quickly. Moreover, the evidence cited above, and explored in greater detail in the rest of this paper, suggests that the Treasury market has already been affected by the paydown, that market participants are moving away from Treasuries as a hedging and reference benchmark, and that the Fed is taking steps to adjust its portfolio in expectations of a further paydown.

U.S. Treasury Securities as a Benchmark and Reserve Asset

Treasury bills, notes, and bonds are issued by the federal government to finance budget shortfalls, the redemption of maturing securities, and short-term cash management needs.[8] Treasury bills have original maturities of one year or less. They pay no interest between issuance and maturity but are instead issued and traded at a discount to their face value. Treasury notes have original maturities of more than one but not more than ten years, and Treasury bonds have original maturities of more than ten years. Notes and bonds (coupon securities) are issued with a stated rate of interest and make coupon payments every six months.

A number of features contribute to the prominence of Treasury securities in financial markets. Treasury securities are backed by the full faith and credit of the U.S. government and are therefore considered free of

7. U.S. General Accounting Office (1998) examines the implications of investing Social Security funds in the stock market.

8. For a more detailed introduction to the Treasury securities market see Dupont and Sack (1999) and Fabozzi and Fleming (2000).

default risk. The creditworthiness and abundant supply of Treasury securities have fostered an extremely liquid, round-the-clock secondary market with extremely active trading and narrow bid-ask spreads.[9] In the first six months of 2000, for example, daily trading activity reported by the primary government securities dealers averaged $207 billion per day.[10] Treasuries also trade in a very active repo market in which dealers can borrow securities and finance their positions, as well as in an active futures market in which dealers can buy and sell securities for future delivery.[11]

Because Treasuries are considered free of default risk, their yields represent risk-free rates of return. These risk-free rates are used in a variety of analytical applications, including the forecasting of interest rates, inflation, and economic activity. Arturo Estrella and Frederic Mishkin, for example, show that the yield spread between the three-month Treasury bill and the ten-year Treasury note is valuable in predicting recessions.[12] Treasury yields are also used as a risk-free benchmark in the analysis of other fixed-income and non-fixed-income markets. In estimating the capital asset pricing model, for example, the rate on a Treasury bill is typically used as a proxy for the risk-free rate.

In addition to their creditworthiness, the liquidity of Treasury securities across a wide range of issues is important to their use as a risk-free benchmark. In an illiquid market, bid-ask bounce or temporary order imbalances can cause significant price moves. The liquidity of the Treasury market, in contrast, ensures that observed prices remain close to the market consensus of where prices should be, and that changes in prices reflect revisions in that consensus, not random noise. Similarly, in a less

9. Fleming (1997) describes the round-the-clock market, and Fleming (2000b) analyzes trading activity, bid-ask spreads, and other measures of Treasury market liquidity.

10. Federal Reserve Bank of New York (www.ny.frb.org/pihome/statistics/msytd.00). Primary dealers are firms with which the Federal Reserve Bank of New York interacts directly in the course of its open market operations. Because trading volume data are collected from all of the primary dealers but from no other entities, trades between primary dealers are counted twice, and trades between nonprimary dealers are not counted at all.

11. In a repo, a party agrees to exchange collateral for cash and, at the same time, to buy back that collateral at a specified price at some point in the future. A dealer owning a particular Treasury note, for example, might agree to sell that security to another dealer and to buy it back the next day. The first dealer can thus use the repo market to finance its positions, often at a favorable rate, and the second dealer can use the same market to borrow and then sell securities it does not hold in its portfolio. For a further introduction to repos, see Duffie (1996) and Jordan and Jordan (1997).

12. Estrella and Mishkin (1998).

integrated market, securities with similar cash flows might trade at very different prices. However, liquidity across Treasury issues, facilitated by the futures, repo, and zero-coupon markets, helps ensure that Treasury securities with similar cash flows trade at similar prices, and that prices are only minimally affected by issue-specific differences in liquidity, supply, or demand.[13]

Treasury securities are also used extensively as a reference benchmark and hedging instrument for other dollar-denominated fixed-income securities. An estimated $500 billion in adjustable-rate mortgages, for example, is referenced against the Treasury's one-year constant-maturity rate.[14] Similarly, when a fixed-rate corporate debt issue is initially sold, it is typically marketed in terms of a yield spread to a particular Treasury security rather than at an absolute yield or price.[15] Treasuries are also used as a hedge to manage investors' interest rate exposure. A dealer might, for example, sell Treasuries at the same time that it agrees to buy a block of agency securities from one of its customers, and then buy back the Treasuries as the agency securities are sold off. In this way the dealer's exposure to changes in interest rates that are common to both Treasuries and agency securities is eliminated. This ability to hedge in the Treasury market increases dealers' willingness to make markets and take positions in other markets and thereby improves the liquidity of these other markets.

To serve as an attractive reference benchmark, Treasury yields should tend to change in line with those of other securities. In bringing a new

13. Zero-coupon securities are created from existing Treasury notes by separating, or stripping, the coupon payments both from the principal and from one another into individual securities. The Treasury's STRIPS (Separate Trading of Registered Interest and Principal Securities) program, introduced in February 1985, facilitates stripping and reconstitution and thereby improves market liquidity. For a recent analysis of Treasury market integration, see Bennett, Garbade, and Kambhu (2000).

14. Sarah Landis, "Adjustable-Rate Mortgages Face Effect of the Elimination of One-Year Bills," *Wall Street Journal,* August 14, 2000. The one-year constant-maturity rate is interpolated from the daily yield curve based on market quotations obtained from the Fed. Additional detail on the series is available at www.bog.frb.fed.us/releases/H15/update/.

15. In contrast, floating-rate issues are typically marketed and priced relative to the London interbank offer rate, the short-term rate charged among banks in the Eurodollar market. An August 1999 issue of DaimlerChrysler AG, for example, had a three-year floating-rate portion marketed relative to the London interbank offer rate (LIBOR) along with five-year and ten-year fixed-rate portions marketed relative to comparable Treasuries (Gregory Zuckerman, "Under Boom Economy, Strain over Debt," *Wall Street Journal,* August 18, 1999, p. C1).

corporate issue to market, for example, Treasuries are used as a reference because changes in Treasury yields are correlated with changes in corporate yields. The liquidity of the Treasury market, the rarity of large, idiosyncratic changes in Treasury prices, and the fact that much of a fixed-income security's interest rate exposure is common with that of a Treasury security of comparable maturity have historically made Treasuries a popular reference benchmark. The simplicity and familiarity of Treasury securities undoubtedly contributes to this popularity.

For Treasury securities to serve as an attractive hedging instrument, correlation of yields is again important, but so are liquidity and the existence of active repo and futures markets. By definition, a hedge should reduce one's interest rate exposure to a position by providing a return that is highly and negatively correlated with the original position's return. Market liquidity is also essential, as hedgers must be able to quickly buy and sell large positions with minimal transactions costs. As hedging frequently involves taking short positions, the ability to borrow securities at low cost in the repo market or to sell securities for future delivery in the futures market is also necessary.

The creditworthiness and liquidity of Treasury securities have also made them central to the implementation of monetary policy. To maintain the federal funds rate around its target level, the Fed adjusts reserve balances through open market operations. "Permanent" additions to reserves are conducted through secondary market purchases of Treasury securities; these purchases totaled $45 billion (at par value) in 1999 alone.[16] As of August 2, 2000, Federal Reserve banks held $524 billion in Treasury securities, or 17 percent of marketable Treasuries outstanding.[17] "Temporary" additions to reserves are conducted through intervention in the repo market. In these operations the Fed effectively lends funds for a period of one to ninety days while accepting Treasury securities, agency debt securities, or mortgage-backed securities as collateral. To temporarily drain

16. Federal Reserve Bank of New York, "Domestic Open Market Operations during 1999" (www.ny.frb.org/pihome/annual.html). These operations are termed "permanent" because they are intended to address permanent changes in the supply of or demand for balances at the Fed and because they permanently affect the size of the Fed's System Open Market Account. "Temporary" operations, in contrast, are used to address shorter-term movements in the supply of or demand for balances.

17. Federal Reserve Bank of New York, "System Open Market Account Holdings" (www.ny.frb.org/pihome/statistics/); these data exclude the effects of sales under matched sale-purchase transactions.

reserves, the Fed enters into a matched sale-purchase transaction in which it effectively borrows funds for one to ninety days while providing Treasury bills as collateral.

This same creditworthiness and liquidity also make Treasuries a popular reserve asset for other financial institutions. As of August 2, 2000, foreign official and international accounts at Federal Reserve banks held $615 billion in Treasury securities, or about 20 percent of marketable Treasury securities outstanding.[18] These institutions' willingness to hold assets in U.S. dollars rests at least partly on their ability to invest in safe and liquid Treasuries. Likewise, domestic depository institutions held $235 billion in Treasuries, or 8 percent of marketable Treasury securities outstanding, as of March 31, 2000.[19] Holding safe and liquid assets like Treasury securities gives these institutions the ability to meet their customers' unexpected liquidity needs by quickly selling such assets, if necessary.[20]

Implications of the Debt Paydown for the Behavior of the Treasury Securities Market

Because only a small fraction of the federal debt turns over each year, what might appear as a modest paydown to date has already resulted in substantial reductions in new issuance of Treasury securities. Issuance sizes have been reduced (for example, those of bills in March 1997), issuance frequencies have been reduced (for example, that of the five-year note in 1998), and some issues have been eliminated altogether (for example, the three-year note in 1998).[21] Treasury bill issuance through

18. Board of Governors of the Federal Reserve, "Federal Reserve Statistical Release H.4.1, Factors Affecting Reserve Balances" (www.bog.frb.fed.us/releases/H41/). Foreign investors in the aggregate held $1.2 trillion in Treasury securities as of June 30, 2000, or 40 percent of marketable Treasury securities outstanding on that date (*Treasury Bulletin,* September 2000, pp. 23 and 47).

19. *Treasury Bulletin,* September 2000, p. 47.

20. Saidenberg and Strahan (1999) discuss this "buffer stock" approach to providing liquidity in their analysis of bank lending during the financial market turmoil of fall 1998.

21. Significant debt management changes are typically announced at the Treasury's quarterly refunding press conferences. The press releases for such conferences are posted at www.treas.gov/press/releases. Also see Dupont and Sack (1999), U.S. General Accounting Office (1999), and Bennett, Garbade, and Kambhu (2000) for a discussion of recent changes in Treasury debt management.

the first seven months of 2000 totaled $933 billion, down 17 percent from the comparable months of 1996.[22] Issuance of Treasury coupon securities fell a much sharper 49 percent over the same period, from $375 billion to $190 billion.

To maintain large issue sizes and the liquidity of the on-the-run securities, the Treasury announced a revision to its original issue discount rules in November 1999 and launched a debt buyback program in January 2000.[23] The rule changes allow the Treasury to reopen its most recent issues within one year of issuance without concern that the price of those issues may have fallen by more than a small amount. As a result, the Treasury was able to announce in February 2000 that every other auction of its five-, ten-, and thirty-year securities would be a reopening of the previous auction. Under the debt buyback program, the Treasury redeems its outstanding unmatured securities by purchasing them in the secondary market through a reverse auction. By buying back off-the-run securities, the Treasury is able to maintain large issue sizes for new securities.

One implication of the reduced issuance of Treasuries is that the cost of borrowing these securities in the repo market may increase. The recent behavior of the one-year Treasury bill is instructive. As already noted, at its February 2000 quarterly refunding the Treasury announced that new issuance of the one-year bill would be reduced from every four weeks to every thirteen weeks. The one-year bill auctioned on February 29 (and maturing March 1, 2001) was the last sold on the old cycle and thus the first to remain on the run for thirteen weeks instead of four. The issue size of the bill, at $10 billion, was unchanged from that of its predecessors.[24]

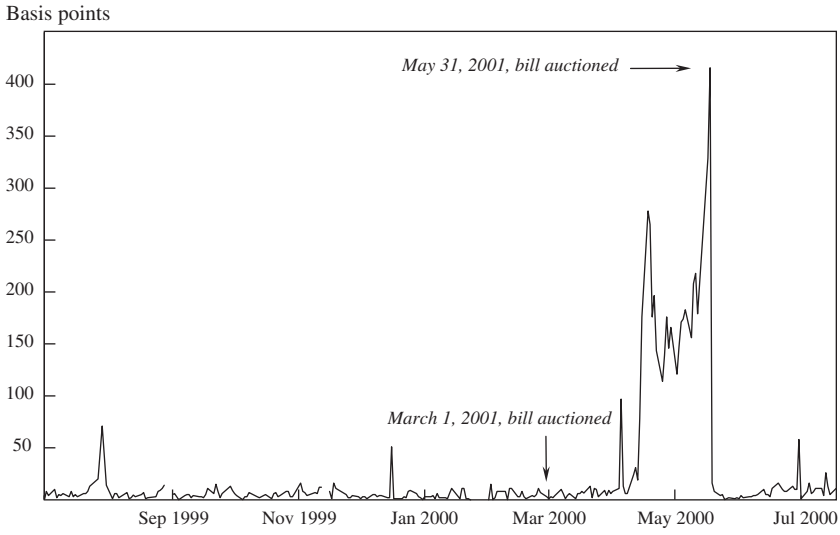
In late April 2000 the cost of borrowing the March 1, 2001, bill became strikingly high. On April 30, for example, an investor had to lend funds at a 4.00 percent annual rate to secure the one-year bill as collateral on an overnight repo. The general Treasury collateral rate on the same day was 5.75 percent. In such a case, when an investor must lend funds at a rate

22. Issuance figures are calculated using data available at the Bureau of the Public Debt's website (www.publicdebt.treas.gov/of/ofaicqry.htm).

23. "On-the-run" securities are the most recently issued securities of a given maturity. Older securities of a given maturity are called "off-the-run."

24. In contrast, when issuance of the five-year Treasury note was reduced from monthly to quarterly in 1998, issue sizes were increased from $11 billion to $16 billion.

Figure 1. Repurchase Agreement Market Specialness of the On-the-Run One-Year Treasury Bill, July 1999–July 2000



Source: Author's calculations based on data from GovPX.
a. Overnight general collateral rate less the collateral rate for on-the-run bills. Daily data using 9:00 a.m. quotes.

below the general collateral rate to borrow a security, the issue is said to be "on special." Figure 1 shows that this differential or "specialness" of the one-year bill reached 1.75 percent (175 basis points) on April 28 and peaked at 415 basis points on May 31. Shorter-term bills were also on special over this period, although much less so than the one-year bill; the specialness of the three-month bill peaked at 123 basis points on May 30, and that of the six-month bill at 35 basis points on May 3. The sharp drop in specialness of the one-year bill on June 1 reflects the crossover from the March 1, 2001, bill to the new one-year bill auctioned the previous day.

Why did the one-year bill become so expensive to borrow? It is likely that dealers who shorted the one-year bill when it was relatively new did not anticipate how scarce and expensive the issue would become in the repo market as it aged beyond four weeks. An analogy can be drawn between this episode and what often happens with Treasury coupon securities. Issues become expensive to borrow when borrowing demand is high

Table 1. Repurchase Market Specialness of On-the-Run Treasury Coupon Securities, 1997–2000[a]

Basis points

	Two-year note		*Five-year note*		*Ten-year note*		*Thirty-year bond*	
Year	*Mean*	*Standard deviation*	*Mean*	*Standard deviation*	*Mean*	*Standard deviation*	*Mean*	*Standard deviation*
1997	28.3	38.3	63.0	70.4	132.6	118.2	65.4	95.2
1998	32.0	54.8	81.6	101.9	159.4	141.8	151.1	149.9
1999	33.6	48.5	79.7	91.5	180.7	153.7	118.2	120.9
2000[b]	50.6	42.4	103.2	128.3	145.5	108.4	55.5	81.0

Source: Author's calculations based on data from GovPX.

a. Difference between the overnight general collateral rate and the collateral rate on the indicated security (daily averages).

b. Through July 27.

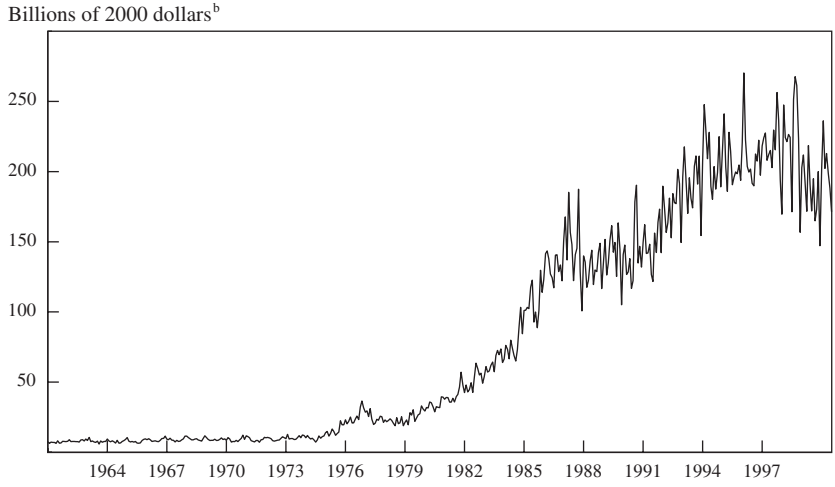
relative to lendable supply. On-the-run Treasury coupon securities frequently trade on special because coupon securities are often shorted for hedging or speculative purposes and because on-the-run securities are the most liquid. As on-the-run coupon securities age, they typically become more expensive to borrow in the repo market as they are sold off by the dealer community and their available supply decreases.[25]

Despite this episode with the one-year bill, repo market borrowing costs have not generally shown much of an increase in recent years. Table 1 reports the average level of specialness in each of the last few years for on-the-run coupon securities of various maturities. It shows that specialness in 2000 (through July 31) is somewhat higher than usual for the two- and five-year notes, but lower than usual for the ten-year note and the thirty-year bond. The absence of a substantial increase in specialness in light of reduced Treasury issuance may partly reflect reduced demand to borrow Treasuries (as investors adopt substitutes), but it probably also reflects the fact that the lendable supply of Treasuries has decreased less than the issuance. This has happened because holders of Treasury securities, such as the Fed, have become more willing to lend out specific issues from their portfolios.[26] The Treasury's steps toward more frequent reopening of

25. Keane (1996) documents this pattern of repo rates over the auction cycle.

26. See Federal Reserve Bank of New York, "Announcement of Revisions to the SOMA Securities Lending Program," February 12, 1999 (www.ny.frb.org/pihome/news/announce/1999/soma.html).

Figure 2. Daily Trading Volume of Treasury Securities, 1961–2000[a]



Source: Federal Reserve Bank of New York data; *Federal Reserve Bulletin*, various issues.
a. Monthly averages of daily trading volume (par value) as reported by the primary dealers. Trades between primary dealers are reported by both counterparties and are therefore double-counted.
b. Adjusted for inflation using the implicit GDP deflator.

issues also result in increased issue sizes and hence an increase in lendable supply for a given issue.

Another likely implication of the projected debt paydown is a deterioration in market liquidity. In fact, market participants are already raising concerns about liquidity as the supply of marketable Treasuries has declined.[27] Although data are insufficient to allow an examination of many measures of liquidity on a historical basis, average daily trading volume data are available and are plotted by month for the past forty years in figure 2. Trading volume increased sharply between the mid-1970s and the mid-1990s with the growth in federal debt, with the development of the Treasury STRIPS market, and with the introduction and expansion of other fixed-income markets such as the mortgage-backed securities market. The peak in trading volume roughly corresponds with the March 1997

27. See, for example, "Liquidity Angst Grows in Treasury Market," *BondWeek,* March 15, 1999, p. 1, and Gregory Zuckerman, "Pared Treasury Supply Poses Risks: Paying Off Debt Has a Downside," *Wall Street Journal,* January 27, 2000, p. C1.

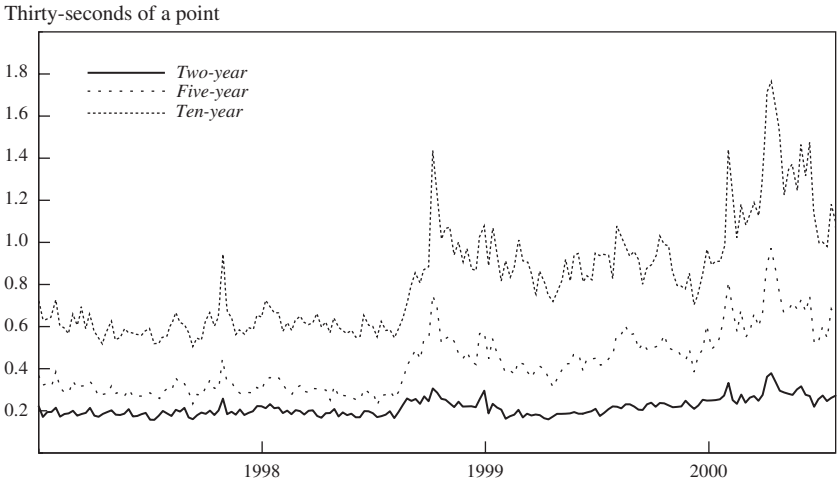
peak in marketable securities outstanding. The recent fall in trading volume, which corresponds to the decreased volume of securities outstanding, is broadly consistent with other evidence that the market has become less liquid.

Market liquidity can be assessed more precisely for recent years and has shown a marked deterioration since 1998. Figure 3 plots the average weekly bid-ask spreads of the on-the-run notes. Although spreads have widened, suggesting a reduction in market liquidity, the role of reduced Treasury issuance is not clear. Most of the sharp widenings in these spreads are associated with equity market declines or general financial market turmoil (such as that surrounding the near failure of Long-Term Capital Management in September 1998). In February 2000, the spread widenings seem to have been precipitated by debt management announcements at the Treasury's quarterly refunding press conference. Even in this case, it is not easy to interpret the market's response, since the announcements pertained to *future* issue sizes and frequencies.

The behavior of the one-year bill is again instructive, as liquidity deteriorated markedly in this part of the market after the issuance frequency of the bill was reduced. As figure 4 shows, bid-ask spreads for this security increased sharply in May 2000, averaging over 1.5 basis points in late May, higher than their peak in the fall of 1998. Furthermore, trading volume in the one-year bill plummeted in May 2000, as shown in figure 5. Bid-ask spreads on shorter-term bills also widened sharply in May 2000, but trading volume declined much more modestly for these securities. Significantly, trading volume remained low in the new one-year bill auctioned in May 2000, suggesting that what transpired with the previous bill may have long-lasting implications. Dealers who had taken short positions in the previous bill, only to have difficulty covering them, were probably less willing to take short positions in the new bill.

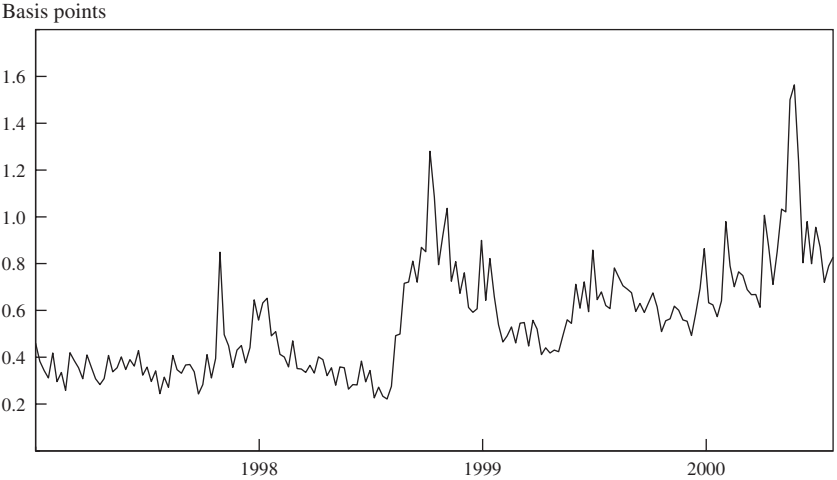
Decreased Treasury issuance may also cause some Treasury securities to perform differently from others, and some segments of the Treasury market to perform differently from other segments. Figure 6 plots the yield spread between the thirty-year Treasury bond and the ten-year Treasury note. The spread widened sharply amid the financial market turmoil of the fall of 1998, as reported "flight-to-quality" flows caused yields on shorter-term Treasuries to fall more than did longer-term yields. Later, in early 2000, the launch of the debt buyback program and speculation that

Figure 3. Bid-Ask Spreads of On-the-Run Treasury Notes by Maturity, 1997–2000[a]



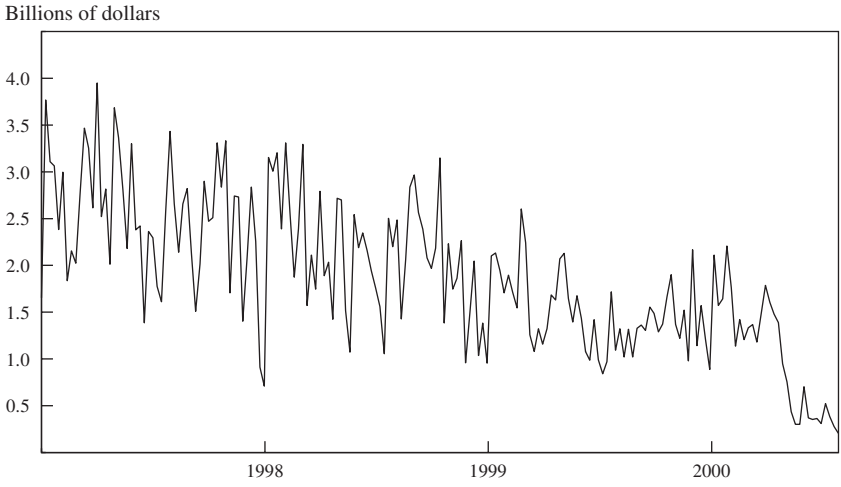
Source: Author's calculations based on data from GovPX.
a. Weekly averages of interdealer bid-ask spreads.

Figure 4. Bid-Ask Spreads of the On-the-Run One-Year Treasury Bill, 1997–2000[a]



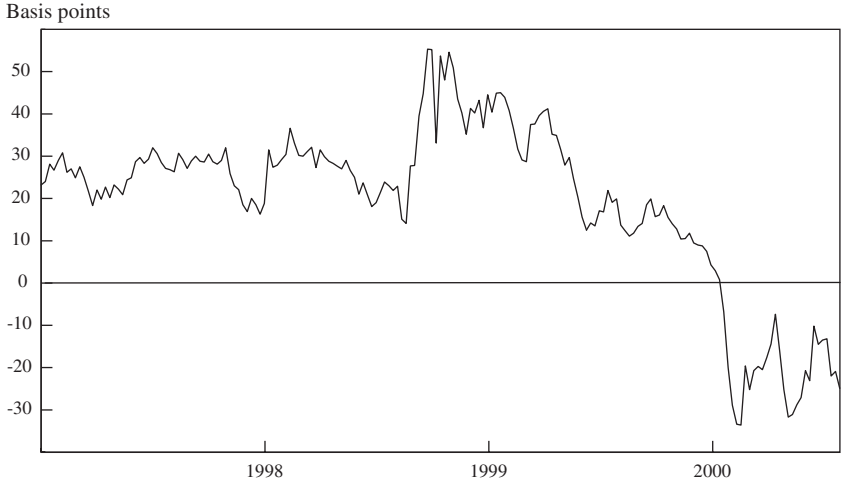
Source: Author's calculations based on data from GovPX.
a. Weekly averages of interdealer bid-ask spreads.

Figure 5. Daily Trading Volume of the On-the-Run One-Year Treasury Bill, 1997–2000[a]



Source: Author's calculations based on data from GovPX.
a. Weekly averages of interdealer trading volume.

Figure 6. Yield Spread between Thirty-Year and Ten-Year Treasury Securities, 1997–2000[a]



Source: Author's calculations based on data from Bloomberg.
a. Data are weekly closes.

issuance of the thirty-year bond might soon end contributed to a plunge in the thirty-year yield relative to shorter-term yields.[28] Spreads between on-the-run and off-the-run securities widened further at the same time.[29] J. Huston McCulloch has noted that these spreads can be so wide as to imply negative forward rates.[30]

Again, the behavior of the one-year bill is informative. Figure 7 plots the yield of the coupon security with the maturity closest to one year less the yield of the on-the-run one-year bill. The spread is positive for the entire sample, reflecting the price premium (or yield discount) of bills versus coupon securities.[31] This premium increased sharply in late April and May of 2000, at the same time that the one-year bill was on special in the repo market, peaking at an average spread of 56 basis points in the week ending May 26. The premium came down somewhat after the new one-year bill was issued but remained quite high by historical standards, averaging 43 basis points in the week ending July 28.

Finally, decreased Treasury issuance may also cause the whole Treasury market to perform differently from other fixed-income markets as Treasuries become scarcer and thus relatively more valuable. Figure 8 plots yield spreads between the ten-year Treasury note and three other types of instrument: interest rate swaps, agency debt securities, and corporate debt securities. After being relatively stable through much of the 1990s, spreads widened significantly in the fall of 1998 and again in early 2000. The coincidence of part of the widening with the Treasury's debt management

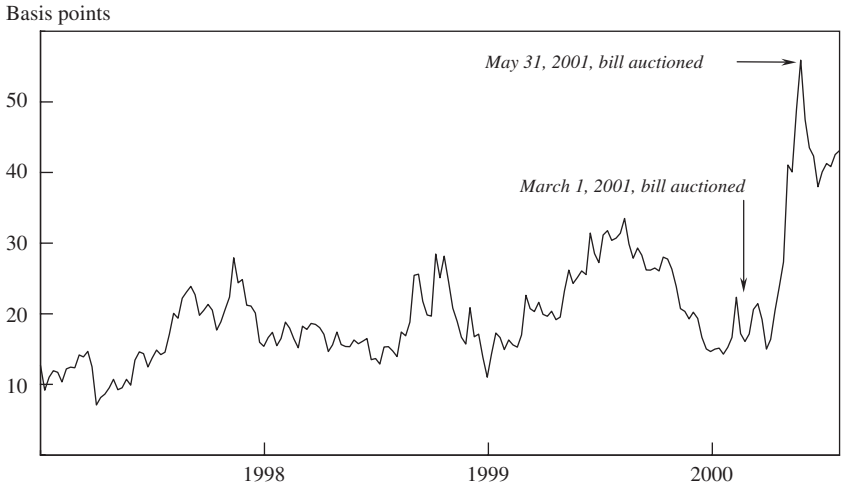
28. The timing of the inversion on and around the days of debt management announcements suggests that economic fundamentals are not the sole explanation. Two of several articles relating the debt management changes to the inversion include William Pesek, Jr., "It's a Tale of Two Bond Markets: The 30-Year Treasury, and Everything Else," *Barron's,* January 31, 2000, p. MW8, and Joshua Chaffin, "Search on to Replace the 30-Year Bond: Most Bond Traders Have Turned to the 10-Year Note as the New Market Benchmark," *Financial Times,* May 19, 2000, p. v.

29. Spreads between on-the-run and off-the-run securities widened significantly during the financial market turmoil of fall 1998 (Bank for International Settlements, 1999; Fleming, 2000a, 2000b) and were already wider than usual before the debt management announcements.

30. Using February 17, 2000, data, McCulloch (2000) estimates that investors are paying the Treasury a 3.09 percent annual rate to hold their principal for the year and a quarter between February 2029 and May 2030. He argues that this anomaly is not adequately explained by differences in liquidity or expected specialness.

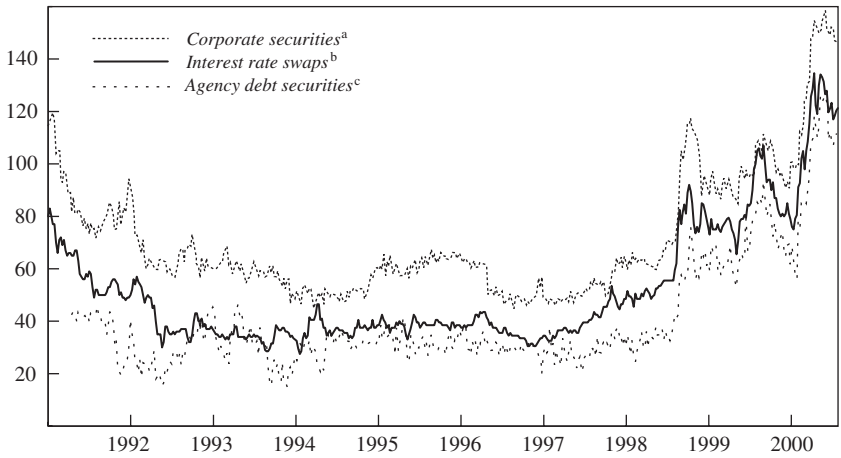
31. The yield differential between Treasury bills and coupon securities is examined by Amihud and Mendelson (1991) and Kamara (1994).

Figure 7. Yield Spread between Off-the-Run Treasury Coupon Securities and the On-the-Run One-Year Treasury Bill, 1997–2000[a]



Source: Author's calculations based on data from Bear Stearns and GovPX.
a. Weekly averages of daily data, calculated as the yield of the coupon security with the maturity closest to one year less the yield of the on-the-run one-year bill. When two or more coupon securities have the closest maturity, their average yield is used.

Figure 8. Yield Spreads between Selected Non-Treasury Instruments and the Ten-Year Treasury Note, 1991–2000



Source: Author's calculations based on data from Bloomberg and Merrill Lynch.
a. Seven- to ten-year index yield for Aa/AA-rated U.S. corporate securities.
b. Ten-year semiannual fixed versus three-month LIBOR.
c. Ten-year option-free index yield.

announcements of early 2000 suggests that economic fundamentals are not the only explanation.

The increasingly disparate performance of Treasury securities is also evident in table 2, which reports correlations among four-week yield changes for the series plotted in figure 8. The top panel reports these correlations from the beginning of the sample period (April 19, 1991) through July 1998, the month preceding the financial market turmoil related to the devaluation of the Russian ruble and the near failure of Long-Term Capital Management. The bottom panel reports correlations from then through the end of the sample period (July 28, 2000). The yields for each of the three non-Treasury instruments correlate highest with Treasuries for the first part of the sample period, and lowest with Treasuries for the second part. As an example, the correlation between agency securities and Treasuries is 0.978 in the first period, compared with 0.975 between agency securities and swaps, but in the second period the correlation between agency securities and Treasuries is only 0.942, compared with 0.976 between agency securities and swaps. The increasingly idiosyncratic behavior of the Treasury market, due to reduced Treasury issuance, partially explains the breakdown in the correlations with Treasuries.[32]

In summary, the paydown of the federal debt could reasonably be expected to affect the attributes that make Treasury securities an attractive benchmark, and in fact there is already evidence of market disruptions. The cost of borrowing the one-year bill in the repo market increased sharply after the issuance frequency of the bill was reduced. Furthermore, the entire Treasury market is less liquid than it once was, although the role of reduced Treasury supply in this development is not conclusive. In addition, particular Treasury securities (such as the one-year bill maturing March 1, 2001), certain parts of the market (such as that for thirty-year bonds), and possibly even the entire Treasury market are showing signs that the paydown is leading to increased scarcity value and increased idiosyncratic behavior among Treasuries.

32. The evidence from correlations is less compelling when the yield changes are measured over shorter intervals. This may reflect short-term idiosyncratic price behavior, or data measurement problems for the non-Treasury instruments, or both.

Table 2. Correlations of Changes in Yields among Fixed-Income Instruments, 1991–2000[a]

Instrument	*Treasury debt*	*Agency debt*	*Corporate debt*	*Swaps*
		April 19, 1991, to July 31, 1998		
Treasury debt[b]	1.000			
Agency debt[c]	0.978	1.000		
Corporate debt[d]	0.986	0.973	1.000	
Swaps[e]	0.993	0.975	0.981	1.000
		July 31, 1998, to July 28, 2000		
Treasury debt	1.000			
Agency debt	0.942	1.000		
Corporate debt	0.955	0.964	1.000	
Swaps	0.940	0.976	0.964	1.000

Source: Author's calculations based on data from Bloomberg and Merrill Lynch.
a. Correlations of four-week changes in yields for the indicated period.
b. On-the-run ten-year Treasury note.
c. Bloomberg's ten-year option-free agency securities index.
d. Merrill Lynch's index of seven- to ten-year Aa/AA-rated corporate bonds.
e. Ten-year semiannual fixed versus three-month LIBOR swap rate.

Implications of the Debt Paydown for the Benchmark Role of Treasury Securities

The expected paydown of the federal debt challenges Treasury securities' benchmark role. In fact, recent changes in the market are already forcing market participants to reassess how they use Treasury securities as a benchmark and to start using other instruments in place of Treasuries. Concerns with the reference and hedging roles of Treasuries, in particular, are attracting significant attention.[33] In contrast, relatively little attention has been paid to the implications of the paydown for Treasury securities' role as a proxy for risk-free rates. This may reflect the fact that Treasuries remain free of default risk and quite liquid, and that the market's uses as a risk-free benchmark are less pressing to market participants than its uses as a reference and hedging device.

33. See, for example, John M. Berry, "Treasuries' Vanishing Act; As U.S. Borrowing Shrinks, Investors Big and Small Seek Safety Elsewhere," *Washington Post,* July 30, 2000, p. H1, and Simon Boughey, "Casting a Long Shadow: With Fewer Treasurys and Alternative Benchmarks Uncertain, the Credit Markets Turn Chaotic," *Investment Dealers' Digest,* April 3, 2000, p. 16.

The recent idiosyncratic behavior of Treasury securities seems to explain much of the dissatisfaction with their reference and hedging roles. Changes in the premium accruing to on-the-run Treasury securities lead to a divergence in performance between these and other fixed-income securities, making Treasuries a poorer hedge and their yield a poorer reference rate. Reflecting this divergence, market participants have experimented with using off-the-run Treasuries as references for bringing new corporate issues to market.[34] Unfortunately, the same feature that may make off-the-run Treasuries a better gauge of Treasury market performance, namely, their relative lack of liquidity, also makes them more susceptible to idiosyncratic price changes and thus a poor hedging vehicle.

Like the spread between on-the-run and off-the-run securities, the seemingly idiosyncratic behavior of the thirty-year bond sector has led to a divergence in performance between thirty-year Treasury bonds and other thirty-year securities, making the Treasury bond a less effective reference and hedging security. Underwriters bringing new corporate issues to market have thus tried using ten-year Treasuries as references for thirty-year corporate bonds.[35] However, the potential for changes in the slope of the yield curve suggests that a ten-year Treasury is not a good benchmark for this purpose.

In the short end of the market as well, the idiosyncratic behavior of the one-year Treasury bill is having unintended consequences for that security's reference role. A Treasury market strategist quoted in the August 14, 2000, *Wall Street Journal* observed that " 'Anyone who has a mortgage referenced against the one-year CMT' [constant-maturity Treasury] that has reset in the past few months is paying 0.35 percentage point less 'than they would be without the scarcity of the year bill.' "[36] The Treasury indicated at its May and August 2000 quarterly refunding press conferences that, in consideration of the bill's elimination, it will work with Congress to revise other such provisions that reference the bill.

34. Gregory Zuckerman, "Quirk in Yields Is Making Bonds More Attractive," *Wall Street Journal,* February 2, 1999, p. C1.

35. Gregory Zuckerman and Sonoko Setaishi, "Treasury Prices Drop as Supply Concerns Ease: Vodafone Finds Demand for $5.25 Billion Issue," *Wall Street Journal,* February 8, 2000, p. C21.

36. Sarah Landis, "Adjustable-Rate Mortgages Face Effect of the Elimination of One-Year Bills," *Wall Street Journal,* August 14, 2000, quoting Michael Cloherty, a Treasury strategist at Credit Suisse First Boston Corporation.

Possible Alternative Benchmarks to Treasury Securities

Alternatives to Treasury securities are also being investigated and in some cases adopted for reference and hedging purposes. Among the potential alternatives are agency debt securities, corporate debt securities, and interest rate swaps.

Agency Debt Securities

Agency securities are obligations of federal government agencies or government-sponsored enterprises such as Fannie Mae, Freddie Mac, the Federal Home Loan Banks (FHLBanks), the farm credit banks, Sallie Mae, and the Tennessee Valley Authority. These agencies issue debt securities to finance activities that are supported by public policy, including home ownership, farming, and education. Their securities are typically not backed by the full faith and credit of the U.S. government as Treasury securities are, and therefore they trade with some credit risk. They are nevertheless considered to be of high credit quality and receive the highest ratings from the major rating agencies.[37]

Seeking to capitalize on the reduction in Treasury supply and the market's interest in large, liquid issues, some agencies have introduced their own benchmark debt issuance programs, starting with Fannie Mae's Benchmark Notes program in January 1998. These programs provide for the regular issuance of large-sized, noncallable coupon securities in a range of maturities, and thus mimic the Treasury's issuance practices. As table 3 shows, the most recent (as of July 31, 2000) benchmark coupon issues of the three largest agencies have generally ranged from $2 billion to $8 billion and are thus about one-fifth to two-thirds as large as comparable Treasury issues.

The performance of agency securities relative to that of other fixed-income securities suggests that they may be good reference and hedging vehicles. As can be seen in figure 8 and table 2, yields on agency securities tend to move closely with those of swaps and corporate bonds over long periods. These co-movements suggest a credit risk component to interest rates that is common to agency securities, swaps, and corporate securi-

37. For more detail on the agency debt securities market, see Fabozzi and Fleming (2000).

Table 3. Issue Sizes of Selected Benchmark Agency and Treasury Coupon Securities, 2000[a]

Billions of dollars

Issue maturity	*Fannie Mae benchmark*	*Freddie Mac reference*	*FHLBanks global*[b]	*FHLBanks tap*[c]	*Treasury*[d]
Two-year	3.0		3.0	2.3[e]	10.0
Three-year	3.0	5.0		2.4[e]	
Five-year	5.5	4.0		1.5[e]	12.0
Seven-year	4.0			0.5[e]	
Ten-year	3.0	8.0[e]		1.0[e]	18.0[e]
Thirty-year	2.0	3.0[e]			10.0

Sources: Data from Bloomberg; Fannie Mae; Office of Finance, Federal Home Loan Banks; Freddie Mac.

a. Issues are the most recent noncallable benchmark coupon issues as of July 31. Securities more than one year old are excluded.

b. Issues under the global debt program are typically issued through one-time auctions, like the benchmark issues of other agencies, whereas those under the tap program are reopened on an ongoing basis over a period of several months.

c. Listed FHLBanks tap issues are limited to those designated as on the run by the FHLBanks.

d. Excludes amounts issued to refund maturing securities of the Federal Reserve banks as well as amounts that Federal Reserve banks bid for on behalf of foreign and international monetary authorities.

e. Reopened after original issue.

ties, but not Treasuries. Interestingly, then, the credit risk in agency securities actually gives them the potential to be better reference and hedging instruments than Treasuries, as it allows their performance to correlate more closely with that of other securities. On the other hand, the presence of credit risk also means that there is an idiosyncratic risk component to agency securities. This is particularly relevant given the proposals to end some of the privileges that the government-sponsored enterprises now enjoy.[38]

An active repo market in agency securities has developed, allowing market participants to borrow these securities for hedging and trading purposes. In addition, an active futures market has been developing quickly since contracts started trading on the Chicago Board of Trade and the Chicago Mercantile Exchange in March 2000. Agency securities often trade on special in the repo market, although differences in repo market specialness and liquidity have so far resulted in only minor valuation differences. The relative unimportance of idiosyncratic factors in determining

38. See, for example, Michael Schroeder and Gregory Zuckerman, "Treasury Official's Warning Rocks Bond Market, Challenging Fannie Mae's Goal to Be Benchmark," *Wall Street Journal,* March 23, 2000, p. C28, and Kathleen Day, "Greenspan Urges Review of Fannie, Freddie Subsidies," *Washington Post,* May 24, 2000, p. E3.

yields helps explain why the yield curve for the Fannie Mae benchmark issues, shown in figure 9, is relatively smooth, particularly when compared with the constant-maturity Treasury yield curve. However, increased demand to borrow and trade agency benchmark issues could cause issue-specific differences to become more important in the future.

The liquidity of agency securities does not yet match that of Treasury securities. Daily trading in agency coupon securities by the primary government securities dealers averaged $17.5 billion through the first six months of 2000, compared with $178.8 billion in Treasury coupon securities.[39] Bid-ask spreads for agency securities are roughly ½ to 1 basis point for on-the-run benchmark issues and 1 to 2 basis points for off-the-run issues.[40] In contrast, bid-ask spreads for Treasury notes, plotted in figure 4 in price terms, are typically less than ½ basis point in yield terms.

In summary, agency debt securities are increasingly used both as a reference benchmark and hedging instrument. The yields on the agencies' benchmark securities are used as barometers of the agency market for monitoring and analytical purposes, and new debt issues have been marketed at yields stated relative to those on benchmark agency securities.[41] Agency securities are also actively used as hedging vehicles for both corporate debt and mortgage-backed securities. Agency securities are likely to assume an increasingly significant benchmark role, although their liquidity is limited by the size of the market, and their credit risk is likely to remain a concern.

Corporate Debt Securities

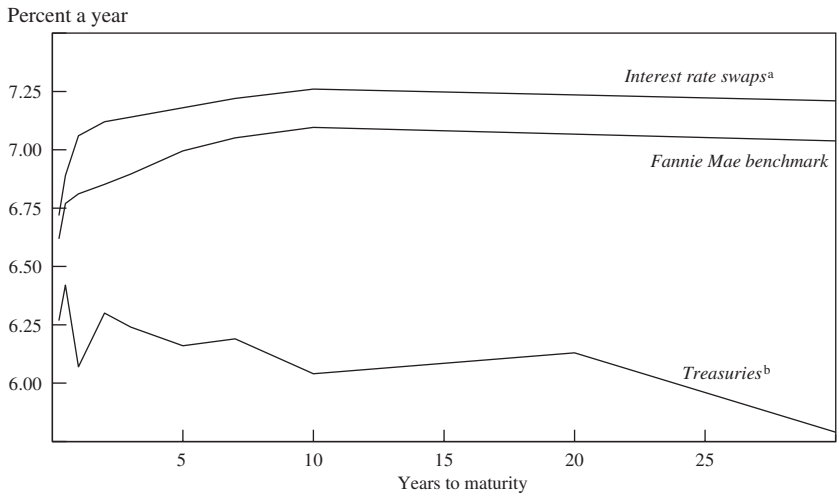
Some large corporations have recently increased the size and regularity of their debt issues to meet investor demand for large, liquid issues. Ford Motor Company, in particular, announced in June 1999 its Global Landmark Securities (or GlobLS) program, modeled on the programs of Fannie Mae and Freddie Mac. Under this program, Ford and its financing subsidiary Ford Motor Credit Company have stated that they will bring offerings of at least $3 billion to market two to four times a year.

39. Federal Reserve Bank of New York (www.ny.frb.org/pihome/statistics/msytd.00).

40. Fannie Mae, *Funding Notes,* Vol. 5, June 2000, p. 3.

41. In August 1999, for example, a new issue of the Private Export Funding Corporation was marketed in terms of Fannie Mae's benchmark ten-year note (Gregory Zuckerman and John Montgomery, "Bonds Sustain Rally on Low Inflation, with Investors Expecting Low Inflation and Restraint on Rates from Fed," *Wall Street Journal,* August 26, 1999, p. C17).

Figure 9. Yield Curves for Fannie Mae Benchmark Securities, Interest Rate Swaps, and Treasury Securities, July 31, 2000



Source: Bloomberg and Federal Reserve data.
a. Three-month and six-month LIBOR are used for the short end of the swap curve.
b. Constant-maturity yield curve.

As figure 8 showed, corporate yields as a group tend to change in line with those of agencies and swaps. Indexes of corporate debt do not necessarily make good reference benchmarks, however (for one thing, most are only calculated once a day), and they cannot be used for hedging. Individual issues, on the other hand, often carry significant credit risk, which causes their performance to deviate sharply from that of other issues. Ford's latest ten-year GlobLS issue, for example, rose 25 basis points relative to Treasuries in August 2000 in the midst of the Bridgestone/Firestone tire recalls, in a month when the spread between comparable corporate bonds and Treasuries widened only 13 basis points.[42]

42. The yield data are from Bloomberg, and the comparable corporate reference is Merrill Lynch's seven- to ten-year corporate Aa/AA index. The tire recalls are cited as a factor in the widening spreads in Steven Vames, "Economic Data Help Push Treasurys Ahead, But Some Worry That Market Can't Rally More," *Wall Street Journal,* September 1, 2000, p. C15.

The corporate debt market is less liquid than the agency debt market. Although it is almost twice as large as the agency debt market, with debt outstanding totaling $3.1 trillion on March 31, 2000, compared with $1.6 trillion in agency securities, it is far more fragmented.[43] Corporate issuers are simply not large enough to issue debt securities in the sizes and with the frequency of the agencies or the Treasury. Ford, for example, had debt outstanding of $155 billion on March 31, 2000, compared with $558 billion for Fannie Mae, $535 billion for the FHLBanks, and $378 billion for Freddie Mac.[44] Bid-ask spreads for Ford GlobLS are reported to be 1 to 2 basis points, and those for smaller issues of similar quality are reported to be 3 to 5 basis points.[45] The repo market for corporate issues is fairly active, but less so than those for agency securities or Treasuries. There is no futures market for corporate issues, although such a market is being considered.[46]

Ford GlobLS and other large issues play a limited benchmark role in the corporate debt market. Their yields are used as reference rates for monitoring the performance of that market and evaluating other outstanding corporate debt securities. They are also used in the marketing of some new corporate issues.[47] Hedging using corporate issues is also taking place, but activity is less than that with agency securities and interest rate swaps. As noted, fragmentation limits the corporate debt market's liquidity and thereby inhibits it from assuming a more significant benchmark role.

Interest Rate Swaps

An interest rate swap is an agreement between two parties to exchange one stream of interest payments for another. The most common type of

43. The corporate debt figure is from the Bond Market Association, and the agency debt figure is from the September 2000 *Federal Reserve Bulletin,* p. A30.

44. Ford's debt figure is from its earnings report for the quarter ending March 31, 2000, and the agency debt figures are from the September 2000 *Federal Reserve Bulletin,* p. A30.

45. "Ford Credit Taps Demand for Big Issues with $5 Bln Global Note," Bloomberg, October 21, 1999.

46. Barbara Etzel, "Bond Market Assn. Forms Task Force to Study a Corporate Futures Contract," *Investment Dealers' Digest,* July 10, 2000, p. 3.

47. "Ford Reinforces Benchmark Status of GlobLS Programme," *Euroweek,* March 10, 2000, p. 22. In this case, an outstanding Ford GlobLS issue was used to price a new Ford GlobLS issue. Referencing another security from the same issuer is attractive when marketing a new security, because both securities are likely to be similarly affected by firm-specific as well as general credit market developments (that is, they are close substitutes).

interest rate swap exchanges fixed interest rate payments for floating interest rate payments for a given principal amount and period of time. The floating rate in such contracts is often based on the London interbank offer rate (LIBOR).

Swap rates are quoted in terms of the fixed rate that must be paid to convert to floating. At the daily close on July 31, 2000, for example, the quoted ten-year swap rate was 7.26 percent. This means that semiannual fixed interest payments for ten years at an annual rate of 7.26 percent could be swapped for semiannual floating interest payments on the same principal amount for ten years based on three-month LIBOR. Swap rates are often quoted relative to a Treasury security; thus the ten-year spread on July 31 was quoted as 122 basis points (the 7.26 percent swap rate less the 6.04 percent yield on the on-the-run ten-year Treasury note). Swap rates exceed those on Treasuries mainly because the floating payments are based on a rate that contains a premium for credit risk (LIBOR is a Aa/AA rate).

Since they are based on a floating rate that embodies credit risk, swap rates often change in line with yields on debt securities, as shown in figure 8 and table 2. Swaps therefore also have the potential to serve as a better reference and hedging instrument than Treasuries. At the same time, the counterparty credit risk in a swap contract is minimal. Although there is some risk that that one's counterparty in a swap will default on its end of the agreement, dealers mitigate this risk by executing swaps out of credit-enhanced subsidiaries and by structuring swaps so that they automatically unwind if a party's Aaa/AAA credit rating is lost.

The swaps market is very active, with narrow bid-ask spreads. A market survey by the Federal Reserve Bank of New York found daily trading in U.S. dollar interest rate swaps to average $22 billion in April 1998.[48] Bid-ask spreads for active contracts are reported to be about 1 basis point. Liquidity may be hindered somewhat by the lack of fungibility in swaps contracts. A dealer who has engaged in a swaps contract and wants to unwind it has to either go back to the original counterparty, who may not

48. Federal Reserve Bank of New York, "Foreign Exchange and Interest Rate Derivatives Market Survey: Turnover in the United States," September 29, 1998. Note that this is the average notional principal amount on which parties agreed to exchange interest payments rather than a measure of the value of securities traded.

want to unwind, or find a third party to take the dealer's side of the swap who is also acceptable to the original counterparty.

The absence of an underlying fundamental asset is an advantage of the swaps market. There is no supply limit on swaps contracts and no need to borrow securities to go short, as an entity can enter into as many swaps contracts as it wants. Specific-issue concerns are also mitigated by the nature of swaps. The ability to create swaps, combined with the fungible nature of the underlying cash flows, prevents swaps with the same or nearly the same cash flows from trading at widely different rates. These features of swaps help explain why the swaps curve was fairly smooth on July 31, 2000, as shown in figure 9.

Swaps are already actively used as references and in hedging. They are used for evaluating the performance of other fixed-income markets, and numerous new corporate and asset-backed securities have been marketed off of swap rates.[49] Swap rates are also used as reference rates for forecasting the future path of LIBOR. Positions in the agency debt, corporate debt, and mortgage-backed securities markets are all hedged using interest rate swaps. Swaps are likely to assume an increasingly important benchmark role as the supply of Treasuries diminishes.

In summary, market participants are experimenting with and adopting agency debt securities, corporate debt securities, and interest rate swaps as references and as hedging instruments. Agency securities and swaps appear to have the greatest potential. Agency securities are offered in large and liquid issues, are structured in a manner similar to familiar Treasury securities, and tend to perform similarly to other fixed-income securities with credit risk. Swap rates are unaffected by supply considerations and tend to move closely with yields of fixed-income securities that have credit risk, yet have minimal credit risk themselves. Treasuries remain the predominant benchmark, but these alternative markets are likely to assume greater reference and hedging roles as the Treasury debt is paid down.

49. See, for example, Gregory Zuckerman, "Treasurys Stumble as Some Investors Make Move to Agency Securities on Hopeful U.S. Comments," *Wall Street Journal,* April 12, 2000, p. C21, and Kara Scannell, "Ford Motor Credit Sells $4.5 Billion of Bonds, A Further Sign of Revival in Corporate Issuance," *Wall Street Journal,* June 8, 2000, p. C24.

Implications of the Debt Paydown for Monetary Policy

Changes in the Treasury market resulting from the paydown of the federal debt also present challenges for the implementation of monetary policy. Although the creditworthiness of Treasuries is not in question, the desirability of these securities for use in the conduct of monetary policy also rests on the market's size and liquidity. The Fed must to be able to quickly add reserves to or drain them from the economy. Market liquidity allows the Fed to do so at minimal cost to itself and with minimal disruption to the market.

As noted earlier, Fed holdings amounted to 17 percent of marketable Treasury securities as of August 2000. As the stock of these securities declines, and as Fed holdings continue to increase, the share held by the Fed is likely to increase rapidly. Assuming that the debt shrinks according to the Congressional Budget Office's July 2000 projections, that Fed holdings grow at the same rate as they did between 1989 and 1999 (an 8.5 percent compound annual growth rate), and that nonmarketable debt remains a constant 11.0 percent of the public debt, Fed holdings would grow to 25 percent of the total in 2002, 50 percent in 2005, and close to 100 percent in 2007.

It is not clear at what level Fed holdings become unduly large relative to the stock of Treasury securities outstanding. At the March 2000 FOMC meeting, however, the manager of the Fed's System Open Market Account suggested limits of 35 to 40 percent for bill issues in order to maintain a liquid portfolio.[50] At the same meeting, the FOMC endorsed a study to consider alternative asset classes and selection criteria "in light of declining Treasury debt." Limits on system holdings ranging from 35 percent for bills down to 15 percent for longer-term coupon securities were then announced in July 2000, in order to manage the liquidity and average maturity of the Fed's portfolio.[51] As noted in the announcement, application of these limits has already constrained Fed purchases of Treasury bills.

50. Board of Governors of the Federal Reserve, "Minutes of the Federal Open Market Committee: March 21, 2000" (www.bog.frb.fed.us/fomc/MINUTES/20000321.HTM).

51. Federal Reserve Bank of New York, "Announcement of Changes in the Management of the System Open Market Account," July 5, 2000 (www.ny.frb.org/pihome/news/announce/2000/an000705.html).

In evaluating the Fed's ability to conduct monetary policy as the debt is paid down, it is important to reiterate that it is Fed practice to use temporary operations to meet shorter-term changes in reserves. In 1999, for example, the Fed arranged 244 repos (to add reserves) and 13 matched sale-purchase transactions (to drain reserves).[52] The $15 billion average value of repos outstanding in 1999 masks considerable variation across the year. In particular, to address the unprecedented reserve needs at the turn of the millennium, repos outstanding reached $141 billion on December 31, 1999. Large and rapid increases and subsequent decreases in reserves have therefore been addressed through temporary operations.

The Fed could thus increasingly rely on short-term operations to meet the expected growth in reserve needs with minimal disruption. In fact, the minutes of the March 2000 FOMC meeting disclose that, pending completion of the Fed's asset allocation study, the Fed could rely on temporary operations to meet the growth in reserves that could not easily be met by additional outright purchases of Treasury securities. An increased reliance on short-term operations would be facilitated by an expansion of the pool of collateral eligible for use in repos. Temporary approval of mortgage-backed securities as eligible collateral was given by the FOMC at its August 1999 meeting and then extended at the March 2000 meeting pending completion of the Fed's study. The Fed indicated, however, that the temporary extension of authority "should not be read as indicating in any way how the Committee might ultimately choose to allocate the portfolio."

The Fed could also diversify its permanent portfolio should the availability of Treasury securities decline as projected. The Federal Reserve Act already allows the Fed to buy agency securities, certain municipal securities, foreign exchange, and foreign sovereign debt. In fact, as of July 31, 2000, the Fed held $15.1 billion in foreign currency–denominated securities and $140 million in agency debt securities.[53] Should it wish to, the Fed could seek authority, through technical changes in the Federal Reserve Act, to transact in a broader range of assets. Other

52. Federal Reserve Bank of New York, "Domestic Open Market Operations during 1999" (www.ny.frb.org/pihome/annual.html).

53. *Federal Reserve Bulletin,* October 2000, p. A10.

assets may be less liquid than Treasury securities, but the Fed's entire portfolio need not be made up of highly liquid instruments for it to effectively manage reserves.

Diversification of the Fed's permanent portfolio does raise some concerns, however. First, the Fed would inevitably be seen as favoring some issuers over others, whatever its credit allocation decisions, and there is a risk that those decisions could be seen as an endorsement of those issuers. Second, the Fed would likely be assuming a greater amount of credit risk. Of course, the Fed already holds assets with significant risk, namely, longer-term Treasury securities, although in this case the risk primarily comes from general yield curve changes rather than specific credit exposure. One can therefore imagine the Fed shifting its portfolio in a way that assumes greater credit risk but that does not necessarily increase overall risk.

In summary, the declining stock of Treasury securities should not be particularly problematic for the implementation of monetary policy. The Fed relies on temporary operations to meet short-term changes in its reserve needs, and it conducted such operations to address the unprecedented changes in reserve needs that occurred at the turn of the millennium. The range of securities accepted in such operations could be expanded beyond Treasuries, agency securities, and mortgage-backed securities. The permanent portfolio could also be expanded to include less liquid securities. Although the Fed may want to maintain a high degree of liquidity in a large part of its portfolio to address anticipated and unanticipated changes in reserve needs, its entire portfolio need not be as liquid as Treasury securities have historically been.

As mentioned earlier, many financial institutions besides the Federal Reserve, including foreign central banks and domestic depository institutions, use U.S. Treasury securities as a reserve asset. Although Treasury securities are a much smaller share of these institutions' portfolios, the paydown of the federal debt could be even more pertinent to their operations. The Fed largely relies on short-term financing markets to meet marginal changes in reserve needs, but some of these other institutions may be relying on the safety and liquidity of Treasury securities to meet marginal changes in liquidity needs. Furthermore, some of these institutions may not have access to the same investment options as the Fed because of regulatory restrictions or inadequate investment expertise.

Conclusion

The paydown of the federal debt raises some valid concerns, as U.S. Treasury securities have long been central to the implementation of monetary policy and to the operation of financial markets more generally. These securities serve as the primary asset of the Federal Reserve, as a proxy for risk-free interest rates, as a reference for pricing other fixed-income securities, and as a popular hedging device. Many of the attributes of Treasury securities that make them so attractive are likely to be affected by the debt paydown. Preliminary evidence suggests that the paydown has already contributed to higher borrowing costs in the repo market and to lower liquidity among certain securities as well as increased idiosyncratic price behavior.

Market participants are responding to the paydown through the consideration of alternative benchmarks and reserve assets. To hedge positions and price new issues in other fixed-income markets, agency debt securities, corporate debt securities, and interest rate swaps are increasingly being adopted. Yields on these securities often move more closely with those of other fixed-income securities than with Treasury yields, giving them the potential to be better hedging and reference benchmarks. The Fed is also taking steps toward adjusting its portfolio to respond to the diminished supply of Treasury securities, and it should be able to make such adjustments with minimal implications for monetary policy.

[Comments and discussion on this paper, as well as bibliographic references, appear on page 285.]