

# **OFHEO WORKING PAPERS**

## **Working Paper 03-4**

### **Market Discipline of Fannie Mae and Freddie Mac: How Do Share Prices and Debt Yield Spreads Respond to New Information?**

Robert S. Seiler

December 2003

OFHEO Working Papers are preliminary products circulated to stimulate discussion and critical comment. The analysis and conclusions are those of the authors and do not imply concurrence by other staff of the Office of Federal Housing Enterprise Oversight or its Director. Single copies of the paper will be provided upon request. References to OFHEO Working Papers (other than an acknowledgment by a writer that he or she has had access to such unpublished material) should be cleared with the author to protect the tentative character of these papers.

# OFHEO WORKING PAPERS

## WORKING PAPER 03-4

### **Market Discipline of Fannie Mae and Freddie Mac: How Do Share Prices and Debt Yield Spreads Respond to New Information?\***

by Robert S. Seiler, Jr.  
Office of Federal Housing Enterprise Oversight  
1700 G Street, NW  
Washington, DC 20552  
202-414-3785  
rseiler@ofheo.gov

\*forthcoming in *Market Discipline in Banking: Theory and Evidence*, ed. Kaufman, George G., (JAI/Elsevier Press, in publication).

OFHEO working papers are preliminary products circulated to stimulate discussion and critical comment. The analysis and conclusions are those of the authors and do not imply concurrence by other staff of the Office of Federal Housing Enterprise Oversight or its Director. Single copies of the paper will be provided on request. References to OFHEO Working Papers (other than acknowledgement by a writer that he or she has had access to such unpublished material) should be cleared with the author to protect the tentative character of these papers.

## Abstract

# Market Discipline of Fannie Mae and Freddie Mac: How Do Share Prices and Debt Yield Spreads Respond to New Information?

There is growing interest in enhancing market discipline of Fannie Mae and Freddie Mac, the two government-sponsored enterprises (GSEs) that support the secondary market in residential mortgages. This paper assesses empirically how the market responds to new information about those two GSEs. The share prices of each Enterprise and the spreads between the yields of each Enterprise's 10-year noncallable senior debt and the yields of comparable-maturity Treasury debt during the period from February 2000 through mid-June 2003 are examined. The results suggest that share prices and senior debt yield spreads respond predictably to events that provide new information about an Enterprise's financial risks, the likelihood that the government would protect the debt investors or other major creditors of an insolvent Enterprise, or the probability that Congress will enact legislation that would reduce each Enterprise's franchise value. Information about one Enterprise that has a positive effect on its share price also tends to have a similar positive effect on the other Enterprise's share price. Further, the release of information that tends to be followed by lower (higher) Enterprise stock prices also tends to be followed by higher (lower) senior debt yield spreads. Because neither Enterprise experienced a severe deterioration in its financial condition during the period analyzed, the results do not suggest how senior debt yields spreads would behave in such an event. The experiences of Fannie Mae in the late 1970s and early 1980s and the Farm Credit System in the mid-1980s suggest that a severely financially troubled Enterprise's senior debt yield spreads would not increase as much as they would if the Enterprise was not a GSE.

## **Market Discipline of Fannie Mae and Freddie Mac:**

### **How Do Share Prices and Debt Yield Spreads Respond to New Information?**

#### **I. INTRODUCTION**

In recent years deregulation has blurred the boundaries between banking and other types of financial services, a wave of consolidation has helped lead to the creation of a growing number of very large and geographically diverse banking organizations, and the operations of those organizations have become increasingly complex. Responding to those trends, U.S. and international banking supervisors have expressed concern about their ability to monitor banking organizations in a timely manner and to control the institutions' behavior using the traditional supervisory tools of capital standards and examinations. Supervisors have also become increasingly interested in the possibility of relying more heavily on financial markets to monitor and discipline the behavior of large banking organizations. That interest is consistent with growing empirical evidence that monitoring of banking organizations by shareholders and holders of uninsured bank liabilities is rational and effectively reflected in security prices (Flannery 1998).

Supervisory interest in greater reliance on markets to monitor and discipline the behavior of banking organizations has led to policy proposals. The new Capital Accord developed by the Basel Committee on Banking Supervision ("Basel II") advocates that supervisors of internationally active banking organizations rely on market discipline on a par with capital standards and examinations and proposes standards for adequate

financial disclosure by banks (Basel Committee on Banking Supervision 2003). Market discipline occurs when: 1) investors are able to *monitor* the changing financial condition of firms and price securities appropriately, and 2) changes in security prices *influence* management to take actions that counteract adverse changes in a firm's condition (Bliss and Flannery 2001). Supervisory proposals to enhance disclosure by banking organizations recognize that market participants' having accurate and timely information about those organizations' condition is a necessary condition of market discipline (Federal Reserve System Study Group on Disclosure 2000).

U.S. banking supervisors have analyzed proposals to require large banking organizations to issue subordinated debt (Board of Governors of the Federal Reserve System 1999, Board of Governors of the Federal Reserve System and U.S. Department of the Treasury 2000). Advocates of such proposals argue that, because investors in bank subordinated debt are subject to risk of default, the yields of such debt could provide additional information about the condition and risks of banking organizations beyond that provided by share prices and senior debt yields, and that such information could be used in the supervisory process, perhaps to trigger mandatory supervisory action when the spreads between the yields on senior and subordinated debt rise sufficiently (Evanoff and Wall 2001, Flannery 2001).

## **Market Discipline of GSEs**

Similar interest has developed in enhancing market discipline of government-sponsored enterprises (GSEs). GSEs benefit from a market perception that the federal government has implicitly guaranteed the debt they issue and the mortgage-backed securities (MBS) they guarantee (Stanton 2002). That perception weakens market discipline by each GSE's debt investors. Those investors do not believe they are fully at risk of loss, so they have less incentive to monitor the enterprise's condition and incorporate assessments about its risk of failure in debt prices. There is considerable anecdotal evidence that the yields of a GSE's debt are less sensitive to changes in the financial condition of the enterprise than are the debt yields of firms whose liabilities are not covered or perceived to be covered by the financial safety net.

For example, in the late 1970s and early 1980s Fannie Mae—then and now the largest GSE—had a portfolio of long-term mortgages financed with short-term debt, which exposed it to considerable interest rate risk. When interest rates rose sharply in 1979, it became insolvent on a mark-to-market basis and remained so until the end of 1984 (Kane and Foster 1986). The spread between the yields on 6-month Fannie Mae notes and 6-month Treasury notes increased during that period, rising from about 20 basis points in late 1978 to over 80 basis points during periods in 1979-1982 and nearly 200 basis points in early 1981, before falling to about 20 basis points in late 1982 and 1983 (U.S. General Accounting Office 1985). Fannie Mae continued to borrow during the period, issuing about \$31 billion in bonds and debentures and over \$64 billion in short-

term notes in 1981-1982. Another financial institution with comparable solvency problems that did not benefit from an explicit or the perception of an implicit federal guarantee would have experienced a much larger increase in its debt yields, would probably have not been able to issue new debt, and would probably have been forced into bankruptcy. Similarly, when the Farm Credit System had serious solvency problems in the mid-1980s, its debt yield spreads increased by only about 120 basis points and it continued to borrow tens of billions of dollars (U.S. General Accounting Office 1990).

The shareholders of a publicly held GSE have the same incentives to monitor the GSE's financial condition and price its shares accordingly as the shareholders of other publicly held firms. However, the perception of an implicit federal guarantee gives shareholders an incentive to influence the GSE's management to increase risk, since that increase will not be fully reflected in debt yields. If the enterprise is financially strong, the benefit to shareholders of taking additional risk may be small, because they stand to absorb most of any resulting losses. On the other hand, if a GSE is financially weak, the benefits to shareholders of taking additional risk may outweigh the costs, as the government is likely to absorb most losses. Recognizing that the perception of the implicit federal guarantee limits and distorts market discipline of GSEs, the Congress has subjected each GSE to prudential regulation by a federal agency.

## **Market Discipline of Fannie Mae and Freddie Mac**

Most of the interest in enhancing market discipline of GSEs has focused on Fannie Mae and Freddie Mac (“the Enterprises”), which support the housing sector and assist refinance activity by purchasing single- and multifamily mortgages and guaranteeing mortgage-backed securities (MBS) backed by such loans. Fannie Mae and Freddie Mac have grown very rapidly in the last two decades, as the reduced role of thrift institutions in housing finance, waves of mortgage refinancings, and the economic benefits of government sponsorship have allowed them to increase substantially the volume of mortgages they have securitized or financed with debt. At the end of 2002, the combined outstanding MBS guaranteed by Fannie Mae and Freddie Mac and held by other investors was over \$1.6 trillion, whereas the Enterprises’ combined mortgage asset portfolios exceeded \$1.4 trillion. The combined total book of business of Fannie Mae and Freddie Mac—mortgages securitized and held on the balance sheet—represented about 48 percent of outstanding U.S. residential mortgage debt at that time. Today, the Enterprises are among the very largest non-bank financial institutions, private debt issuers, and end-users of financial derivatives in the world. Because Fannie Mae and Freddie Mac are so important, a sudden, sharp deterioration in the financial health of either Enterprise could adversely affect the financial system and the aggregate economy (U.S. Office of Federal Housing Enterprise Oversight 2003).

Proposals have been made that are intended to enhance market discipline of Fannie Mae and Freddie Mac. Some initiatives would subject the Enterprises to the



disclosure requirements that apply to other public companies. Like most other GSEs, the Enterprises are exempt from the registration requirements of the Securities Act of 1933. The Treasury Department, the Securities and Exchange Commission (SEC), and the Federal Reserve Board have recommended that those exemptions be eliminated for GSE equity and unsecured debt securities (U.S. Department of the Treasury, Securities and Exchange Commission, and Board of Governors of the Federal Reserve System 1992). Legislation has been introduced in the Congress to implement that recommendation. Such proposals seek primarily to increase market discipline of Fannie Mae and Freddie Mac by shareholders. There have also been discussions of the option of requiring the Enterprises to issue subordinated debt, where the debt would be structured to expose investors to greater risk of loss than is posed by senior Enterprise debt (Golding 1990, U.S. Congressional Budget Office 1991).

In response to concerns about the systemic risk they pose and Congressional consideration of legislation to reform their charters and regulation, in October 2000 Fannie Mae and Freddie Mac announced six initiatives intended to improve their transparency, increase their liquidity, and enhance market discipline (Frame and Wall 2002, Frantantoni 2002). Those initiatives include the monthly disclosure of new information about each Enterprise's exposure to interest rate risk and credit risk, the annual disclosure of "risk-to-the-government" credit ratings of each Enterprise, and the issuance by each Enterprise of a new type of subordinated debt. Fannie Mae and Freddie Mac have each disclosed the new risk measures since January 2001 (Fannie Mae 2003, Freddie Mac 2003). The Enterprises began issuing the new subordinated debt in the first

quarter of 2001. As of mid-June 2003, Fannie Mae had outstanding about \$8.5 billion and Freddie Mac \$5.5 billion, of the new subordinated debt.

Complementing those initiatives, in July 2002 Fannie Mae and Freddie Mac announced their intention to voluntarily register their stock with the SEC under the Securities Act of 1934. Fannie Mae registered its stock at the end of March 2003, whereas Freddie Mac has delayed registering its stock pending the completion of a restatement of its financial results for 2000, 2001, and 2002.

### **Overview of the Paper**

There has been little empirical research assessing market discipline of Fannie Mae and Freddie Mac. A first step is to investigate how Enterprise share prices and debt yields respond to new information. This paper does so by examining the share prices of Fannie Mae and Freddie Mac and the spreads between the yields of each Enterprise's noncallable senior debt and the yields of comparable-maturity Treasury debt (senior debt yield spreads) during the period from February 2000 through mid-June 2003. The paper presents estimates of the effects on share prices and senior debt yield spreads during that period of the release of new information about the Enterprises. Investors revise their assessments of the discounted future cash flows of Fannie Mae or Freddie Mac, the appropriate market price of each Enterprise's shares, and the appropriate yield of its debt securities in response to new information about many factors, including conditions in the housing sector and the overall economy. This paper focuses on the response of

Enterprise share prices and debt yields to new information released during the period that was likely to affect investors' views about:

1. The Enterprise's financial risks, principally credit risk, interest rate risk, and operations risk;
2. The likelihood that the federal government will protect investors in the Enterprise's debt and other major creditors such as derivatives counterparties in the event the Enterprise became insolvent; and
3. The probability that the government will alter other aspects of the Enterprise's relationship to the government that contribute to its franchise value, such as the Enterprise's federal capital requirements, the duopoly structure of the secondary mortgage market, and the Enterprise's other benefits under federal law.<sup>2</sup>

The paper analyzes the spreads between the yields of senior Fannie Mae and Freddie Mac debt and Treasury yields, rather than the spreads between subordinated and senior Enterprise debt yields, for two reasons. First, the market for Enterprise subordinated debt is much less active and liquid than the market for Enterprise senior debt. Although Bloomberg tracks the yields of Enterprise subordinated debt since issuance, observations are missing for many days and, for an unknown number of days, they are based on indicative yields posted by dealers rather than actual trades. A more complete data series was not available during the writing of the paper.

Second, as Bliss (2001) emphasizes, extracting information about an issuer's risk of failure from the yields of its subordinated debt is difficult. This is particularly true in the case of Fannie Mae and Freddie Mac. Although investors in each Enterprise's subordinated debt are clearly exposed to greater *cash flow* risk than investors in its senior debt, it is not certain that the former are subject to greater ultimate risk of loss than the latter (Frame and Wall 2000).<sup>1</sup> Legislation to provide financial assistance to a failed Enterprise could protect holders of subordinated debt just as easily as investors in senior debt.

The remainder of the paper is organized as follows. Section II briefly presents descriptive statistics about Fannie Mae and Freddie Mac share prices and senior debt yield spreads from February 2000 to mid-June 2003. Section III reviews the 11 events analyzed in the paper and indicates my assumptions about how the new information revealed at the beginning of each of those events probably affected Enterprise share prices and yield spreads. Section IV presents my equations and results. Section V concludes the paper.

## **II. THE ENTERPRISES' SHARE PRICES AND SENIOR DEBT YIELDS, 2000 -MID-2003**

The share prices of Fannie Mae and Freddie Mac rose by about 21 percent and 7 percent, respectively, between February 2000 and June 13, 2003 (Figure 1). The standard deviation of daily changes in the share price of Fannie Mae and Freddie Mac was 2.4

percent and 2.5 percent of the respective Enterprise's share price at the start of the period. The market value of other financial stocks, as measured by the New York Stock Exchange (NYSE) Financials Index, grew by about 9 percent in that period (Table 1).<sup>3</sup>

The yields of senior debt issued by Fannie Mae and Freddie Mac followed the downward trend of Treasury yields during the period (Figures 2 and 3). The spreads between the yields of noncallable Fannie Mae Benchmark Notes and Freddie Mac Reference Notes and the yields of comparable-maturity Treasury securities averaged about 55 basis points for the 5-year bonds and about 75 basis points for the 10-year debt. The yields on the Enterprises' issues were somewhat more volatile (Table 2).

### **III. THE EVENTS**

Each of the 11 events encompasses a 10-day period that includes a trading day on which new information about Fannie Mae and Freddie Mac became public (or the first trading day thereafter, in the case information became available on a day on which the markets were closed) and the nine subsequent trading days. The assumption is that changes in share prices and senior debt yield spreads over the 10 days will capture investors' response to the new information. This section presents the 11 events, summarizes how Fannie Mae and Freddie Mac share prices and 10-year senior debt yield spreads moved during each event, and indicates what the statistical analysis assumes about the effects of the new information. Table 3 summarizes the events and assumptions.

The share prices of Fannie Mae and Freddie Mac typically move in the same direction on each trading day, but the magnitude of the change in each variable often differs between the Enterprises. There is a similar relationship between the yield spreads of the two Enterprises' senior debt. Those correlations are not surprising, since investors tend to view Fannie Mae and Freddie Mac as similar institutions and each Enterprise's securities are close substitutes for the other's securities. New information about the risk of either Enterprise tends to affect the market's perception of the other Enterprise's risk, and each Enterprise's stock price and its senior debt yield spreads tend to move in opposite directions in response to such events. Thus, the paper assumes that new information that is followed by a decline in either Enterprise's share price should also be followed by a drop in the other Enterprise's share price and increases in both Enterprises' senior debt yield spreads, and that new information followed by an increase in either Enterprise's senior debt yield spreads should also be followed by an increase the other's spreads and declines in both Enterprises share prices.

### **Event 1**

On March 22, 2000, Under Secretary of the Treasury Gary Gensler gave Congressional testimony in which he expressed support for repealing the Secretary of the Treasury's conditional authority to purchase up to \$2.25 billion of each Enterprise's obligations and making other changes in statute that would have tightened federal regulation of the Enterprises. The share prices of Fannie Mae and Freddie Mac declined, and each Enterprise's 10-year senior debt yield spreads increased, following the testimony (Figures

4 and 5). The paper assumes that investors perceived heightened risk of the enactment of legislation that would change the Enterprises' charters and regulation in ways that reduced future earnings, and less certainty about whether the government would make good on the unpaid debts of a failed Enterprise. Therefore, the statistical analysis assumes that the event had a negative effect on Enterprise share prices and a positive effect on Enterprise senior debt yield spreads.

### **Event 2**

On October 19, 2000, Fannie Mae and Freddie Mac announced the six initiatives mentioned above. Each Enterprise's share price increased and its 10-year senior debt yield spreads declined, after the announcement (Figures 6 and 7). It is likely that investors perceived the initiatives as making less likely the enactment of legislation that would lower the Enterprises' franchise values and reducing uncertainty about the government's willingness to back a financially troubled Enterprise. The analysis assumes that the new information had a positive effect on share prices and a negative effect on senior debt yield spreads.

### **Event 3**

On March 6, 2002, Freddie Mac announced the replacement of its auditor, Arthur Anderson, with PricewaterhouseCoopers. Fannie Mae's share price remained essentially unchanged following that event, whereas Freddie Mac's declined somewhat for about

two weeks (Figure 8). Freddie Mac's 10-year senior debt yield spread increased, rising to the level of Fannie Mae's within about two weeks (Figure 9). Investors may have perceived that Freddie Mac and, to a degree, Fannie Mae, posed heightened financial risk. The analysis assumes that the announcement had a negative effect on each Enterprise's share prices and a positive effect on its senior debt yield spreads.

#### **Event 4**

On July 12, 2002, Fannie Mae and Freddie Mac announced plans to voluntarily register their stock with the SEC. Each Enterprise's share prices fluctuated for a few days and then trended upward following the event, whereas each Enterprise's 10-year senior debt yield spreads increased, with Freddie Mac's rising more than Fannie Mae's (Figures 10 and 11). Investors were probably uncertain about the potential implications of SEC registration and any new disclosures related thereto, and the changes in share prices and yield spreads may have reflected a risk premium associated with that perception. The analysis assumes that the announcement had a negative effect on share prices and a positive effect on senior debt yield spreads.

#### **Event 5**

On September 16, 2002, Fannie Mae announced that the effective duration gap of its mortgage asset portfolio was a negative 14 months at the end of August 2002, down from a negative 9 months at the end of July and significantly outside the Enterprise's target



band of between positive six and negative six months. Interest rates had recently declined sharply, which increased the rate at which borrowers prepaid mortgages held by Fannie Mae and shortened the durations of its assets at a more rapid rate than the Enterprise was able to shorten the durations of its liabilities. A wider negative duration gap meant that Fannie Mae was exposed to greater risk of loss if interest rates declined further, as assets would run off faster than liabilities, causing interest income to fall more rapidly than interest expense. Following the announcement, the share price of each Enterprise declined, Fannie Mae's much more sharply than Freddie Mac's (Figure 12). Each Enterprise's 10-year senior debt yield spread increased, Fannie Mae's rising above Freddie Mac's (Figure 13). It is likely that the market perceived Fannie Mae as exposed to greater interest rate risk, and that perception contagiously infected Freddie Mac. The analysis assumes that the announcement had a negative effect on each Enterprise's share prices and a positive effect on its senior debt yield spreads.

## **Event 6**

On October 1, 2002, Fannie Mae announced that its effective duration gap at the end of September was negative 10 months. That announcement was followed by an increase in each Enterprise's share price and a decline in its 10-year debt yield spreads. Those movements suggest a partial reversal of the perceptions formed at the time of the previous announcement. The analysis assumes the announcement had a positive effect on share prices and a negative effect on senior debt yield spreads.

## **Event 7**

On January 22, 2003, Freddie Mac announced that PricewaterhouseCoopers was conducting a reaudit of its financial results for 2000 and 2001, and that, as a result, the Enterprise would restate its earnings for those years and 2002. The Enterprise indicated that the restatement would involve the reclassification of certain derivatives transactions under Financial Accounting Standard 133 and would result in higher reported earnings in those three years. Each Enterprise's share prices declined and 10-year senior debt yield spreads increased following the announcement, with Freddie Mac's changing much more than Fannie Mae's (Figures 14 and 15). It is likely that investors perceived each Enterprise's future cash flows as less certain and its securities as riskier following the event. The analysis assumes the announcement had a negative effect on share prices and a positive effect on senior debt yield spreads.

## **Event 8**

On March 10, 2003, William Poole, President of the Federal Reserve Bank of St. Louis, gave a speech at a symposium sponsored by the Office of Federal Housing Enterprise Oversight (OFHEO), which is responsible for prudential regulation of Fannie Mae and Freddie Mac, in which he expressed concern about the systemic risk the Enterprises pose, supported repeal of the Treasury's discretionary authority to purchase obligations, and suggested that each Enterprise did not have sufficient capital to protect against nonquantifiable risks (Poole 2003). Each Enterprise's share prices dropped, and its 10-

year senior debt yield spreads increased, immediately following that event (Figures 16 and 17). The market likely assigned a higher probability to the possibility of an increase in the Enterprises' capital requirements or other changes that reduced its franchise value, was less certain about the implicit federal guarantee, and was responding to what it perceived as a "bad headline". The analysis assumed the speech had a negative effect on share prices and a positive effect on senior debt yield spreads.

### **Event 9**

On March 31, 2003, Fannie Mae registered its stock with the SEC, filing a 10-K report for 2002. Each Enterprise's share prices declined immediately following that announcement, and then trended upward. Fannie Mae's 10-year senior debt yield spreads increased immediately following the announcement, whereas Freddie Mac's remained steady, and then both exhibited a downward trend (Figures 16 and 17). The registration probably increased investors' uncertainty about the future performance of each Enterprise and its securities. The analysis assumed the registration had a negative effect on share prices and a positive effect on senior debt yield spreads.

### **Events 10 and 11**

On June 9, 2003, Freddie Mac announced the retirement of its Chief Executive Officer, the termination of its Chief Operating Officer, and the resignation of its Chief Financial Officer, in a management shakeup related to the reaudit of the Enterprise's financial

reports. OFHEO announced that it is conducting an investigation of Freddie Mac's accounting practices related to the restatement, management's progress in taking remedial action, and potential employee misconduct. On June 11, 2003, the SEC and the Department of Justice announced investigations of the circumstances surrounding those management changes. Both announcements were followed by declines in the share prices and increases in the 10-year senior debt yield spreads of each Enterprise, with larger changes affecting Freddie Mac Figures 18 and 19). Those announcements probably led investors to perceive Freddie Mac's financial risk as greater, that change in perception affected Fannie Mae to some degree, and investors probably viewed the possibility of legislation that would alter the Enterprises' ties to the government in ways that reduced their franchise value as more likely. The analysis assumed both announcements as having a negative effect on share prices and a positive effect on senior debt yield spreads.

### **III. STATISTICAL ANALYSIS**

Generalized least squares equations were estimated for the purpose of assessing whether the release of new information about Fannie Mae or Freddie Mac had a measurable effect on the Enterprises' share prices and senior debt yield spreads. The effects of each event were assessed over the 10 trading days on and following the day new information became public. Four equations were estimated: one for each GSE's stock price, one for the spread between the yields of 10-year, noncallable Freddie Mac Reference notes and 10-year Treasury securities, and one for the spread between the yields of 10-year, noncallable Fannie Mae Benchmark notes and 10-year Treasuries. The data, which were obtained

from Bloomberg and Yahoo.finance.com, include all weekdays excluding holidays from February 1, 2000 through June 13, 2003. Daily values of the NYSE Financials Index were also obtained for the period from Yahoo.finance.com.

### **Freddie Mac's Stock Price**

It was assumed that daily stock prices for Freddie Mac (FRE) in the period were a linear function of the trend for the most recent five trading days (SPTrend), a dummy variable representing Events 10 and 11 (FRE6/03), a dummy variable representing the other events assumed to have a negative effect on the Enterprises' share prices (Events(-)), a dummy variable representing the events assumed to have a positive effect (Events(+)), and the NYSE Financials Index (NYSE).

$$FRE_t = a_0 + a_1 * SPTrend_t + a_2 * Events(-)_t + a_3 * Events(+)_t + a_4 * FRE6/03_t + a_5 * NYSE_t + e_{1t}$$

where

$FRE_t$  is the closing price of Freddie Mac's stock on day t;

$SPTrend_t$  is the expected closing price of Freddie Mac's stock on day t, estimated as a linear function its price on the 5 previous trading days;

Events(-) is a dummy variable whose value is 1 for the 10 trading days of each event assumed to have a negative effect on  $FRE_t$ , other than Events 10 and 11, and 0 for other trading days;

Events(+) is a dummy variable whose value is 1 for the 10 trading days of each event assumed to have a positive effect on  $FRE_t$ , and 0 for other trading days;

$FRE6/03_t$  is a dummy variable whose value is 1 for the trading days of Event 10 and 11 and 0 for other trading days; and

$NYSE_t$  is the closing price of the NYSE Financials Index on day t.

Note that the value of a dummy variable may exceed 1 on a trading day if the period of more than one of the 11 events included that day.

A priori expectations were that  $a_1$ ,  $a_3$ , and  $a_5 > 0$ , and  $a_2$  and  $a_4 < 0$ . Those expectations were satisfied, but the coefficients for Events(-) and Events(+) were not statistically significant (Table 4). Events 10 and 11 do appear to have had a negative effect on Freddie Mac's share price, reducing that price by \$3.29 per share. Every \$1 increase in the trend of Freddie Mac's share price over the previous five days had a 16 cents positive effect on the current price. The other negative events had a much smaller negative effect, lowering the share price by \$0.61. The positive events had a positive effect, raising that price by \$0.18. Every point increase in the NYSE Financials Index had

a 4 cents positive effect on the share price. The overall fit of Equation 1 was quite strong, with an  $R^2$  of .98.

### **Fannie Mae's Stock Price**

Similarly, it was assumed that daily stock prices for Fannie Mae (FNM) were a linear function of the trend for the most recent five trading days (SPTrend), a dummy variable representing Events 10 and 11 (FRE6/03), a dummy variable representing the other events that we assumed to have a negative effect on the Enterprises' share prices (Events(-)), a dummy variable representing the events that we assumed to have a positive effect (Events(+), and the NYSE Financials Index (NYSE).

$$FNM_t = b_0 + b_1 * SPTrend_t + b_2 * Events(-)_t + b_3 * Events(+)_t + b_4 * FRE6/03_t + b_5 * NYSE_t + e_{2t}$$

A priori expectations were that  $b_1$ ,  $b_3$ , and  $b_5 > 0$ , and  $b_2$  and  $b_4 < 0$ . Those expectations were satisfied, but the coefficients for Events(+) and FRE6/03 were not statistically significant (Table 4). Every \$1 increase in the trend in Fannie Mae's share price over the previous 5 days had a 3 cent positive effect on the current price. The postulated negative events, other than Events 10 and 11, appear to have had a negative effect on Fannie Mae's stock price, reducing that price for the duration of each event by \$0.82 per share. That effect is larger than the impact of those events on Freddie Mac's share price. Every point increase in the NYSE Financials Index had an 8 cents positive

effect on the Fannie Mae's share price. In addition, the effect of Events 10 and 11 on Fannie Mae's share price, although not statistically significant, was about one fifth of the effect of those events on Freddie Mac's share price. The overall fit of Equation 2 was quite strong, with an  $R^2$  of .98.

### **Spread Between Yields of 10-Year, Noncallable Freddie Mac Reference Note and 10-Year Treasury Note**

It was assumed that daily spreads between the yield on 10-year, noncallable Freddie Mac Reference Notes and the yield on 10-year Treasury Notes (FRESPD) were a linear function of the trend for the most recent five trading days (SPDTrend); a dummy variable representing Events 10 and 11 (FRE6/03); the other events that are assumed to have positive effect on the Enterprises' share prices (Events(+)); events that are assumed to have a negative effect on those prices (Events(-)); and the NYSE Financials Index (NYSE).

$$\text{FRESPD}_t = c_0 + c_1 * \text{SPDTrend}_t + c_2 * \text{Events}(-)_t + c_3 * \text{Events}(+)_t + c_4 * \text{FRE6/03}_t + c_5 * \text{NYSE}_t + e_{3t}$$

A priori expectations were that  $c_1$ ,  $c_2$ , and  $c_4$ ,  $> 0$ , whereas  $c_3$  and  $c_5 < 0$ . Those expectations were satisfied, although the coefficient for Events(+) was not statistically significant (Table 5). The trend in Freddie Mac's 10-year senior debt yield spread over the previous five days had a significant positive effect on the current spread. Every 100 basis point increase (decrease) in that trend results in a 25 basis point increase (decrease)



in the current spread. Note how the postulated events that reduced stock prices had the opposite effect on spreads. Events 10 and 11 (FRE6/03) increased spreads by about 5 basis points. When the other negative events (Events(-)) occurred, they tended to increase spreads by about 2 basis points. Events that had positive effects on Enterprise stock prices should and did reduce the spread, but were statistically insignificant. A 100 point gain in the NYSE reduced the spread only 3 basis points. The overall fit of Equation 3 was good, with an  $R^2$  of .98.

### **Spread Between Yields of 10-Year, Noncallable Fannie Mae Benchmark Note and 10-Year Treasury Note**

Daily spreads between the yield on 10-year, noncallable Fannie Mae Benchmark Notes and the yield on 10-year Treasury Notes (FNMSPD) are assumed to be a linear function of the trend for the most recent five trading days (SPDTrend); a dummy variable representing Events 10 and 11 (FRE6/03); other events that are assumed to have a negative effect on Enterprise stock prices (Events(-)); events that are assumed to have a positive effect on those prices (Events(+)); and the NYSE Financials Index (NYSE).

$$\text{FNMSPD}_t = d_0 + d_1 * \text{SPDTrend}_t + d_2 * \text{Events}(-)_t + d_3 * \text{Events}(+)_t + d_4 * \text{FRE6/03}_t + d_5 * \text{NYSE}_t + e_{4t}$$

A priori expectations were that  $d_1$ ,  $d_2$ , and  $d_4 > 0$  and  $d_3$  and  $d_5 < 0$ . Those expectations were satisfied, although the coefficients for Events(+) and FRE6/03 were not significant (Table 5). The trend in Fannie Mae's 10-year senior debt yield spreads over the previous five days had a significant effect on current spreads. Every 100 basis point increase (decrease) in that trend results in a 19 basis point increase (decrease) in the current spread. Events with a negative effect on the Enterprises' share prices increase the spread by 2 basis points over this period, whereas positive events seem to have a smaller and statistically insignificant effect on the spread. Not surprisingly, Events 10 and 11 have a positive effect on the spread, although that effect was not statistically significant. As expected, a 100 point gain in the NYSE Financials Index would reduce the spread only 3.5 basis points. The overall fit of Equation 3 was good, with an  $R^2$  of .98.

#### **IV. CONCLUSION**

The aim of this paper is to assess how the share prices and debt yields of Fannie Mae and Freddie Mac respond to new information about the Enterprises. The results suggest that share prices and the spreads between the yields of each Enterprise's 10-year senior debt and comparable-maturity Treasury debt respond predictably to events that provide new information about an Enterprise's financial risks, the likelihood that the federal government will protect an Enterprise's debt investors and other major creditors in the event the Enterprise became insolvent, and the probability that the government will alter other aspects of the Enterprise's relationship to the government that contribute to its franchise value. The results also suggest information about one Enterprise that has a

positive effect on its share price typically has a similar positive on the other Enterprise's share price. Those correlations reflect the similarities in the charters, missions, activities, and financial condition of Fannie Mae and Freddie Mac, and the fact that market participants tend to view them as having essentially identical relationships to the government. Further, the release of information that tends to be followed by lower (higher) Enterprise stock prices also tends to be followed by higher (lower) senior debt yield spreads.

A limitation of the analysis is that the events analyzed do not include any episodes comparable to the mark-to-market insolvency of Fannie Mae in the late 1970s and early 1980s or the severe financial difficulties of the Farm Credit System in the mid-1980s. Thus, the paper could not assess how the Enterprises' senior debt yield spreads would tend to respond to a severe deterioration in either Enterprise's financial condition. Those earlier experiences with Fannie Mae and the Farm Credit System suggest that, in such an event, a severely financially troubled Enterprise's senior debt yield spreads would not increase as much as they would if the Enterprise was not a GSE.

## NOTES

<sup>1</sup> The terms of each Enterprise's subordinated debt specify that it will defer interest payments on all such obligations if core capital becomes too low or, when requested by the Enterprise, the Secretary of the Treasury buys its debt. If interest payments are deferred, dividend payments on all outstanding common and preferred stock are suspended. Interest deferral for an issue would occur for a maximum of five years, but would not extend beyond the stated maturity of the issue. Upon the earliest of 1) the requirement for interest deferral ceasing, 2) a given issue maturing, or 3) the maximum five-year period for deferral having elapsed, all deferred interest on that issue would be due and payable along with interest payable on the missed payments compounded at the coupon rate of the issue. Neither Enterprise's subordinated obligations allow investors to accelerate the maturity of the securities if that Enterprise does not pay after a five-year deferral.

<sup>2</sup> For discussions of those other legal benefits, see U.S. Congressional Budget Office (1991) and U.S. Office of Federal Housing Enterprise Oversight (2003).

<sup>3</sup> The NYSE Financials Index is a capitalization-weighted index of all the financial stocks that trade on the New York Stock Exchange that is designed to measure the performance of the financial sector as a whole. The index has a base value of 50 as of December 31, 1965.

## ACKNOWLEDGEMENTS

The author thanks Pat Lawler, Tom Lutton, Angelo Mascaro, Forrest Pafenberg, Anthony Pennington-Cross, David Torregrossa, and Robert Van Order for helpful comments; Tom Lutton for econometric assistance; and Tom Ruseski for help in obtaining data.

## REFERENCES

Basel Committee on Banking Supervision. 2003. *Consultative Document: The New Basel Capital Accord*. Basel: Bank for International Settlements.

Bliss, Robert R. 2001. "Market Discipline and Subordinated Debt: A Review of Some Salient Issues." *Economic Perspectives*, Federal Reserve Bank of Chicago, First Quarter, pp. 24-45.

Bliss, Robert R. and Mark J. Flannery. 2001. "Market Discipline in the Governance of U.S. Bank Holding Companies: Monitoring vs. Influencing," in *Prudential Supervision: What Works and What Doesn't*. Frederic S. Mishkin, ed. Chicago: The University of Chicago Press, pp. 107-143.

Fannie Mae. 2003. Voluntary Initiatives Disclosure. Washington, DC, May.

Federal Reserve System Study Group on Disclosure. 2000. *Improving Public Disclosure in Banking*. Washington, DC: Board of Governors of the Federal Reserve System.

Flannery, Mark J. 1998. "Using Market Information in Prudential Bank Supervision: A Review of the U.S. Empirical Evidence," *Journal of Money, Credit, and Banking*, 30:3, August, Part I, pp. 273-305.

- Flannery, Mark J. 2001. "The Faces of 'Market Discipline,'" *Journal of Financial Services Research*, 20:2/3, October/December, pp. 107-119.
- Frame, W. Scott. and Larry D. Wall. 2002. "Fannie Mae's and Freddie Mac's Voluntary Initiatives: Lessons from Banking," *Economic Review* (Federal Reserve Bank of Atlanta), pp. 45-59.
- Frantantoni, Michael. 2002. "Fannie Mae's Voluntary Initiatives After 18 Months: A Report on Implementation and Policy Issues," *Fannie Mae Papers*, I: 4, June.
- Freddie Mac. 2003. *Monthly Volume Summary*. McLean, VA, May.
- Golding, Edward L. 1990. "Regulating the Secondary Mortgage Market," *Secondary Mortgage Markets*, Fall, pp. 3-6.
- Kane, Edward J. and Chester S. Foster. 1986. "Valuing Conjectural Government Guarantees of FNMA Liabilities," *1986 Proceedings of a Conference on Bank Structure and Competition* (Federal Reserve Bank of Chicago), pp. 347-368.
- Poole, William. 2003. "Housing in the Macroeconomy" (speech at Office of Federal Housing Enterprise Oversight Symposium on House Prices and the Economy, Washington, DC, March 10).
- Stanton, Thomas H. 2002. *Government-Sponsored Enterprises: Mercantilist Companies in the Modern World*. Washington, DC: The AEI Press.

U.S. Congressional Budget Office. Controlling the Risks of Government-Sponsored Enterprises. Washington, DC: U.S. Government Printing Office.

U.S. Department of the Treasury, Securities and Exchange Commission, and Board of Governors of the Federal Reserve System. 1992. *Joint Report on the Government Securities Market*. Washington, DC: U.S. Government Printing Office.

U.S. General Accounting Office. 1985. *The Federal National Mortgage Association in a Changing Economic Environment*. Washington, DC: Government Printing Office.

U.S. General Accounting Office. 1990. *Government-Sponsored Enterprises: The Government's Exposure to Risks*. Washington, DC: Government Printing Office.

U. S. Office of Federal Housing Enterprise Oversight. 2003. *Systemic Risk: Fannie Mae, Freddie Mac, and the Role of OFHEO*. Washington, DC: Government Printing Office.

**Table 1. Fannie Mae and Freddie Mac Share Prices and NYSE Financials Index, February 2000 - Mid-June 2003**

	<b>Fannie Mae</b>	<b>Freddie Mac</b>	<b>NYSE Financials</b>
<b>Range</b>			
<b>Maximum</b>	148.18	146.65	130.97
<b>Minimum</b>	80.31	76.51	87.19
<b>Mean</b>	122.76	121.93	112.23

**Note: share prices and index values normed to equal 100 on February 1, 2000.**

**Table 2. Yields on Treasury, Fannie Mae, and Freddie Mac 5-Year and 10-Year Debt, February 2000 - Mid-June 2003 (percent)**

	<b>5-Year Treasury</b>	<b>5-Year Fannie Mae*</b>	<b>5-Year Freddie Mac**</b>
<b>Mean</b>	4.48	5.04	5.02
<b>Standard deviation</b>	1.23	1.38	1.40
	<b>10-Year Treasury</b>	<b>10-Year Fannie Mae</b>	<b>10-Year Freddie Mac</b>
<b>Mean</b>	4.98	5.74	5.73
<b>Standard deviation</b>	0.81	0.99	0.98

**\*Noncallable Benchmark notes**

**\*\*Noncallable Reference notes**



**Table 3. Events That May Have Affected Fannie Mae and Freddie Mac Share Prices and Spreads Between Yields on Senior Debt and Treasury Debt, February 2000 - Mid-June 2003**

	Date	Summary of Event	Expected Effects			
			Share Prices		Senior Debt Yield Spreads	
			Fannie	Freddie	Fannie	Freddie
1	3/22/2000	U.S. Treasury Under Secretary Gensler testifies before Rep. Baker's subcommittee expressing support for repealing the Treasury's discretionary authority to purchase \$2.25 billion of an Enterprise's debt	-	-	+	+
2	10/19/2000	Fannie Mae and Freddie Mac announce plans to implement six voluntary initiatives	+	+	-	-
3	3/6/2002	Freddie Mac replaces its auditor, Arthur Anderson, with Price Waterhouse Coopers	-	-	+	+
4	7/12/2002	The Enterprises announce plans to register their stock with the SEC	-	-	+	+
5	9/16/2002	Fannie Mae releases portfolio duration gap of -14 months	-	-	+	+
6	10/1/2002	Fannie Mae releases portfolio duration gap of -10 months	+	+	-	-
7	1/22/2003	Freddie Mac announces plan to restate earnings for 2000-2001	-	-	+	+
8	3/10/2003	Federal Reserve Bank of St. Louis President William Poole speech	-	-	+	+
9	3/31/2003	Fannie Mae registers stock with the SEC	+	+	-	-
10	6/9/2003	Freddie Mac's senior management shakeup	-	-	+	+
11	6/11/2003	SEC and DOJ investigations of Freddie Mac announced	-	-	+	+

**Table 4. Summary Statistics – Share Prices**

**Equation 1. Freddie Mac’s Share Price**

R <sup>2</sup> =	Est. Rho=
0.98	0.8

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept*	-2.95701	0.405286	-7.29611
SP Trend*	0.164093	0.004758	34.48742
Events(-)	-0.60773	0.337818	-1.79898
Events(+)	0.183707	0.41459	0.443105
FRE6/03*	-3.28508	0.675814	-4.86092
NYSE Financials*	0.044859	0.003307	13.56333

\*Statistically significant at the 95 percent confidence level

**Equation 2. Fannie Mae’s Share Price**

R <sup>2</sup> =	Est. Rho=
0.98	0.95

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept*	-0.9182	0.312985	-2.93368
Stock Price Trend*	0.031121	0.004214	7.384597
Events(-)*	-0.82371	0.349514	-2.35673
Events(+)	0.134304	0.428294	0.31358
FRE6/03	-0.66929	0.798558	-0.83812
NYSE Financials*	0.079983	0.004709	16.9834

\*Statistically significant at the 95 percent confidence level

**Table 5. Summary Statistics – Senior Debt Yield Spreads**

**Equation 3. Spreads Between Yields on 10-Year, Noncallable Freddie Mac Reference Note and 10-Year Treasury Note**

R <sup>2</sup> =	Est. Rho=
0.98	0.75

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept*	4.892512	1.122297	4.359373
SPD Trend*	0.245038	0.005398	45.3978
Events(-)*	1.823592	0.926696	1.967842
Events(+)	-2.21374	1.134447	-1.95138
FRE6/03*	4.908148	1.814289	2.705274
NYSE Financials*	-0.03272	0.007979	-4.10138

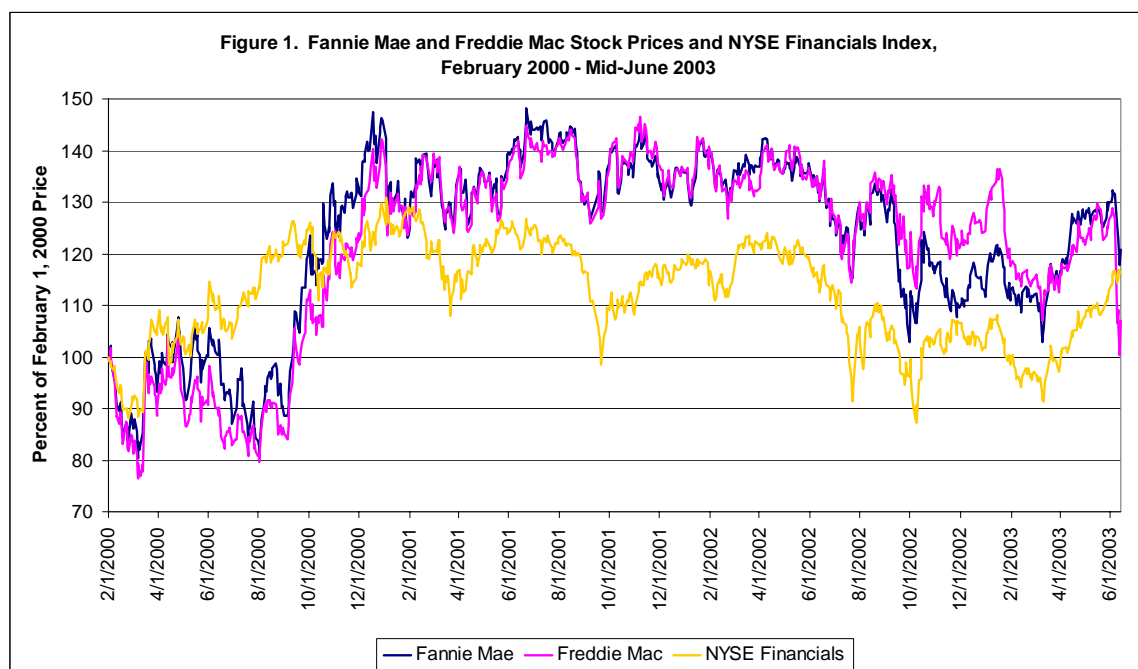
\*Statistically significant at the 95 percent confidence level

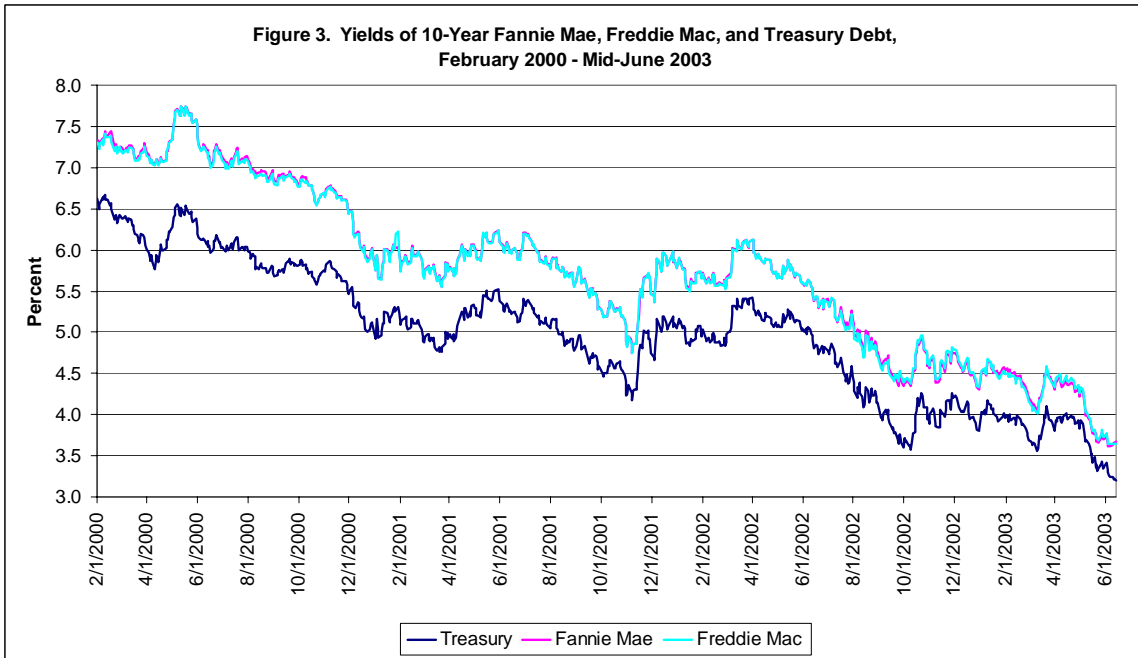
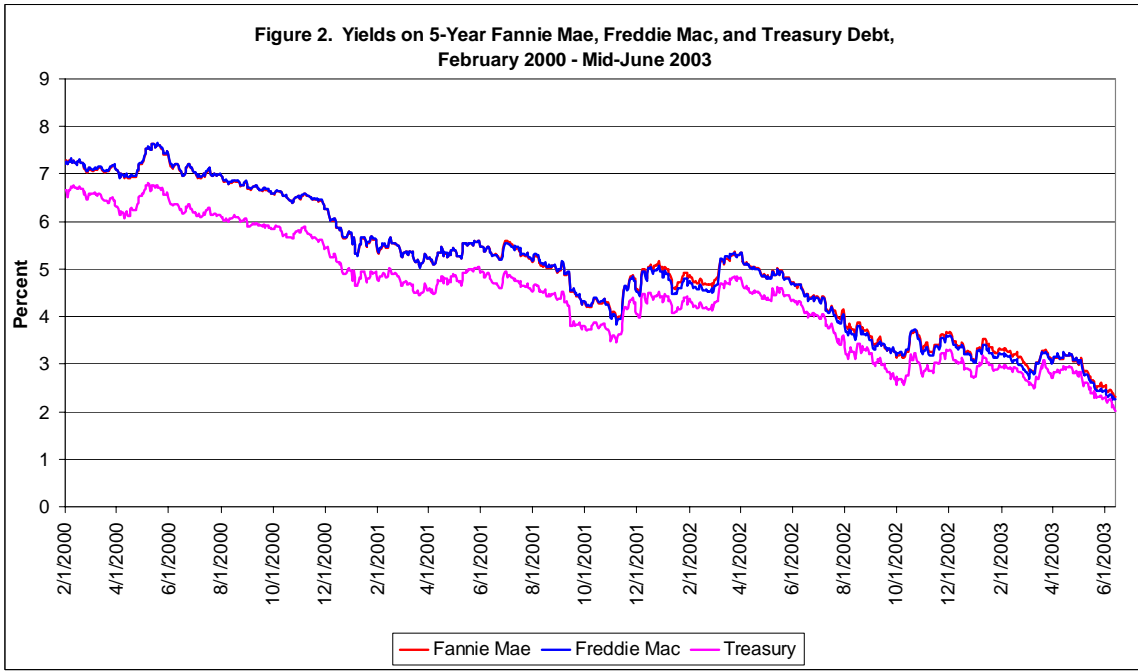
**Equation 4. Spreads Between Yields on 10-Year, Noncallable Fannie Mae Benchmark Note and 10-Year Treasury Note**

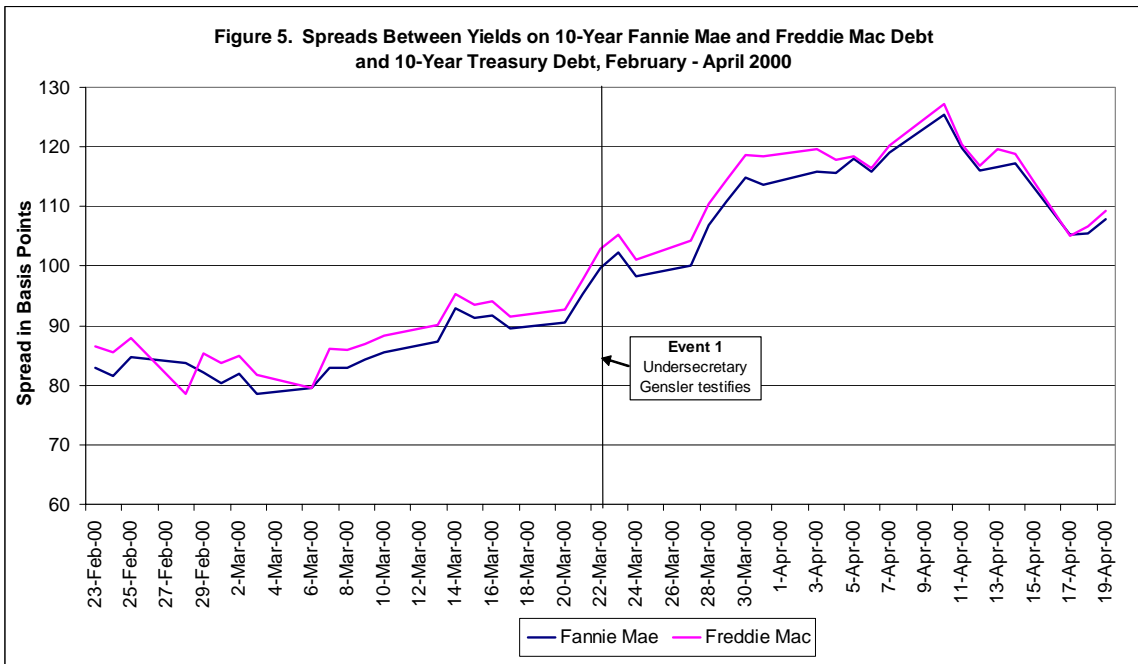
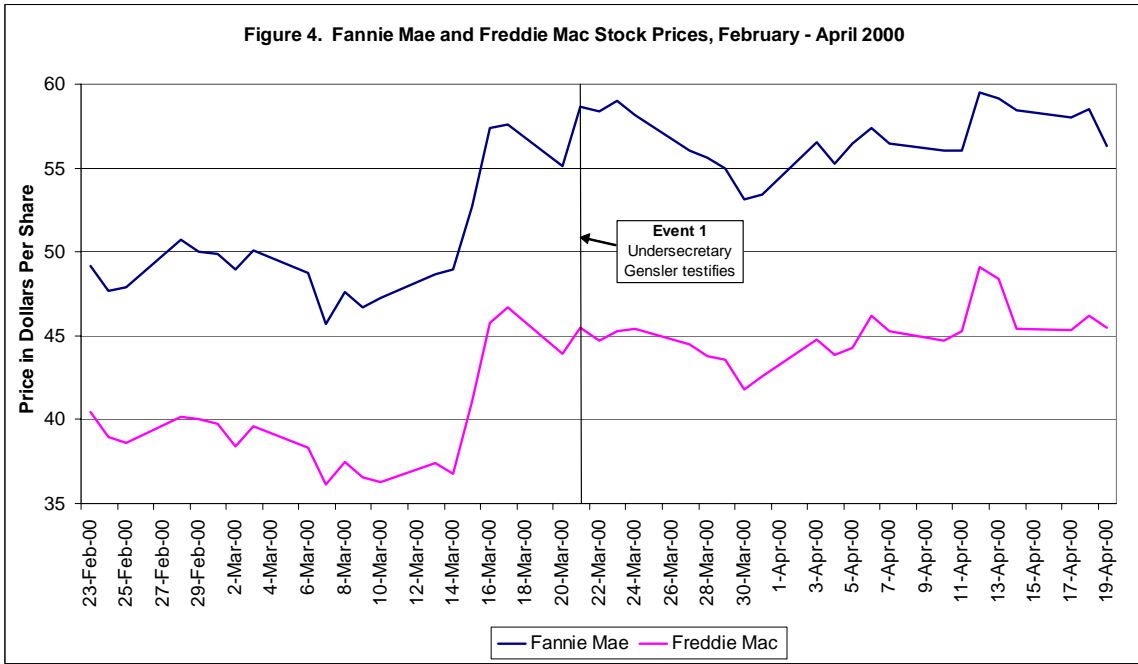
R <sup>2</sup> =	Est. Rho=
0.98	0.8

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>
Intercept*	4.26463	0.923309	4.618854
SPD Trend*	0.194427	0.004977	39.06422
Events(-)*	1.941232	0.84228	2.304735
Event(+)	-0.84037	1.030945	-0.81514
FRE6/03	2.48776	1.698832	1.464394
NYSE Financials*	-0.03486	0.008131	-4.28704

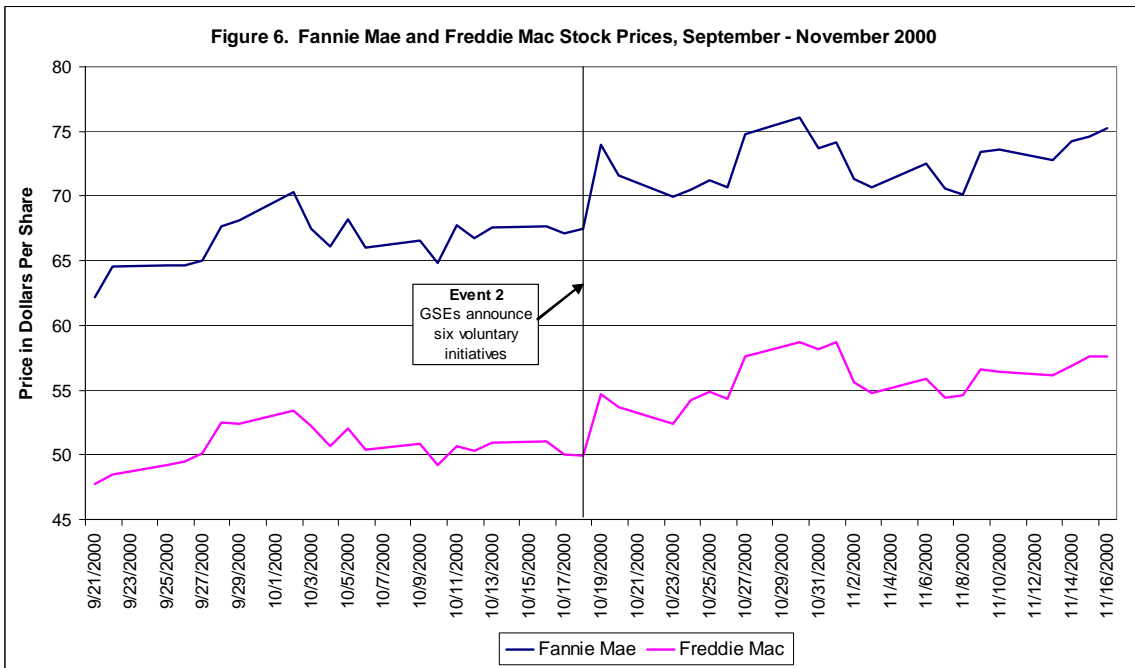
\*Statistically significant at the 95 percent confidence level







**Figure 6. Fannie Mae and Freddie Mac Stock Prices, September - November 2000**



**Figure 7. Spreads Between Yields of 10-Year Fannie Mae and Freddie Mac Debt and 10-Year Treasury Debt, September - November 2000**

