

U.S. Treasury and Agency Securities

The Handbook of Fixed Income Securities, seventh edition

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* The views expressed in this chapter are those of the authors' and not necessarily those of the Federal Reserve Bank of New York or the Federal Reserve System.

U.S. Treasury securities are direct obligations of the U.S. government issued by the Department of the Treasury. They are backed by the full faith and credit of the U.S. government and are therefore considered to be free of credit risk. Agency securities, in contrast, are obligations of specific entities that are either part of or sponsored by the U.S. government. Agency securities do not typically have an explicit government backing, but are nevertheless viewed as having very low credit risk. In this chapter, we discuss U.S. Treasury and agency securities.

TREASURY SECURITIES

As noted, Treasury securities are obligations of the U.S. government and are thus considered to be free of credit risk. Issuance to pay off maturing debt and raise needed funds has created a stock of marketable Treasury securities that totaled \$3.7 trillion on March 31, 2004.¹ The creditworthiness and supply of the securities has resulted in a highly liquid round-the-clock secondary market with high levels of trading activity and narrow bid-ask spreads.

Because of their liquidity, Treasury securities are commonly used to price and hedge positions in other fixed-income securities and to speculate on the course of interest rates. The securities' creditworthiness and liquidity also makes them a widespread benchmark for risk-free rates. These same attributes make Treasury securities a key reserve asset of central banks and other financial institutions. Finally, exemption of interest income from state and local taxes helps make the securities a popular investment asset to institutions and individuals.

As of September 30, 2003, foreign and international investors held 37% of the publicly held Treasury debt.² Federal Reserve Banks held an additional 17% of the debt. The remaining public debt was held by pension funds (9%), mutual funds (8%), state and local treasuries (8%), depository institutions (4%), insurance companies (4%), and other miscellaneous investors, including individuals (14%).

Types of Securities

Treasury securities are issued as either *discount* or *coupon securities*. Discount securities pay a fixed amount at maturity, called *face value* or *par value*, with no intervening interest payments. Discount securities are so called because they are issued at a price below face value with the return to the investor being the difference between the face

¹ The stock of nonmarketable Treasury securities on the same date totaled \$3.4 trillion. Of this, \$3.0 trillion was non-public debt (held in government accounts), \$0.2 trillion was held by private investors in the form of U.S. savings bonds, and \$0.2 trillion was held in a special series by state and local governments (Monthly Statement of the Public Debt, www.publicdebt.ustreas.gov/opd/opddload.htm). This chapter focuses on marketable Treasury securities.

² The publicly held debt includes marketable and nonmarketable securities held in non-government accounts. Figures are calculated from Table 1.41 of the *Statistical Supplement to the Federal Reserve Bulletin* and Table OFS-2 of the *Treasury Bulletin*.

value and the issue price. Coupon securities are issued with a stated rate of interest, pay interest every six months, and are redeemed at par value (or *principal value*) at maturity. Coupon securities are issued at a price close to par value with the return to the investor being primarily the coupon payments received over the security's life.

The Treasury issues securities with original maturities of one year or less as discount securities. These securities are called *Treasury bills*. The Treasury currently issues bills with original maturities of 4 weeks (1 month), 13 weeks (3 months), and 26 weeks (6 months), as well as cash-management bills with various maturities. On March 31, 2004, Treasury bills accounted for \$985 billion (26%) of the \$3.7 trillion in outstanding marketable Treasury securities, as shown in Exhibit 1.

Securities with original maturities of more than one year are issued as coupon securities. Coupon securities with original maturities of more than 1 year but not more than 10 years are called *Treasury notes*. The Treasury currently issues notes with maturities of 2 years, 3 years, 5 years, and 10 years. On March 31, 2004, Treasury notes accounted for \$2.0 trillion (53%) of the outstanding marketable Treasury securities.

Coupon securities with original maturities of more than 10 years are called *Treasury bonds*. The Treasury does not currently issue any bonds, most recently suspending issuance of 30-year bonds in October 2001. Previously issued 20- and 30-year bonds are still outstanding, however, so that bonds accounted for \$564 billion (15%) of the outstanding marketable Treasury securities on March 31, 2004. While several of the outstanding bonds are callable, the Treasury has not issued callable securities since 1984.

In January 1997, the Treasury began selling *inflation-indexed securities*. The principal of these securities is adjusted for inflation using the consumer price index for urban consumers. Semi-annual interest payments are a fixed percentage of the inflation-adjusted principal and the inflation-adjusted principal is paid at maturity. On March 31, 2004, Treasury inflation-indexed notes and bonds accounted for \$188 billion (5%) of the outstanding marketable Treasury securities. As these securities are discussed in detail in Chapter XX, the remainder of this section focuses on nominal (or fixed-principal) Treasury securities.

The Primary Market

Marketable Treasury securities are sold in the primary market through sealed-bid, *single-price* (or *uniform price*) *auctions*. Each auction is announced several days in advance by means of a Treasury Department press release. The announcement provides details of the offering, including the offering amount and the term and type of security being offered, and describes some of the auction rules and procedures.

Treasury auctions are open to all entities. Bids must be made in multiples of \$1,000 (with a \$1,000 minimum) and submitted to a Federal Reserve Bank, to the Treasury's Bureau of the Public Debt, or through an authorized financial institution.

Competitive bids must be made in terms of yield and must typically be submitted by 1:00 p.m. eastern time on auction day. Noncompetitive bids must typically be submitted by noon on auction day. While most tenders (or formal offers to buy) are submitted electronically, both competitive and noncompetitive tenders can be made on paper.³

All noncompetitive bids from the public up to \$1 million for bills and \$5 million for coupon securities are accepted. The lowest yield (i.e., highest price) competitive bids are then accepted up to the yield required to cover the amount offered (less the amount of noncompetitive bids). The highest yield accepted is called the *stop-out yield*. All accepted tenders (competitive and noncompetitive) are awarded at the stop-out yield. There is no maximum acceptable yield, and the Treasury does not add to or reduce the size of the offering according to the strength of the bids.

Historically, the Treasury auctioned securities through *multiple-price* (or *discriminatory*) *auctions*. With multiple-price auctions, the Treasury still accepted the lowest-yielding bids up to the yield required to sell the amount offered (less the amount of noncompetitive bids), but accepted bids were awarded at the particular yields bid, rather than at the stop-out yield. Noncompetitive bids were awarded at the weighted-average yield of the accepted competitive bids rather than at the stop-out yield. In September 1992 the Treasury started conducting single-price auctions for the 2- and 5-year notes. In November 1998 the Treasury adopted the single-price method for all auctions.

Within minutes of the 1:00 p.m. auction deadline, the Treasury announces the auction results. Announced results include the stop-out yield, the associated price, and the proportion of securities awarded to those investors who bid exactly the stop-out yield. Also announced is the quantity of noncompetitive tenders, the median-yield bid, and the ratio of the total amount bid for by the public to the amount awarded to the public (called the *bid-to-cover ratio*). For notes and bonds, the announcement includes the coupon rate of the new security. The coupon rate is set to be that rate (in increments of 1/8 of one percent) that produces the price closest to, but not above, par when evaluated at the yield awarded to successful bidders.

Accepted bidders make payment on issue date through a Federal Reserve account or account at their financial institution, or they provide payment in full with their tender. Marketable Treasury securities are issued in book-entry form and held in the commercial book-entry system operated by the Federal Reserve Banks or in the Bureau of the Public Debt's *TreasuryDirect* book-entry system.

³ Commercial bidders, such as broker/dealers and depository institutions, are encouraged to submit tenders electronically by computer, although paper tenders are accepted. Non-commercial bidders are encouraged to submit tenders electronically by phone or Internet, although mailed-in paper tenders are accepted. Bidding procedures are described in detail on the Bureau of the Public Debt's website at www.publicdebt.ustreas.gov.

Primary Dealers

While the primary market is open to all investors, the *primary government securities dealers* play a special role. Primary dealers are firms with which the Federal Reserve Bank of New York interacts directly in the course of its open market operations. They include large diversified securities firms, money center banks, and specialized securities firms, and are foreign- as well as U.S.-owned. Among their responsibilities, primary dealers are expected to participate meaningfully in Treasury auctions, make reasonably good markets to the Federal Reserve Bank of New York's trading desk, and supply market information and commentary to the Fed. The dealers must also maintain certain designated capital standards. The 23 primary dealers as of April 15, 2004 are listed in Exhibit 2.

Historically, Treasury auction rules tended to facilitate bidding by the primary dealers. In August 1991, however, Salomon Brothers Inc. admitted deliberate and repeated violations of auction rules. While the rules preclude any bidder from being awarded more than 35% of any issue, Salomon amassed significantly larger positions by making unauthorized bids on behalf of their customers. For the 5-year note auctioned on February 21, 1991, for example, Salomon bid for 105% of the issue (including two unauthorized customer bids) and was awarded 57% of the issue. Rule changes enacted later that year allowed any government securities broker or dealer to submit bids on behalf of customers and facilitated competitive bidding by non-primary dealers.⁴

Auction Schedule

To minimize uncertainty surrounding auctions, and thereby reduce borrowing costs, the Treasury offers securities on a regular, predictable schedule as shown in Exhibit 3. Four-, 13-, and 26-week bills are offered weekly. Four-week bills are typically announced for auction on Monday, auctioned the following Tuesday, and issued the following Thursday. Thirteen- and 26-week bills are typically announced for auction on Thursday, auctioned the following Monday, and issued on the following Thursday (one week after they are announced for auction). Cash-management bills are issued when required by the Treasury's short-term cash-flow needs, and not on a regular schedule.

Two- and five-year notes are offered monthly. Two-year notes are usually announced for auction on a Monday, auctioned the following Wednesday, and issued on the last day of the month. Five-year notes are usually auctioned on a Wednesday, announced several days before that, and issued on the 15th of the month.

Three- and 10-year notes are issued as a part of the Treasury's *quarterly refunding* in February, May, August, and November. The Treasury holds a press conference on the first Wednesday of the refunding month (or on the last Wednesday of the preceding

⁴ For further information on the auction violations and subsequent rule changes, see the *Joint Report on the Government Securities Market*, published by the Department of the Treasury, the Securities and Exchange Commission, and the Board of Governors of the Federal Reserve System in January 1992.

month) at which it announces details of the upcoming auctions. The auctions then typically take place on the following Tuesday (3-year) and Thursday (10-year), with issuance on the 15th of the refunding month.

While the Treasury seeks to maintain a regular issuance cycle, its borrowing needs change over time. The improved fiscal situation in the late 1990s reduced the Treasury's borrowing needs, resulting in decreased issuance and a declining stock of outstanding Treasury securities. To maintain large, liquid issues, the Treasury suspended issuance of 3-year notes in 1998, and 52-week bills and 30-year bonds in 2001. More recently, the worsened fiscal situation has increased the Treasury's borrowing needs, resulting in increased issuance and a rising stock of outstanding Treasury securities. The three-year note was thus reintroduced in 2003.

In addition to maintaining a regular issuance cycle, the Treasury tries to maintain a stable issue size for issues of a given maturity. As shown in Exhibit 3, public offering amounts as of the first quarter of 2004 were \$8-22 billion for 4-week bills, \$17-19 billion for 13-week bills, \$15-17 billion for 26-week bills, \$26 billion for 2-year notes, \$24 billion for 3-year notes, and \$16 billion for 5- and 10-year notes. Issue sizes have also changed in recent years in response to the government's changing funding needs. Issue sizes for 2-year notes, for example, declined from over \$18 billion in 1996 to \$10 billion in late 2000, before increasing to \$26 billion in early 2004.

Reopenings

While the Treasury regularly offers new securities at auction, it often offers additional amounts of outstanding securities. Such additional offerings are called *reopenings*. Current Treasury practice is to reopen 10-year notes one month after their initial issuance, in March, June, September, and December. Moreover, shorter-term bills are typically fungible with previously issued and outstanding bills, so that every 13-week bill is a reopening of a previously issued 26-week bill, and every 4-week bill is a reopening of a previously issued 13- and 26-week bill. The Treasury also reopens securities on an *ad hoc* basis from time to time.

Buybacks

To maintain the sizes of its new issues and help manage the maturity of its debt, the Treasury launched a debt buyback program in January 2000. Under the program, the Treasury redeems outstanding unmatured Treasury securities by purchasing them in the secondary market through reverse auctions. Buyback operations are announced one day in advance. Each announcement contains details of the operation, including the operation size, the eligible securities, and some of the operation rules and procedures.

The Treasury conducted 45 buyback operations between March 2000 and April 2002 (as of April 2004, there were no operations since April 2002). Operation sizes ranged from \$750 million par to \$3 billion par, with all but three between \$1 and 2 billion. The number of eligible securities in the operations ranged from 6 to 26, but was

more typically in the 10 to 13 range. Eligible securities were limited to those with original maturities of 30 years, consistent with the Treasury's goal of using buybacks to prevent an increase in the average maturity of the public debt.

The Secondary Market

Secondary trading in Treasury securities occurs in a multiple-dealer over-the-counter market rather than through an organized exchange. Trading takes place around the clock during the week, from the three main trading centers of Tokyo, London, and New York. As shown in Exhibit 4, the vast majority of trading takes place during New York trading hours, roughly 7:30 a.m. to 5:00 p.m. eastern time. The primary dealers are the principal market makers, buying and selling securities from customers for their own accounts at their quoted bid and ask prices. For the first quarter of 2004, primary dealers reported daily trading activity in the secondary market that averaged \$482 billion per day.⁵

Interdealer Brokers

In addition to trading with their customers, the dealers trade among themselves through *interdealer brokers*. The brokers offer the dealers proprietary electronic screens or electronic trading platforms that post the best bid and offer prices of the dealers, along with the associated quantities bid or offered (minimums are \$5 million for bills and \$1 million for notes and bonds). The dealers execute trades by notifying the brokers (by phone or electronically), who then post the resulting trade price and size. In compensation for their services, the brokers charge a small fee.

Interdealer brokers thus facilitate information flows in the market while providing anonymity to the trading dealers. For the most part, the brokers act only as agents and serve only the primary dealers and a number of non-primary dealers. The brokers include BrokerTec, Cantor Fitzgerald/eSpeed, Garban-Intercapital, Hilliard Farber, and Tullett Liberty.

Federal Reserve

The Federal Reserve is another important participant in the secondary market for Treasury securities by virtue of its security holdings, open market operations, and surveillance activities. The Federal Reserve Banks held \$656 billion in Treasury securities as of September 30, 2003, or 17% of the publicly held stock. The Federal Reserve Bank of New York buys and sells Treasury securities through open market operations as one of the tools used to implement the monetary policy directives of the Federal Open Market Committee (FOMC). Finally, the New York Fed follows and analyzes the Treasury market and communicates market developments to other

⁵ Federal Reserve Bank of New York (www.newyorkfed.org/markets/statrel.html). As the data is collected from all of the primary dealers but no other entities, trades between primary dealers are counted twice, and trades between non-primary dealers are not counted at all. The figure excludes financing transactions, such as repurchase agreements and reverse repurchase agreements.

government agencies, including the Federal Reserve Board and the Treasury Department.

Trading Activity

While the Treasury market is extremely active and liquid, much of the activity is concentrated in a small number of the roughly 175 issues outstanding. The most recently issued securities of a given maturity, called *on-the-run securities*, are particularly active. Analysis of 1998 data from GovPX, Inc., a firm that tracks interdealer trading volume, shows that on-the-run issues account for 70% of trading activity. Older issues of a given maturity are called *off-the-run securities*. While nearly all Treasury securities are off-the-run, they account for only 24% of interdealer trading.

The remaining 6% of interdealer trading occurs in *when-issued securities*. When-issued securities are securities that have been announced for auction but not yet issued. When-issued trading facilitates price discovery for new issues and can serve to reduce uncertainty about bidding levels surrounding auctions. The when-issued market also enables dealers to sell securities to their customers in advance of the auctions, and thereby bid competitively with relatively little risk. While most Treasury market trades settle the following day, trades in the when-issued market settle on the issue date of the new security.

There are also notable differences in trading activity by issue type, as shown in Exhibit 5. According to 1998 data from GovPX, on-the-run Treasury notes are the most actively traded securities, with average daily trading of \$7.3 billion for the 2-year, \$6.6 billion for the 5-year, and \$4.5 billion for the 10-year.⁶ Trading activity in when-issued securities is similarly concentrated in the notes, with average daily trading of \$2.1 billion for the 2-year, \$1.7 billion for the 3-year, and \$1.1 billion for the 5-year. In contrast, off-the-run trading is concentrated in the more frequently issued shorter-term issues, with the most active being the 3-month bill (\$160 million per issue), the 2-year note (\$97 million per issue), and the 26-week bill (\$79 million per issue). Trading in longer-term off-the-run securities is extremely thin, with mean daily per-issue trading of just \$18 million for the 5-year note and \$7 million for the 10-year note.

Quoting Conventions for Treasury Bills

The convention in the Treasury market is to quote bills on a discount rate basis. The rate on a discount basis is computed as:

$$Y_d = \frac{(F - P)}{F} * \frac{360}{t}$$

where

⁶ GovPX tracks trading activity among several of the interdealer brokers and thus covers much, but not all, of the interdealer market. Total interdealer trading volume therefore exceeds the figures given in the text and Exhibit 5 (particularly for longer-term securities).

Y_d is the rate on a discount basis,
 F is the face value,
 P is the price,
and t is the number of days to maturity.

For example, the 26-week bill auctioned April 5, 2004 sold at a price (P) of \$99.479 per \$100 face value (F). At issue, the bill had 182 days to maturity (t). The rate on a discount basis is then calculated as:

$$Y_d = \frac{(\$100 - \$99.479)}{\$100} * \frac{360}{182} = 1.03\%$$

Conversely, given the rate on a discount basis, the price can be computed as:

$$P = F - (F * Y_d * \frac{t}{360})$$

For our example,

$$P = \$100 - (\$100 * 1.03\% * \frac{182}{360}) = \$99.479$$

The discount rate differs from more standard return measures for two reasons: First, the measure compares the dollar return to the face value rather than to the price. Second, the return is annualized based on a 360-day year rather than a 365-day year. Nevertheless, the discount rate can be converted to a bond-equivalent yield (as discussed in Chapter XX), and such yields are often reported alongside the discount rate.

Treasury bill discount rates are typically quoted to two decimal places in the secondary market, so that a quoted discount rate might be 1.18%. For more active issues, the last digit is often split into halves, so that a quoted rate might be 1.175%.

Typical bid-ask spreads in the interdealer market for the on-the-run bills are 0.5 basis points, as shown in Exhibit 6. A basis point equals one one-hundredth of a percentage point, so that quotes for a half basis point spread might be 1.175%/1.17%. Exhibit 6 also shows that spreads vary with market conditions, ranging from 0 to about 2 basis points most of the time. A zero spread is called a “locked market” and can persist in the interdealer market because of the transaction fee paid to the broker who mediates a trade. Bid-ask spreads are typically wider outside of the interdealer market and for less active issues.

Quoting Conventions for Treasury Coupon Securities

In contrast to Treasury bills, Treasury notes and bonds are quoted in the secondary

market on a price basis in points where one point equals one percent of par.⁷ The points are split into units of 32nds, so that a price of 97-14, for example, refers to a price of 97 and $\frac{14}{32}$ or 97.4375. The 32nds are themselves split by the addition of a plus sign or a number, with a plus sign indicating that half a 32nd (or $\frac{1}{64}$) is added to the price and a number indicating how many eighths of 32nds (or 256ths) are added to the price. A price of 97-14+ therefore refers to a price of 97 and $14\frac{1}{32}$ or 97.453125, while a price of 97-142 refers to a price of 97 and $14\frac{2}{8/32}$ or 97.4453125. The yield to maturity, discussed in Chapter XX, is typically reported alongside the price.

Typical bid-ask spreads in the interdealer market for the on-the-run coupon issues range from $\frac{1}{128}$ point for the 2-year note to $\frac{1}{64}$ point for the 10-year note, as shown in Exhibit 6. A 2-year note might thus be quoted as 99-082/99-08+ whereas a 10-year note might be quoted as 95-23/95-23+. As with bills, the spreads vary with market conditions, and are usually wider outside of the interdealer market and for less active issues.

Zero-Coupon Treasury Securities

Zero-coupon Treasury securities are created from existing Treasury notes and bonds through coupon stripping (the Treasury does not issue them). Coupon stripping is the process of separating the coupon payments of a security from the principal and from one another. After stripping, each piece of the original security can trade by itself, entitling its holder to a particular payment on a particular date. A newly issued 10-year Treasury note, for example, can be split into its 20 semi-annual coupon payments (called *coupon strips*) and its principal payment (called the *principal strip*), resulting in 21 individual securities. As the components of stripped Treasury securities consist of single payments (with no intermediate coupon payments), they are often referred to as zero coupons or zeros, as well as strips.

As they make no intermediate payments, zeros sell at discounts to their face value, and frequently at deep discounts due to their oftentimes long maturities. On March 26, 2004, for example, the closing bid price for the February 2031 principal strip was just \$26.50 (per \$100 face value). As zeros have known cash values at specific future dates, they enable investors to closely match their liabilities with Treasury cash flows, and are thus popular with pension funds and insurance companies. Zeros also appeal to speculators as their prices are more sensitive to changes in interest rates than coupon securities with the same maturity date.

The Treasury introduced its *Separate Trading of Registered Interest and Principal Securities* (STRIPS) program in February 1985 to improve the liquidity of the zero-coupon market. The program allows the individual components of eligible Treasury securities to be held separately in the Federal Reserve's book-entry system. Institutions with book-entry accounts can request that a security be stripped into its separate

⁷ Notes and bonds are quoted in yield terms in when-issued trading because coupon rates for new notes and bonds are not set until after these securities are auctioned.

components by sending instructions to a Federal Reserve Bank. Each stripped component receives its own CUSIP (or identification) number and can then be traded and registered separately. The components of stripped Treasury securities remain direct obligations of the U.S. government. The STRIPS program was originally limited to new coupon security issues with maturities of 10 years or longer, but was expanded to include all new coupon issues in September 1997.

Since May 1987, the Treasury has also allowed the components of a stripped Treasury security to be reassembled into their fully constituted form. An institution with a book-entry account assembles the principal component and all remaining interest components of a given security and then sends instructions to a Federal Reserve Bank requesting the reconstitution.

As of March 31, 2004, \$177 billion of fixed-rate Treasury notes and bonds were held in stripped form, representing 7% of the \$2.5 trillion in eligible fixed-rate coupon securities.⁸ There is wide variation across issue types and across issues of a particular type in the rate of stripping. As of March 31, 2004, 32% of eligible bonds were stripped but only 1% of eligible notes were stripped. Among the notes, one issue was 21% stripped, while 34 eligible note issues were not stripped at all. On a flow basis, securities were stripped at a rate of \$16.4 billion per month in the first quarter of 2004, and reconstituted at a rate of \$14.8 billion per month.

AGENCY SECURITIES

Agency securities are direct obligations of federal government agencies or government-sponsored enterprises. *Federal agencies* are entities of the U.S. government, such as the Tennessee Valley Authority. *Government-sponsored enterprises* are publicly chartered but privately owned and operated entities, such as the Federal National Mortgage Association (Fannie Mae), the Federal Home Loan Mortgage Corporation (Freddie Mac), the Federal Home Loan Banks, and the Farm Credit Banks. The agencies issue debt securities to finance activities supported by public policy, including home ownership, farming, and education.⁹

Agency securities are not typically backed by the full faith and credit of the U.S. government, as is the case with Treasury securities. Agency securities are therefore not considered to be risk-free instruments, but rather trade with some credit risk. Nevertheless, agency securities are considered to be of very high credit quality because of the strong fundamentals of their underlying businesses and because of the agencies' government affiliation. Several of the agencies have authority to borrow directly from the Treasury. Additionally, there is a perception among some market participants that the government implicitly backs the agency issues and would be reluctant to let an agency default on its obligations. Agency issues are also attractive to investors because their

⁸ Figures are from Table V of the Treasury's Monthly Statement of the Public Debt (www.publicdebt.ustreas.gov/opd/opddload.htm).

⁹ Several of the agencies also guarantee and/or issue asset-backed securities. Agency mortgage-backed securities are discussed in Chapter XX.

interest income is exempt from state and local taxation for many of the issuers (albeit not for Fannie Mae or Freddie Mac issues).

Types of Securities

Agency securities are issued in a variety of types and maturities. *Discount notes* are short-term obligations issued at a discount from par with maturities ranging from one day to 365 days. *Medium-term notes* are fixed- or floating-rate coupon securities and are offered with a range of maturities. More generally, the agencies offer a wide variety of securities with various attributes, including callable and non-callable securities, fixed-rate, floating-rate, indexed, and zero-coupon securities, and securities denominated in U.S. dollars or in other currencies.

An important development in the agency securities market in the late 1990s was the introduction of agency benchmark programs, including Fannie Mae's *Benchmark Notes* program and Freddie Mac's *Reference Notes* program. The programs provide for the regular issuance of securities in large sizes for a wide range of maturities. The programs are intended to produce a yield curve for liquid agency securities and thereby appeal to investors who might typically buy Treasury securities. The initial benchmark programs were limited to non-callable notes, but were later extended to non-callable bills and bonds, as well as callable securities.

The Primary Market

The agencies use a variety of methods to distribute their securities including allocation to dealers, competitive dealer bidding, direct sales to investors, and sales to investors through dealers. A common distribution mechanism for agency securities is to allocate them among members of a selling group or syndicate of dealers. The syndicate provides market and trading information to the issuing agency before and during the allocation, and may support secondary trading in the issue after allocation. In compensation for their services, the syndicate members retain a percentage of the proceeds from the sold securities.

The quantity of agency securities sold in the primary market has increased rapidly in recent years, as shown in Exhibit 7. In 1994, the agencies issued \$2.3 trillion in debt securities, \$2.1 trillion in short-term debt (securities with a maturity of one year or less) and \$158 billion in long-term debt. In 2003, the agencies issued \$10.5 trillion in debt securities, \$9.2 trillion in short-term debt and \$1.3 trillion in long-term debt.

Rising issuance has resulted in a growing stock of agency debt outstanding, as shown in Exhibit 8. The outstanding debt of the agencies stood at \$2.7 trillion on September 30, 2003, up from \$571 billion on December 31, 1993.¹⁰ The growth in agency debt is attributable to three issuers, Fannie Mae, Freddie Mac, and the Federal

¹⁰ Note that agency debt issuance in 2003 (\$10.5 trillion) significantly exceeded the stock of debt outstanding on September 30, 2003 (\$2.7 trillion). This is because most agency debt issued is of such a short-term that it turns over many times within a year.

Home Loan Banks, which together accounted for 92% of outstanding agency debt as of September 30, 2003.

The Secondary Market

Like Treasury securities, agency securities trade in a multiple dealer over-the-counter secondary market. Also like Treasury securities, trading among dealers is screen-based, through interdealer brokers. Trading volume is significantly lower than that in the Treasury market, but it is still reasonably high relative to that in other fixed income markets. Daily trading by primary dealers in the first quarter of 2004 averaged \$78 billion per day, with \$51 billion in discount notes and \$27 billion in coupon securities.¹¹

Issuing Agencies

As previously mentioned, agency securities are direct obligations of federal agencies or government-sponsored enterprises. Federal agencies are entities of the federal government. They include the Export-Import Bank of the United States, the Federal Housing Administration, the Government National Mortgage Association (Ginnie Mae), the Tennessee Valley Authority (TVA), and the Small Business Administration. Historically, a number of federal agencies issued their own debt securities. In 1974, the Federal Financing Bank was set up to consolidate agency borrowing and thereby reduce borrowing costs. The TVA still issues its own debt securities, however, and accounts for nearly all of the outstanding debt issued directly by federal agencies.

Government-sponsored enterprises (GSEs) are privately owned and operated entities chartered by Congress to decrease the cost of funding for certain sectors of the economy. The GSEs are granted certain privileges to help them achieve their public purposes, and in turn are limited to certain activities. As mentioned, the agencies' securities are thought to have an implicit government guarantee and agency security interest income is exempt from state and local taxation for many of the issuers. The agencies themselves are exempt from state and local income taxes, and are exempt from SEC registration fees.

The largest GSEs were chartered to provide credit to the housing sector. They include the Federal National Mortgage Association (Fannie Mae), the Federal Home Loan Mortgage Corporation (Freddie Mac), and the Federal Home Loan Banks. Another set of GSEs was established to provide credit to the agricultural sector. It includes the Farm Credit Banks, the Farm Credit System Financial Assistance Corporation, and the Federal Agricultural Mortgage Corporation (Farmer Mac). One GSE, the Student Loan Marketing Association (Sallie Mae), was established to provide funds to support higher education. Two other GSEs, the Financing Corporation and the Resolution Funding Corporation, were established to recapitalize the savings and loan industry.

The remainder of this section provides a brief overview of each of the agencies that have debt securities outstanding. The information is summarized in Exhibit 9.

¹¹ Federal Reserve Bank of New York (www.newyorkfed.org/markets/statrel.html).

Federal National Mortgage Association (Fannie Mae)

The Federal National Mortgage Association (Fannie Mae) is a stockholder-owned corporation chartered in 1938 to develop a secondary market for residential mortgages. Fannie Mae buys home loans from banks and other mortgage lenders in the primary market, and holds the mortgages until they mature, or issues securities backed by pools of the mortgages. In addition to promoting a liquid secondary market for mortgages, Fannie Mae is charged with providing access to mortgage finance for low-income families and underserved areas. Fannie Mae's housing mission is overseen by the U.S. Department of Housing and Urban Development (HUD), and its safety and soundness is overseen by the Office of Federal Housing Enterprise Oversight (OFHEO).

Fannie Mae issues a variety of securities including discount notes and medium-term notes. In January 1998, Fannie Mae initiated its Benchmark Notes debt issuance program, followed by the introduction of its *Benchmark Bills* program in November 1999. The programs provide for the regular and predictable issuance of large-sized issues, and are meant to enhance security efficiency, liquidity, and tradability. Benchmark Bills are issued via auction, with 3- and 6-month bills offered weekly and one-year bills offered biweekly. Minimum issue sizes are \$4 billion for 3-month bills, \$1.5 billion for 6-month bills, and \$1 billion for 1-year bills. Benchmark Notes are issued via an underwriting syndicate of dealers following a yearly issuance calendar, with minimum issue sizes of \$4 billion. Total Fannie Mae debt issuance in 2003 was \$2.6 trillion, with \$2.2 trillion in short-term debt and \$348 billion in long-term debt.¹² On September 30, 2003, Fannie Mae had debt securities outstanding of \$976 billion.

Federal Home Loan Mortgage Corporation (Freddie Mac)

The Federal Home Loan Mortgage Corporation (Freddie Mac) is a stockholder-owned corporation chartered in 1970 to improve the liquidity of the secondary mortgage market. Freddie Mac purchases mortgage loans from individual lenders, and sells securities backed by the mortgages to investors, or holds the mortgages until they mature. Like Fannie Mae, Freddie Mac is charged with providing access to mortgage finance for low-income families and underserved areas. Also like Fannie Mae, Freddie Mac is regulated by HUD for its housing mission and by OFHEO for safety and soundness.

Freddie Mac issues a variety of debt securities including discount notes and medium-term notes. In April 1998, Freddie Mac established its own benchmark securities program called Reference Notes, followed by *Reference Bills* in November 1999. Reference Bills are issued via auction, with 1-, 3-, and 6-month bills offered weekly and 12-month bills offered every four weeks. Minimum issue sizes for all Reference Bills are \$1 billion. Reference Notes are offered via auction and dealer syndicate according to a yearly issuance calendar, with minimum issue sizes of \$3

¹² Debt issuance in 2003 for each of the agencies is from The Bond Market Association (www.bondmarkets.com/research/faiss.shtml) while debt outstanding on September 30, 2003 is from Farmer Mac, Freddie Mac, and Table 1.44 of the *Statistical Supplement to the Federal Reserve Bulletin*.

billion. Total Freddie Mac debt issuance in 2003 was \$1.1 trillion, \$779 billion in short-term securities and \$277 billion in long-term securities. On September 30, 2003, Freddie Mac had \$774 billion in outstanding debt.

Federal Home Loan Bank System

The Federal Home Loan Bank System (FHLBank System) is a GSE established in 1932 to increase credit to the housing sector. It consists of 12 federally chartered privately owned Federal Home Loan Banks that are charged with supporting residential mortgage, small business, rural, and agricultural lending by over 8,000 member-stockholder institutions. It does this by making loans to the member institutions, which in turn make loans to homebuyers, small businesses, and others. The Federal Housing Finance Board regulates the FHLBank System for mission as well as safety and soundness issues.

FHLBank debt issuance is conducted through the system's fiscal agent, the Office of Finance. The FHLBanks sells a variety of debt securities including discount notes and medium-term notes. In July 1999, the FHLBanks initiated their own benchmark securities program called the *Tap Issue Program*. The program reopens coupon securities of four common maturities on a daily basis for three months via competitive auction. In 2003, the FHLBanks issued \$5.7 trillion in debt securities, \$5.2 trillion in short-term debt and \$569 billion in long-term debt. The FHLBanks had \$719 billion in outstanding debt as of September 30, 2003.

Farm Credit System

The Farm Credit System (FCS) is a GSE established in 1916 to provide credit to the agricultural sector. The FCS consists of four Farm Credit Banks, one Agricultural Credit Bank, and about 100 related Production Credit Associations, Federal Land Credit Associations, and Agricultural Credit Associations. Products and services offered by FCS institutions include real estate loans, operating loans, rural home mortgage loans, crop insurance, and various financial services. The FCS is regulated by the Farm Credit Administration.

The Federal Farm Credit Banks Funding Corporation is the system's fiscal entity, providing funds to system institutions through the issuance of debt securities. The FCS issues discount notes, medium-term notes, and other debt securities. In March 1999, the FCS introduced its *Designated Bonds* program. The bonds are issued through a dealer syndicate with a minimum issue size of \$1 billion, and generally have a two to five year original maturity. In 2003, the FCS issued \$310 billion in debt securities, \$257 billion in short-term debt and \$53 billion in long-term debt. On September 30, 2003 the FCS had \$90 billion in outstanding debt.

Farm Credit System Financial Assistance Corporation

The Farm Credit Financial Assistance Corporation was chartered in 1988 to finance the recapitalization of FCS institutions. Between 1988 and 1990, the corporation raised \$1.3

billion through the issuance of debt securities, which it provided to system institutions in return for preferred stock. Unlike most GSEs, debt securities of this corporation are fully guaranteed by the U.S. Treasury. On September 30, 2003, the full \$1.3 billion in issued debt securities was outstanding.

Federal Agricultural Mortgage Corporation (Farmer Mac)

The Federal Agricultural Mortgage Corporation (Farmer Mac) is a stockholder-owned corporation chartered in 1988 to promote a liquid secondary market for agricultural real estate and rural housing loans. It does this by buying qualified loans from lenders and grouping the loans into pools against which it issues securities. Farmer Mac thus performs a role for the agricultural mortgage market similar to that performed by Fannie Mae and Freddie Mac for the residential mortgage market. Farmer Mac issues discount notes and medium-term notes, and had debt securities outstanding of \$3.8 billion on September 30, 2003.

Student Loan Marketing Association (Sallie Mae)

The Student Loan Marketing Association (Sallie Mae) is a stockholder-owned corporation established in 1972 to increase the availability of student loans. Sallie Mae purchases insured student loans from lenders and makes loans to lenders secured by student loans. Sallie Mae was reorganized in 1997 in a step towards privatization, and is scheduled to be phased out as a GSE by 2006.

Sallie Mae issues discount notes, medium-term notes, and other debt securities. It issued \$310 billion in debt securities in 2003, \$251 billion in short-term debt and \$53 billion in long-term debt. As of September 30, 2003, Sallie Mae had debt securities outstanding of \$54 billion.

Financing Corporation

The Financing Corporation (FICO) was established in 1987 to finance the recapitalization of the Federal Savings and Loan Insurance Corporation (FSLIC). Between 1987 and 1989, FICO issued debt obligations with an aggregate principal value of \$8.2 billion. The Federal Home Loan Bank System provided capital to purchase zero-coupon Treasury securities to repay the principal. Interest payments were to be funded by an assessment on FSLIC-insured institutions, although assessments were eventually expanded to include banks as well as savings and loans. The full \$8.2 billion in issued debt securities was outstanding as of September 30, 2003.

Resolution Funding Corporation

The Resolution Funding Corporation (REFCorp) was established in 1989 as the funding arm of the Resolution Trust Corporation to finance the recapitalization of the savings and loan industry. REFCorp issued \$30 billion in debt securities between 1989 and 1991. Interest payments on REFCorp bonds are guaranteed by the U.S. government, and the

principal is protected by the purchase of zero-coupon bonds with a face value equal to those of REFCorp bonds. The full \$30 billion in issued debt securities was outstanding on September 30, 2003.

Tennessee Valley Authority

The Tennessee Valley Authority (TVA) is a government-owned corporation established in 1933 to promote development of the Tennessee River and adjacent areas. The TVA manages the river system for flood control, navigation, power generation, and other purposes, and is the nation's largest public power company.

The TVA issues discount notes as well as longer-term coupon securities called *Power Bonds*. Interest and principal on Power Bonds are paid from the proceeds of TVA's power program. The TVA issued \$25 billion in debt securities in 2003, \$22 billion in short-term debt and \$2 billion in long-term debt. The TVA had debt securities outstanding of \$27 billion on September 30, 2003.

SUMMARY

U.S. Treasury securities are obligations of the U.S. government issued by the Department of the Treasury. They trade in a highly liquid secondary market, and are used by market participants as a pricing and hedging instrument, risk-free benchmark, reserve asset, and investment asset. The regular and predictable issuance of Treasury securities has been disrupted in recent years by the government's changing funding needs. Between the late 1990s and 2001, the Treasury suspended issuance of several securities, reduced issuance frequencies and sizes, and launched a debt buyback program. Since 2001, the Treasury has increased issuance sizes and frequencies, reintroduced a security, and suspended use of debt buybacks.

Agency securities are obligations of entities that are either part of or sponsored by the U.S. government. Agency securities are viewed as having very low credit risk although they are not risk-free. Agency security issuance and amount outstanding have grown strongly in recent years due to the growth of the housing GSEs: Fannie Mae, Freddie Mac, and the Federal Home Loan Bank System. The agencies introduced benchmark security programs in the late 1990s to appeal to investors who might typically buy Treasury securities.

Exhibit 1

Marketable U.S. Treasury Securities

| Issue Type | Security Type | Issues | Amount Outstanding (March 31, 2004) |
|---------------------------------------|---------------|---|--|
| Treasury bills | discount | cash-management, 4-week, 13-week, 26-week | \$985 billion |
| Treasury notes | coupon | 2-year, 3-year, 5-year, 10-year | \$1,983 billion |
| Treasury bonds | coupon | (20-year), (30-year) | \$564 billion |
| Treasury inflation-indexed securities | coupon | 10-year, (30-year) | \$188 billion |

Note: Issues no longer offered as of April 2004 are noted by parentheses.

Source: Department of the Treasury, Monthly Statement of the Public Debt (www.publicdebt.treas.gov/opd/opddload.htm) for amounts outstanding.

Exhibit 2

Primary Government Securities Dealers as of April 15, 2004

| | |
|--------------------------------------|--|
| ABN AMRO Bank, N.V., New York Branch | Dresdner Kleinwort Wasserstein Securities LLC. |
| BNP Paribas Securities Corp. | Goldman, Sachs & Co. |
| Banc of America Securities LLC | Greenwich Capital Markets, Inc. |
| Banc One Capital Markets, Inc. | HSBC Securities (USA) Inc. |
| Barclays Capital Inc. | J. P. Morgan Securities, Inc. |
| Bear, Stearns & Co., Inc. | Lehman Brothers Inc. |
| CIBC World Markets Corp. | Merrill Lynch Government Securities Inc. |
| Citigroup Global Markets Inc. | Mizuho Securities USA Inc. |
| Countrywide Securities Corporation | Morgan Stanley & Co. Incorporated |
| Credit Suisse First Boston LLC | Nomura Securities International, Inc. |
| Daiwa Securities America Inc. | UBS Securities LLC. |
| Deutsche Bank Securities Inc. | |

Source: Federal Reserve Bank of New York
(www.newyorkfed.org/markets/pridealers_current.html).

Exhibit 3

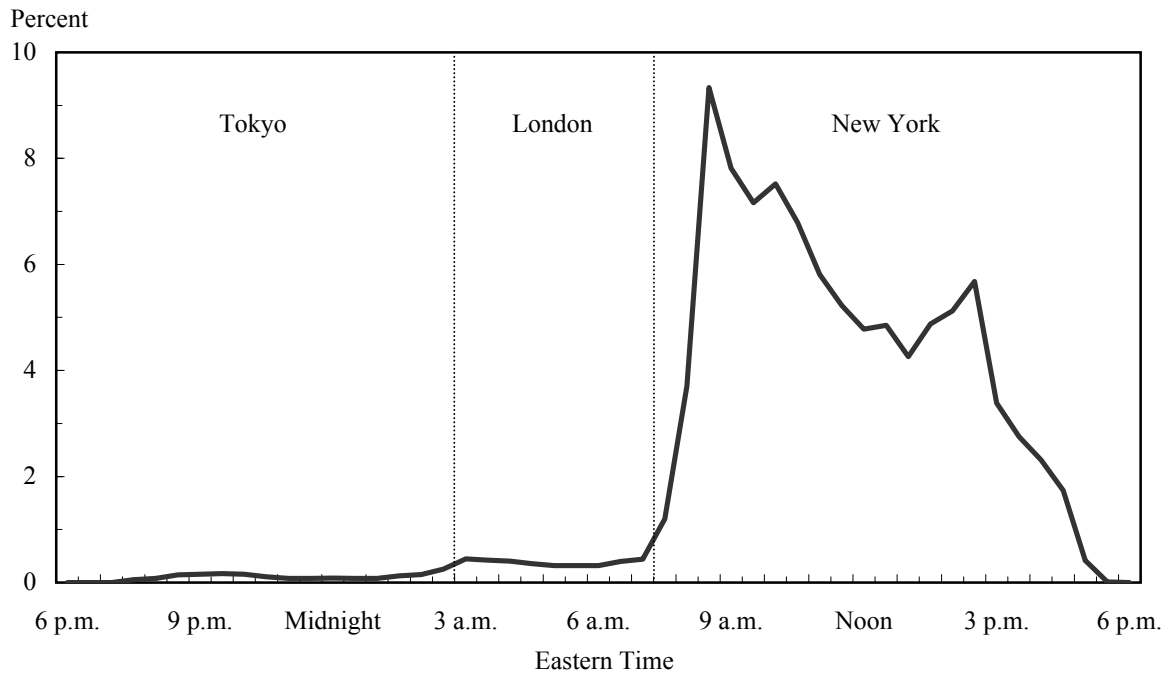
Auction Schedule for U.S. Treasury Securities

| Issue | Auction Frequency | Offering Amount |
|--------------|-------------------|-----------------|
| 4-week bill | weekly | \$8-22 billion |
| 13-week bill | weekly | \$17-19 billion |
| 26-week bill | weekly | \$15-17 billion |
| 2-year note | monthly | \$26 billion |
| 3-year note | quarterly | \$24 billion |
| 5-year note | monthly | \$16 billion |
| 10-year note | quarterly | \$16 billion |

Notes: Auction frequency and offering amount are reported for regularly issued Treasury securities as of the first quarter of 2004. New 10-year notes are auctioned quarterly, but additional amounts of the notes are auctioned one month later. Offering amounts exclude amounts issued to refund maturing securities of Federal Reserve Banks.

Source: Department of the Treasury.

Exhibit 4
Trading Volume of U.S. Treasury Securities by Half Hour



Notes: Mean half-hourly trading volume as a percent of mean daily trading volume is plotted for the April 4 to August 19, 1994 period. The times on the horizontal axis indicate the beginning of intervals.

Source: Chart 2 in Michael J. Fleming, "The Round-the-Clock Market for U.S. Treasury Securities," Federal Reserve Bank of New York *Economic Policy Review* (July 1997).

Exhibit 5

Daily Trading Volume of U.S. Treasury Securities

| Issue | When-issued | On-the-run | Off-the-run |
|--------------|-------------|------------|-------------|
| 13-week bill | 627 | 1,265 | 160 |
| 26-week bill | 441 | 919 | 79 |
| 2-year note | 2,093 | 7,320 | 97 |
| 3-year note | 1,743 | 2,529 | 71 |
| 5-year note | 1,095 | 6,629 | 18 |
| 10-year note | 584 | 4,538 | 7 |

Notes: Mean daily interdealer trading volume is reported by issue for when-issued, on-the-run, and off-the-run Treasury securities. The when-issued figures are estimated only over days on which the securities traded when-issued. The off-the-run figures are per-security averages, estimated over all off-the-run securities of a given issue. Figures are in millions of dollars.

Source: Authors' calculations, based on 1998 data from GovPX.

Exhibit 6

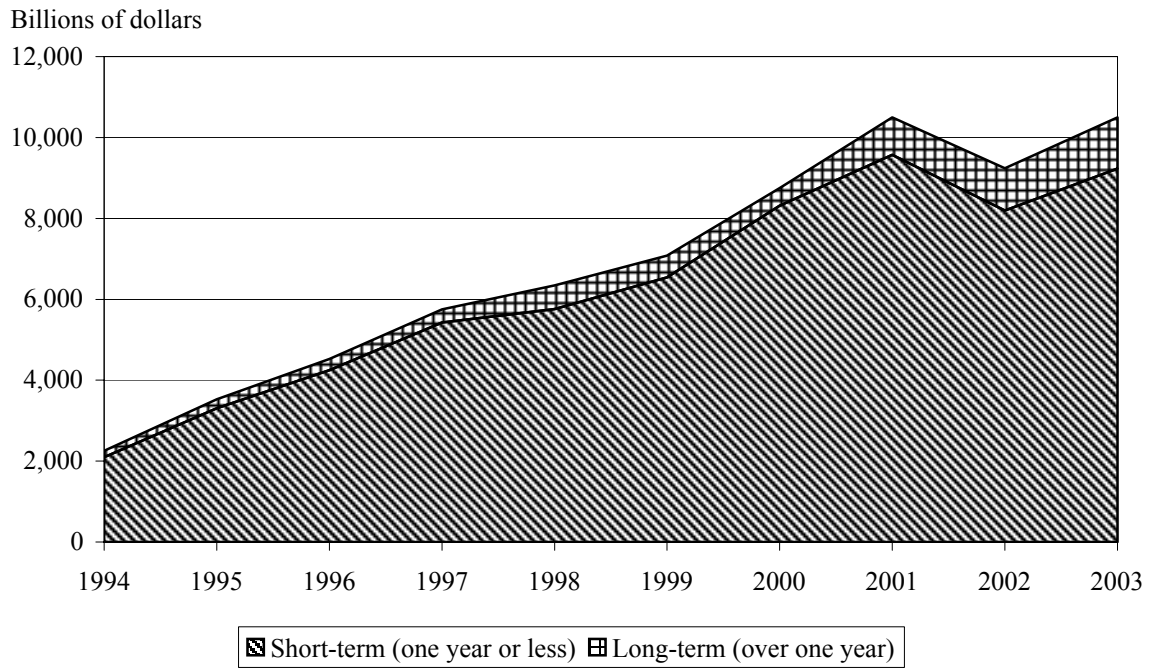
Bid-Ask Spreads for U.S. Treasury Securities

| Issue | Median Spread | 95% Range |
|--------------|------------------|--------------------|
| 4-week bill | 0.5 basis points | 0-2.5 basis points |
| 13-week bill | 0.5 basis points | 0-2.0 basis points |
| 26-week bill | 0.5 basis points | 0-1.5 basis points |
| 2-year note | 1/128 point | 0-1/64 point |
| 3-year note | 1/128 point | 0-3/128 point |
| 5-year note | 1/128 point | 0-1/32 point |
| 10-year note | 1/64 point | 0-2/32 point |

Notes: Statistics for the spread between the best bid and the best offer in the interdealer market are reported for the on-the-run securities of each issue. Bill spreads are reported in yield terms in basis points and coupon spreads are reported in price terms in points.

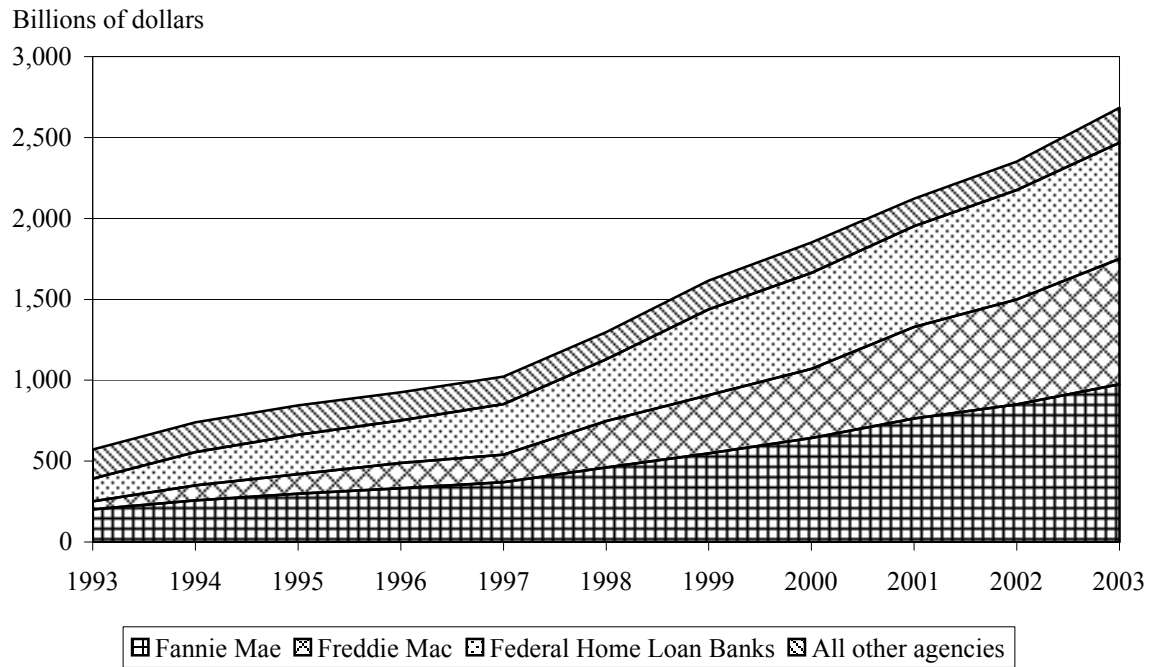
Source: Authors' calculations, based on 2003 (for bills) and 1998 (for notes) data from GovPX.

Exhibit 7
Agency Debt Issuance, 1994-2003



Source: The Bond Market Association (www.bondmarkets.com/research/faiss.shtml).

Exhibit 8
Agency Debt Outstanding, 1993-2003



Note: Figures for 2003 as of September 30; figures for other years as of December 31.
 Sources: Farmer Mac, Freddie Mac, Table 1.44, *Federal Reserve Bulletin*, and Table 1.44, *Statistical Supplement to the Federal Reserve Bulletin*.

Exhibit 9
Agencies

| Agency | Purpose | Debt Outstanding (September 30, 2003) |
|--|--|--|
| Federal National Mortgage Association (Fannie Mae) | Promote liquid secondary market for residential mortgages | \$975.7 billion |
| Federal Home Loan Mortgage Corporation (Freddie Mac) | Promote liquid secondary market for residential mortgages | \$774.0 billion |
| Federal Home Loan Banks | Supply credit for residential mortgages | \$718.7 billion |
| Farm Credit Banks | Supply credit to agricultural sector | \$90.1 billion |
| Farm Credit System Financial Assistance Corporation | Finance recapitalization of Farm Credit System institutions | \$1.3 billion |
| Federal Agricultural Mortgage Corporation (Farmer Mac) | Promote liquid secondary market for agricultural and rural housing loans | \$3.8 billion |
| Student Loan Marketing Association (Sallie Mae) | Increase availability of student loans | \$54.3 billion |
| Financing Corporation | Finance recapitalization of Federal Savings and Loan Insurance Corporation | \$8.2 billion |
| Resolution Funding Corporation | Finance recapitalization of savings and loan industry | \$30.0 billion |
| Tennessee Valley Authority | Promote development of Tennessee River and adjacent areas | \$27.0 billion |

Sources: Farmer Mac, Freddie Mac, and Table 1.44, *Statistical Supplement to the Federal Reserve Bulletin* for debt outstanding.