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FOREIGN CENTRAL BANKS AND THE MARKET FOR 'FEDERAL AGENCY' DEBT

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Foreign Central Banks and the Market for 'Federal Agency' Debt

I. Introduction

The U.S. Treasury is the largest debt issuer in the world with over $4 trillion in publicly held securities outstanding. This fact, coupled with the acceptance of Treasury securities as the international risk-free reference asset, has made the market for these securities the deepest and most liquid in the world. These risk characteristics make U.S. Treasury debt attractive to conservative investors, including foreign investors. Indeed, it is well known that foreign investors own a large and ever increasing fraction of U.S. Treasury debt , a large fraction of which is held by foreign official sources, mainly foreign central banks. These facts, in turn, have led to a great deal of attention from researchers, policymakers, and the media about the attendant economic and political repercussions.[1]

Perhaps less well understood is that a similar trend has also occurred in a closely related segment of the fixed-income market: "Federal Agency" debt. As of year-end 2005, Federal Agency debt outstanding stood at $2.6 trillion, accounting for just over 10 percent of the U.S. fixed-income market.[2] Nearly all Federal Agency debt has been issued by three government-sponsored enterprises (GSEs) that support U.S. residential mortgage finance: the Federal National Mortgage Association (Fannie Mae), the Federal Home Loan Mortgage Corporation (Freddie Mac), and the Federal Home Loan Bank System (FHLB System).[3] GSEs are not actually government agencies, but rather are privately owned financial institutions chartered by

[1] See remarks by Governor Edward M. Gramlich, *Presented at the Euromoney Bond Investors Congress, London, England February 25, 2004.* http://www.federalreserve.gov/boarddocs/speeches/2004/20040225.

[2] See <http://bondmarkets.com/story.asp?id=323>. Mortgage-backed securities, which are issued and guaranteed predominately by the same "federal agencies", comprised the largest component of the bond market at that time ($5.9 trillion). Other major segments were corporate debt ($5.0 trillion), publicly held Treasury debt ($4.2 trillion), money market instruments ($3.5 trillion), municipal debt ($2.2 trillion), and asset-based securities ($2.0 trillion).

[3] The Federal Agency debt market also includes two other much smaller GSEs that serve agriculture (Farm Credit System and Farmer Mac), the Tennessee Valley Authority, and until recently, Sallie Mae.

Congress.[4] GSEs benefit substantially from their anomalous legal status because investors perceive that their debt obligations are implicitly guaranteed by the U.S. government despite explicit language on each security that it is not such an obligation.[5] As a result, GSE senior debt obligations are rated AAA, even though their stand-alone ratings would be lower, and trade at yields below those of any AAA-rated corporation.[6]

The three housing-related GSEs have leveraged the conjectural guarantee to the benefit of their shareholders and, in the process, become sophisticated bond issuers.[7] In fact, GSE debt issuance practices have evolved to now resemble those of the U.S. Treasury. Among their successful innovations is their commitment to issue large quantities of debt regularly according to a predetermined issuance calendar, like the U.S. Treasury does. This approach has attracted new investors, especially those that rely on regular issuance and deep and liquid markets for the debt, perhaps the largest of which are foreign central banks. Indeed, on a flow basis, both Fannie

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[4] Fannie Mae and Freddie Mac are both publicly held corporations with shares listed on the New York Stock Exchange (NYSE), while the FHLB System is a cooperative owned by depository institutions (banks, thrifts, and credit unions) and insurance companies. See Frame and White (2005) and Flannery and Frame (2006) for further background information on Fannie Mae/Freddie Mac and the FHLB System, respectively.

[5] This perception has arisen from past government actions to assist troubled GSEs as well as various charter benefits. In terms of past government actions, the Farm Credit System received a $4 billion taxpayer bailout during the late-1980s. See U.S. General Accounting Office (1990, 90–91) for a discussion of this episode as well as one in the late-1970s when Fannie Mae was insolvent on a market value basis and benefited from supervisory forbearance. Important charter benefits include: lines-of-credit with the U.S. Treasury, treatment as "government securities" for purposes of the Securities and Exchange Act of 1934, the ability to issue and transfer their obligations using the Federal Reserve's book-entry system, and an exemption from the Bankruptcy Code arising from their status as "federal instrumentalities".

[6] Fannie Mae and Freddie Mac receive AA- ratings from Standard and Poor's in terms of their risk to the government. However, such ratings incorporate whatever government support or intervention the entity typically enjoys during the normal course of business. See Frame and Wall (2002) for a discussion. Those two GSEs also receive "bank financial strength" ratings from Moody's (A-E scale) which are B+ (Fannie Mae) and A- (Freddie Mac).

[7] With respect to leveraging their charter benefits, the U.S. Congressional Budget Office (2004) estimated that in 2003 the two companies received gross benefits of $19.6 billion accruing from their federal charters, of which they passed through $13.4 billion to homebuyers through lower mortgage rates and retained $6.2 billion for their shareholders. Using a simulation exercise, Passmore (2003) estimates the median after-tax present value of Fannie Mae's and Freddie Mac's net federal benefits at $72 billion, accounting for 60 percent of the companies' combined market capitalization.

Mae and Freddie Mac now report that almost 30 percent of their new issuance is being purchased by foreign central banks.[8]

Foreign central banks are undoubtedly attracted to housing GSE obligations because of the conjectural guarantee and the positive yield spread above the otherwise similar Treasury securities. However, foreign central bank purchases of GSE debt may also have a signaling effect to the market that influences perceptions of the implied guarantee. In particular, it is plausible that sizable purchases of GSE debt by foreign official sources would further solidify market expectations that such a guarantee exists because the U.S. Congress may be unwilling to impose sizable losses on foreign governments in that event of a housing GSE insolvency.[9] If true, all investors would perceive a higher probability of bailout in the event of financial distress and hence require a lower risk premium.

This paper examines empirically whether changes in foreign central bank holdings of Federal Agency securities have an effect on the attendant debt spreads using a bivariate vector-autoregressive model. Before outlining our empirical approach, we provide some institutional background on the Federal Agency debt market (or more accurately the three housing GSEs' debt funding programs) and then describe the data used in our study.

This paper aims to contribute on three specific fronts. First, while the Federal Agency debt market is of substantial size, there is scant published research about it. Second, the three housing GSEs dominating this market are increasingly controversial members of the financial

[8] Fannie Mae and Freddie Mac disclose this information in their on-line newsletters. See, for example, <http://www.freddiemac.com/debt/pdf/refpoint_feb06.pdf> (Freddie Mac's Reference Point) or < http://www.fanniemae.com/markets/debt/pdf/fundingnotes_3_06.pdf;jsessionid=XMUTQ4TQKQ0LPJ2FQSISFGI> (Fannie Mae's Funding Notes). The GSEs actually report the percentage purchased by central banks, but since the Federal Reserve does not purchase GSE securities the figure can be assigned to the foreign institutions.

[9] Under current law, only Congress can affect resolution of an insolvent GSE. See Carnell (2005) and Wall, Eisenbeis, and Frame (2005).

services landscape. Indeed, the GSE investment portfolios, which are funded with Agency debt, are believed by the Treasury and Federal Reserve to pose a systemic risk to the economy.[10] Finally, while a voluminous literature describes the existence of conjectural guarantees for financial firms arising from systemic risk concerns and/or political cronyism, this paper attempts to isolate the dynamics of the yield differential (reflective of such market expectations) as a function of a measurable quantity. We are aware of no similar empirical investigations of this kind.

II. GSE Debt Funding Trends

We first use aggregate data on total debt outstanding for U.S. Treasury and Federal Agency to highlight the increasing importance of the Agency debt market. Figure 1 displays quarterly data from the Flow of Funds for 1990 to 2005 for the levels of total debt outstanding for each classification as well as the ratio of Federal Agency to Treasury debt outstanding (right scale). In this chart, most striking is the rapid growth of Federal Agency debt outstanding beginning in 1993; ramping-up in 1997; and then peaking in 2003. Federal Agency debt outstanding is currently equal to about 60 percent of the total publicly held outstanding Treasury debt, whereas as recently as 1994 this figure was below 20 percent.

Explanations/Discussion Points for Figure 1:

1.) In 1992, a federal safety-and-soundness supervisor was established for Fannie Mae and Freddie Mac: The Office of Federal Housing Enterprise Oversight (OFHEO). In the law,

[10] See public statements by Treasury Secretary Snow (2005) and former Federal Reserve Board Chairman Greenspan (2005). See also Eisenbeis, Frame, and Wall (2006) for a detailed discussion of the systemic risk posed by Fannie Mae and Freddie Mac and an analysis of policy options to deal with it.

minimum capital requirements were set at 2.5 percent of total assets. This gave Fannie Mae and Freddie Mac a comparative advantage relative to other financial institutions in holding financial assets. These asset portfolios are funded with the Federal Agency debt.

2.) Increased growth around 1997 is coincident with two things: a.) a contraction in net Treasury debt issuance; and b.) the implementation of new funding programs by all three housing GSEs (discussed further below). Taken together, these emphasize increased substitutability of Treasury and Federal Agency debt from both the demand and supply sides.

3.) In 2003, this peak is coincident with two things: a.) increased federal spending that increased Treasury debt issuance; and b.) relatively flat Federal Agency issuance after the public announcement of accounting and financial problems especially at Freddie Mac and Fannie Mae.

Figure 2 tracks the debt outstanding of Fannie Mae, Freddie Mac, and the FHLB System on a monthly basis over the 2001 to 2005 period along with the total GSE (the sum of three housing GSEs) debt outstanding series (using the rightmost scale). We collected these data from the web-sites of the individual housing GSEs that dominate the Federal Agency market.[12] Consistent with our prior statement, debt outstanding at Freddie and Fannie display cyclical patterns, whereas the debt of the FHLB system appears to be on a steady upward trend.

We are in the process of collecting information about the individual housing GSEs' debt funding programs, which are generally characterized by large, regular debt issues across the maturity spectrum. The goal was to be predictable issuers (enhanced liquidity) that could become an additional, new risk-free benchmark asset. (There were public statements by GSEs about this.)

[12] See: www.fanniemae.com, www.freddiemac.com, and www.fhlb-of.com, respectively.

These programs also involved "road shows" to Europe and Asia with public and private institutional investors in an effort to actively market the debt.

Information about foreign holdings of Federal Agency debt (and Treasury debt) is available from the Federal Reserve Board. The flow of funds (Z.1 release, Table L.107) reports quarterly information on U.S. financial assets held by foreigners ("rest of world"). Included in this is a break-down of their Federal Agency holdings according to whether they were in "official" or "private" accounts. Figure 3 plots this information as proportions of Federal Agency debt outstanding from 1995 to 2005 period on a consolidated basis. Three things stand out here. First, the run-up in "private" holdings appears to trend rather consistently with the data in Figure 2. Second, foreign official holdings have escalated from 2 percent of total Federal Agency debt in 1995 to 13 percent in 2005. The sharp rise in official Federal Agency debt holdings observed in the last decade is consistent with the previous discussion about the housing GSEs reshaping their debt funding programs. Third, while the foreign holdings in private accounts seemed to react to news about the relationship between the housing GSEs and the federal government in 1998 and 2003, foreign official holdings did not. We note, however, that the foreign private holdings and foreign official holdings of US Treasury debt display the same differences with the official holdings unresponsive at approximately the same dates. We are investigating alternative explanations for these periods displaying the contrary behavior of foreign private and foreign official investors.

III. Data

We utilize three types of data in our empirical analysis (described below). The first is "total foreign official holdings of federal agency securities," which is reported on a weekly basis

in a memorandum to the Federal Reserve's H.4.1 release. These data are aggregated from custody accounts at the Federal Reserve Bank of New York and reported each Friday using data from the Wednesday close. Figure 4 plots this data, which was first available as of February 9, 2000. Figure 4a displays the weekly data versus the quarterly Flow of Funds data. We note that there appear notable differences in these data starting in 2004. We have no explanation for this finding and we are investigating this issue further.

In our analysis below, we make several assumptions about this weekly series. First, we assume that these "foreign official holdings" are exclusively those of foreign central banks. While other institutions are included (e.g., government entities like XYZ), we do not believe that they account for a material amount of the total. Data on the holdings of individual central banks are unavailable. Second, we assume that these series reflect <u>total</u> foreign official holdings. However, these series almost certainly understate foreign official holdings since these institutions may hold securities in custody not only at the New York Fed, but also at private institutions in the U.S. and abroad. Third, we assume that these holdings are exclusively of debt securities issued by the three housing GSEs. Since the three GSEs of interest account for 98 percent of the Agency market, this assumption should not be too troublesome. Finally, we assume that these foreign official holdings are exclusively debt. This may be an issue insofar as the totals may also include mortgage-backed securities (MBS) issued by Fannie Mae and Freddie Mac. Survey evidence suggests that, as of mid-year 2004, foreigners held $176 billion of MBS – almost one-quarter of their Federal Agency holdings (U.S. Department of the Treasury, Federal Reserve Bank of New York, and Board of Governors of the Federal Reserve System, 2005).

The second type of data used in our analysis is yield spreads on GSE debt securities relative to U.S. Treasury debt securities of comparable maturity. These series were obtained from Federal Reserve Board staff, which in turn, produces them from data provided daily on Bloomberg. The yield spreads are for 5-year and 10-year maturities for Fannie Mae and Freddie Mac only and the series' are constructed independently (Fannie Mae 5-year, Fannie Mae 10-year, Freddie Mac 5-year, and Freddie Mac 10-year). We make the data into a weekly frequency (Wednesday close) to comport with the foreign holdings data discussed earlier.

The spreads are calculated as the difference between the expected value of a bond of maturity *t* issued by GSE *i* and the expected value of a Treasury bond of the same maturity *t*. **(We are looking for exact information about how the series' are computed.)** Figures 5a and 5b present the yield spreads of Fannie Mae and Freddie Mac 5 and 10 year securities over the yields of the respective Treasury security.

IV. Results

The paper investigates whether increases in foreign central bank ownership of GSE debt affects notably the yield spread between GSE and Treasury debt of comparable maturity. In this preliminary draft, we estimate a bi-variate vector auto-regression for yield spreads between GSE and Treasury debt issues for the 5 year and 10 year maturities and for the net change in foreign central bank ownership of GSE debt.[13] We generate results for four bi-variate VAR regressions in order to estimate the response of each individual GSE yield spread. For example, we estimate

[13] We are currently gathering additional quantity data to account for measures of debt supply (net new issues, total outstanding debt). These data are currently only available on a monthly frequency. In order to generate a weekly supply series, we are collecting all issuance dates, auction results data, and debt expiration data. This process is ongoing and currently incomplete.

one VAR for the yield spread of the Fannie Mae 5 year securities, another for the yield spread of the Fannie Mae 10 year security, and two more VARs for the analogous Freddie Mac securities. The sample period begins February 2, 2000 and ends November 16, 2005. We use a standard log likelihood test for lag length to test between 4 and 6 lags, and we cannot reject at the 5 percent confidence level the null hypothesis that 4 lags is sufficient for this application. We also test between a lag length of 2 lags and 4 lags; in this case, the null is rejected at the 1 percent level for all four dependent variables. We estimated a VAR of 4 lags for all the results that follow.

The identification of the bi-variate VAR arises from an institutional feature of the data we use for this study. First, the foreign holdings of agency securities are actually the closing quantities observed on the Friday prior to the Wednesday when the data are made available to the public. Hence, the information in these quantity data is essentially predetermined relative to the spread observations that are determined on Wednesday. This timing difference allows us to use a Choleski ordering to identify the orthogonal shocks for the innovation process. The quantities (the foreign central bank net change in GSE debt) precede the yield spread in each bivariate VAR because official net purchases of GSE debt take place before the market participants see the information released on Wednesday so that quantities do not respond to innovations in the yield spread contemporaneously. Market participants can respond contemporaneously to the quantity data when the Wednesday prices are determined, but the net quantities do not respond to prices.

Our preliminary results are shown in Figures 6 and 7. The results for Fannie Mae (Figures 6 and 7) and Freddie Mac (Figures 8 and 9) are notably similar across the maturities. The general results for the yield spreads at both the 5 and 10 year maturity suggest that an increase in foreign central bank ownership of GSE debt results in a slightly smaller yield spread,

and these results hold for the yield spreads of both the Fannie and Freddie 5 year debt securities. The main contrast is between the 5 and the 10 year maturities for the Fannie Mae spread and yet the difference is slight and remains consistent with the overall results.

To assess statistical importance of the impulse response results, we generate 1000 random draws of a Monte Carlo experiment for each estimated VAR and use 67 percent error bands, that is, 2/3 probability bounds for assessing the impulse responses. We are most interested in the response of the yield spread to unanticipated changes in net holdings of GSE debt by foreign official entities. In each set of impulse response figures, the yield spread impulse response to the change in net GSE debt holdings of foreign official accounts, the lower left corner chart, displays a negative response to an increase in the net foreign official holdings of GSE debt. The error bounds for the yield spread in all these figures are bounded away from zero, suggesting that there is a significant impact on the yield spreads from changes in net foreign official GSE debt holdings.

The economic importance of these findings appear worthy of further study. For example, the yield spread for the 5 year security of either Freddie or Fannie changes about a basis point per $3 billion in net foreign official purchase of GSE debt, where $3 billion reflects the standard error of that series. The maximum, one-week net foreign official purchase of GSE securities in the sample, $12 billion, would lower the yield spread by about 4 basis points. The response lasts throughout the 52 week impulse response horizon for both the Fannie and Freddie 5 year security yield spread. The amount of net debt issuance per GSE debt auction can be substantial. In 2006 alone, Fannie Mae has issued between $13.5 billion to $17.5 billion in new issues each month. The yield reduction of one basis point, if it is consistent across the yield structure, can result in

savings of over $100 million for the debt issuer. We are investigating this result further for robustness in ongoing research.

V. Conclusion

- Tremendous increase in GSE debt outstanding in last decade.
- Notable increase in foreign official holding of GSE debt
- Hypothesis: Does foreign official ownership of GSE debt affect the implied guarantee and lower the spread of GSE yields over Treasury yields?
- Preliminary answer: maybe, and enough to motivate further study.

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Figure 1: Debt Outstanding: US Treasury and Federal Agency

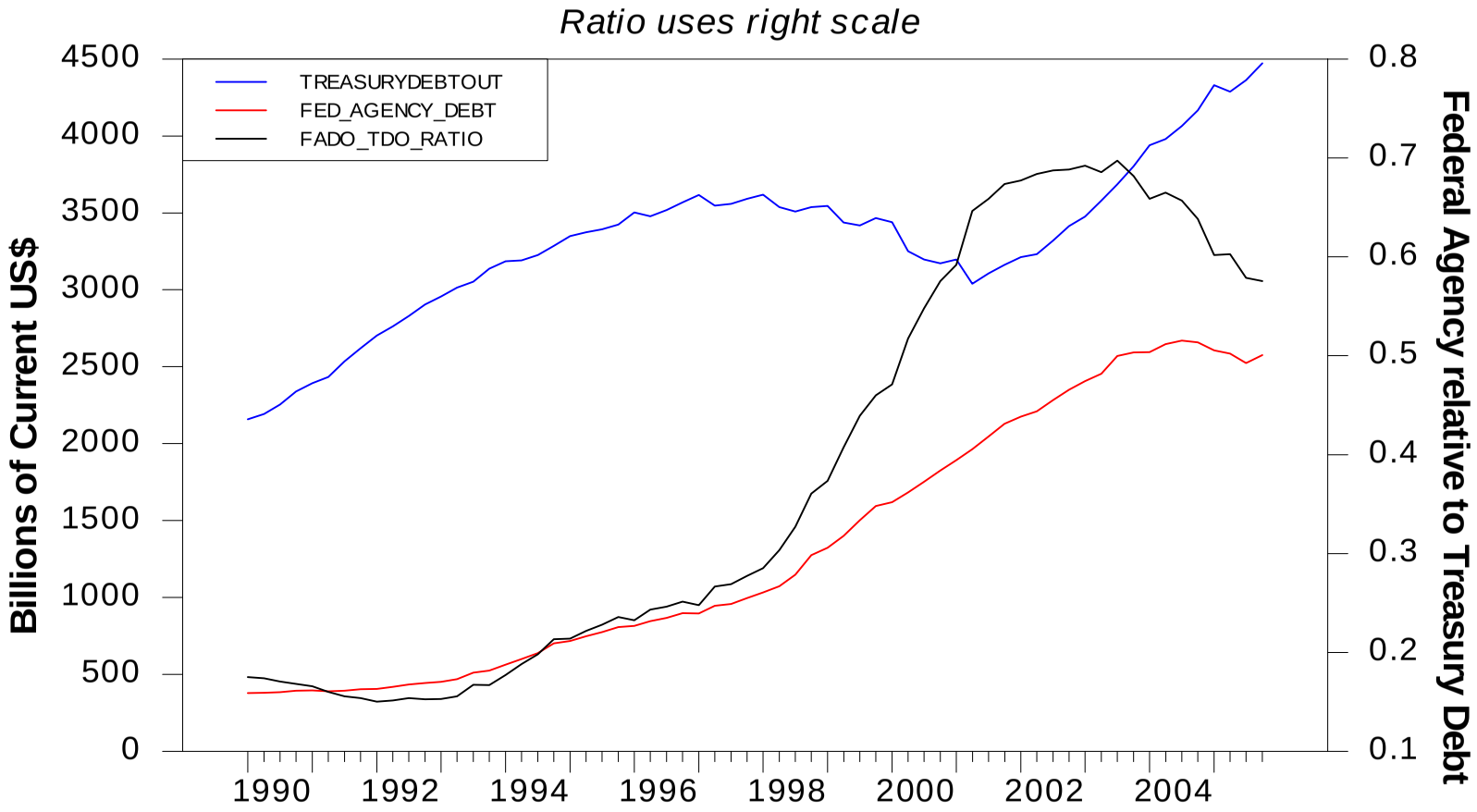


Figure 2: GSE Debt Outstanding by Issuer

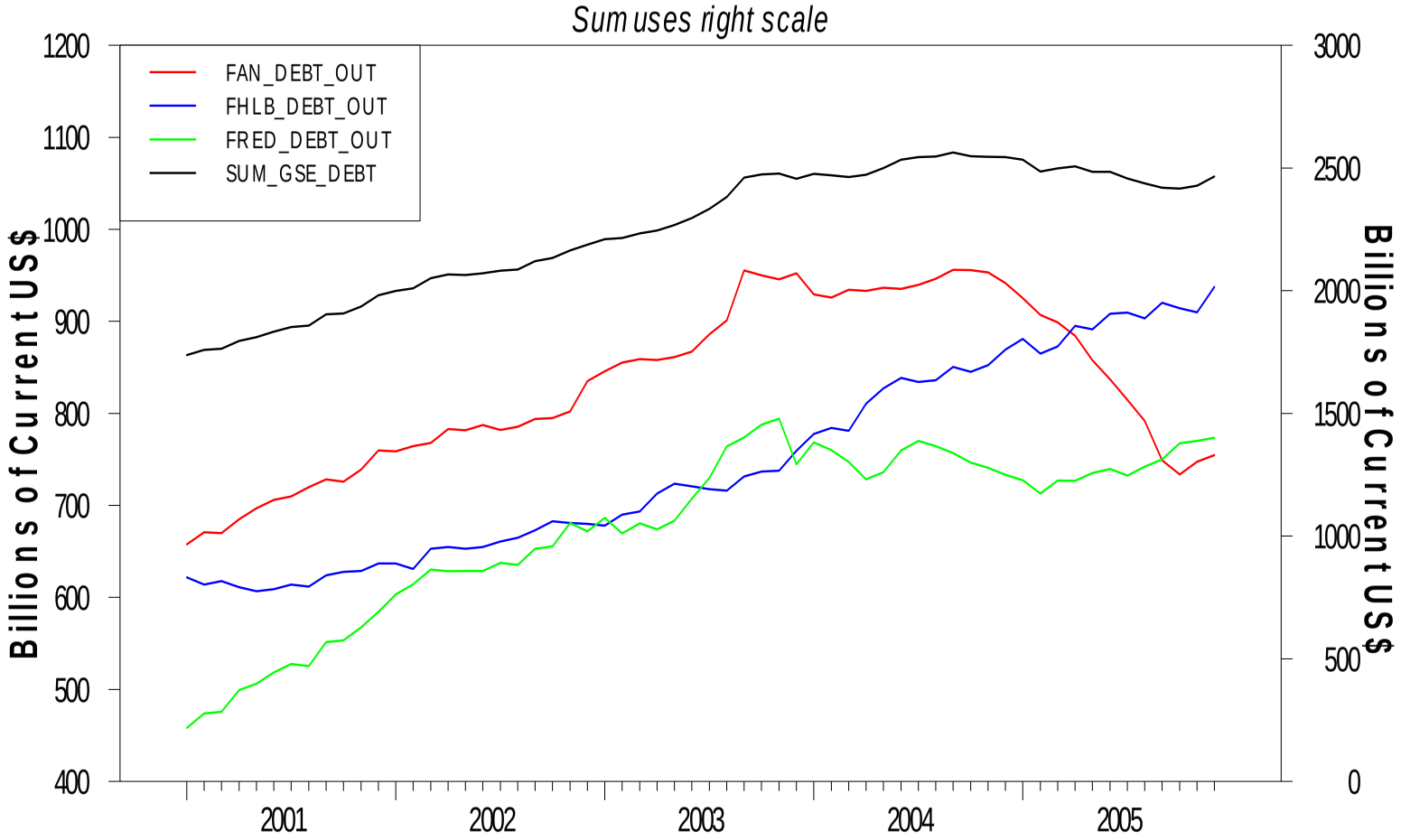


Figure 3: Proportional Holdings of Federal Agency Debt Outstanding

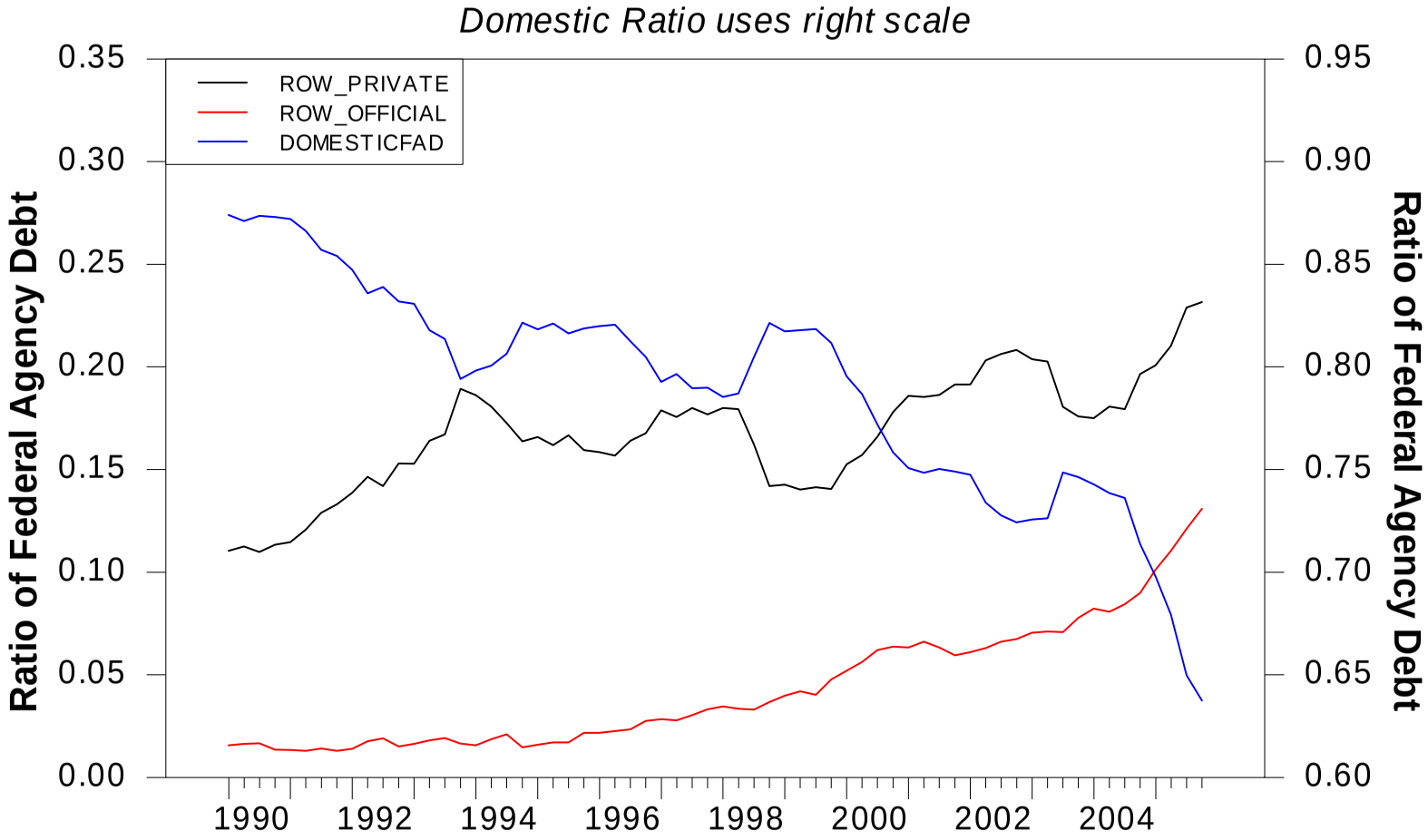


Figure 4: Federal Agency Debt Held in Foreign Official Accounts (weekly)

Source: Federal Reserve H.4.1 Table 1

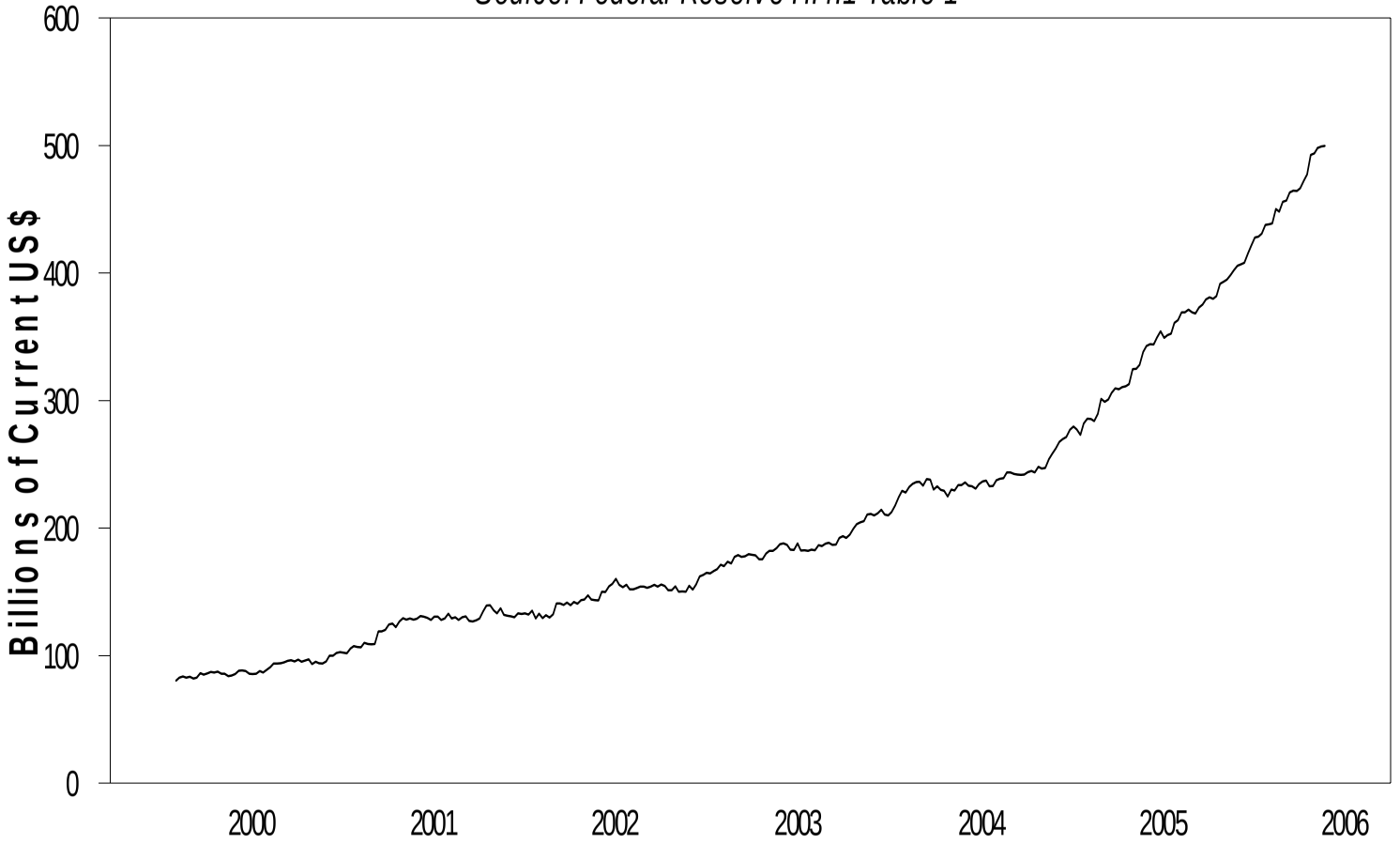
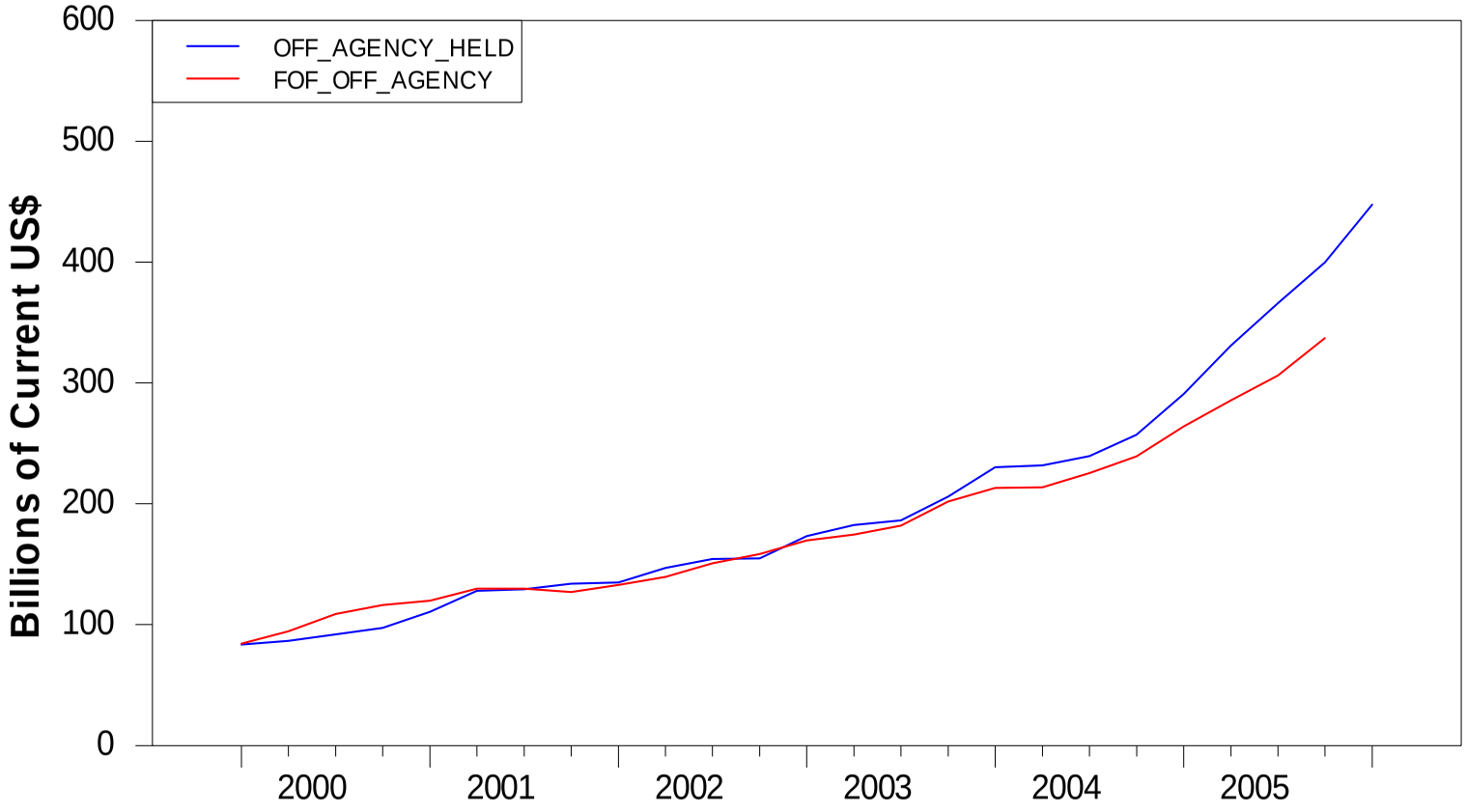


Figure 4A: Federal Agency Debt Held in Foreign Official Accounts

Comparison of weekly H.4.1 vs Quarterly Flow of Funds



Source: Federal Reserve H.4.1 Table 1

Figure 5a: GSE Yield Spreads for 5 Year Maturity

Freddie Mac and Fannie Mae

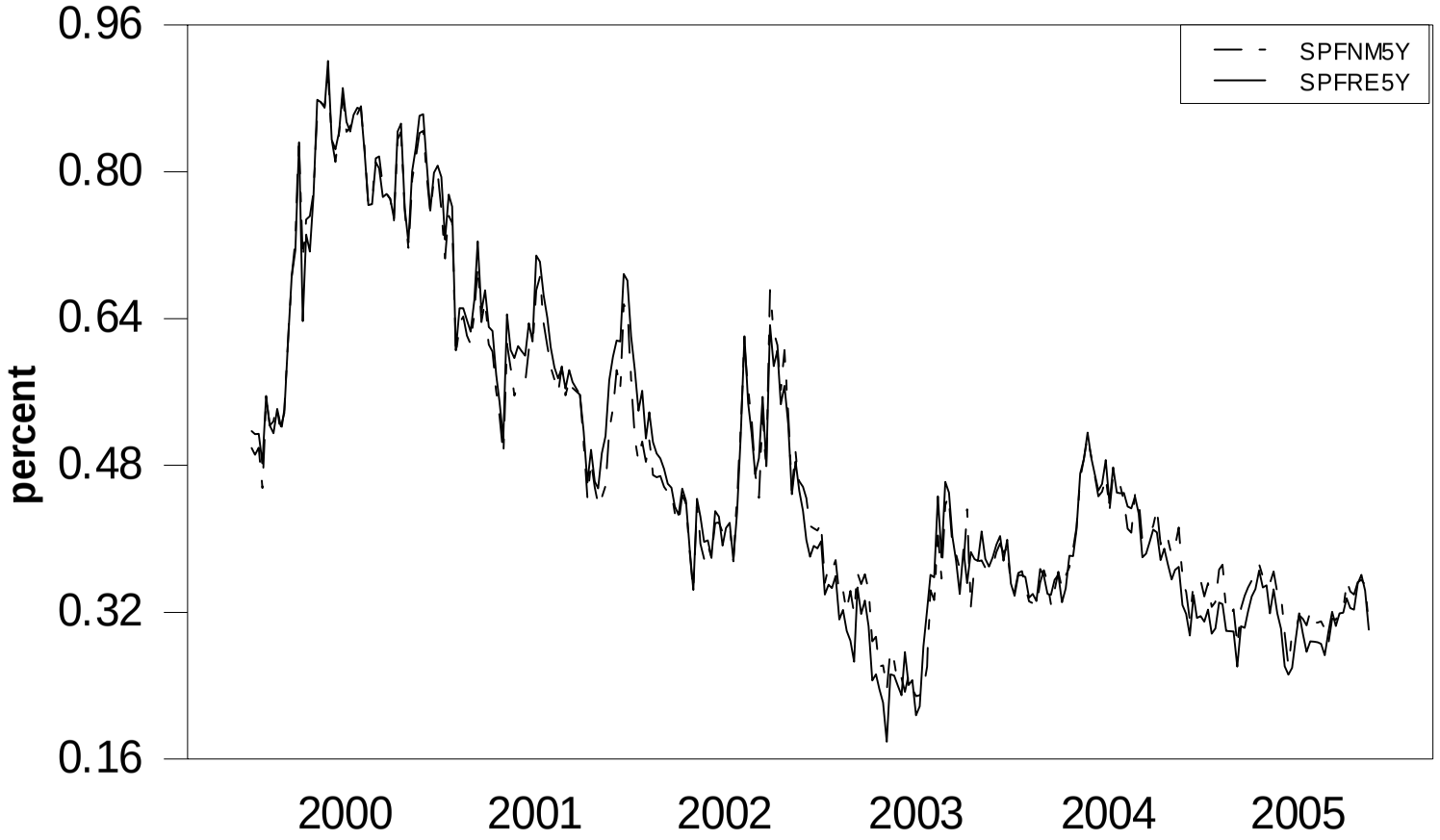
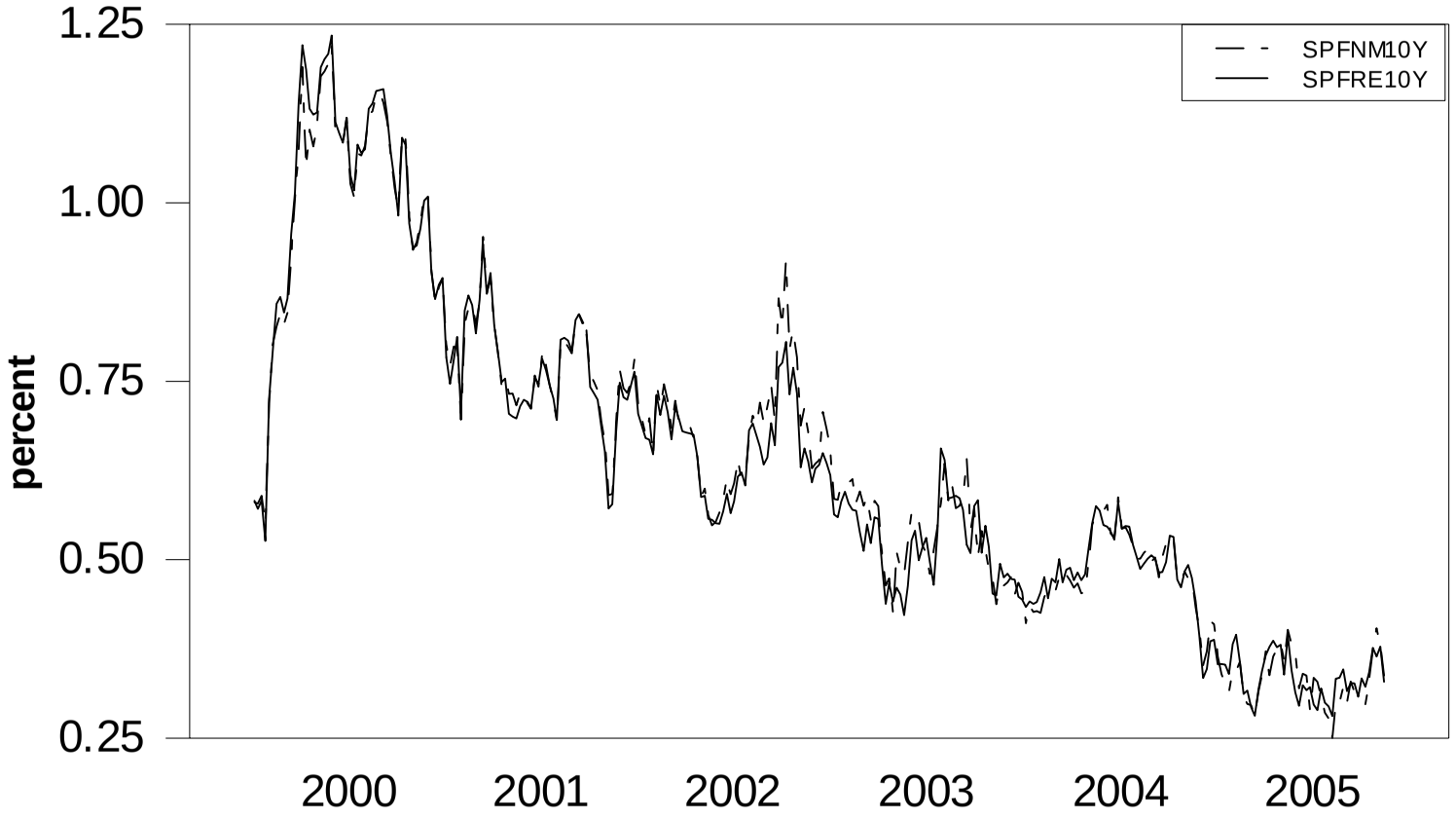


Figure 5b: GSE Yield Spreads for 10 Year Maturity

Freddie Mac and Fannie Mae



KEY FOR IMPULSE RESPONSE CHARTS THAT FOLLOW:

SPFNM5Y, SPFNM10Y – Fannie Mae yield less Treasury yield for 5 year, 10 year maturities

SPFRE5Y, SPFRE10Y – Freddie Mac yield less Treasury yield for 5 year, 10 year maturities

OFNETAGPUR – Official net purchases of agency debt from prior week

FIGURE 6: FANNIE MAE 5 YEAR MATURITY YIELD SPREAD

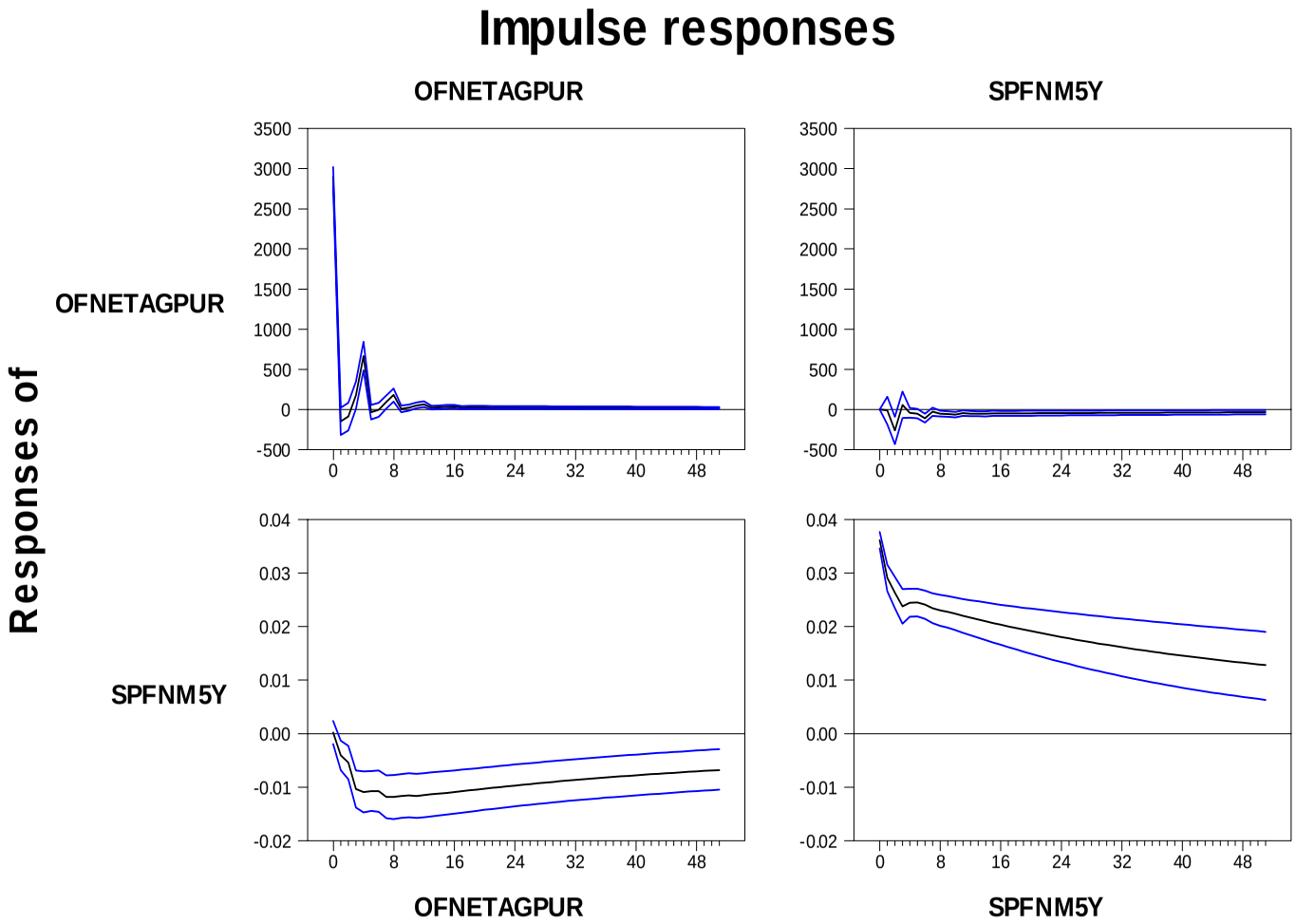


FIGURE 7: FANNIE MAE 10 YEAR MATURITY YIELD SPREAD

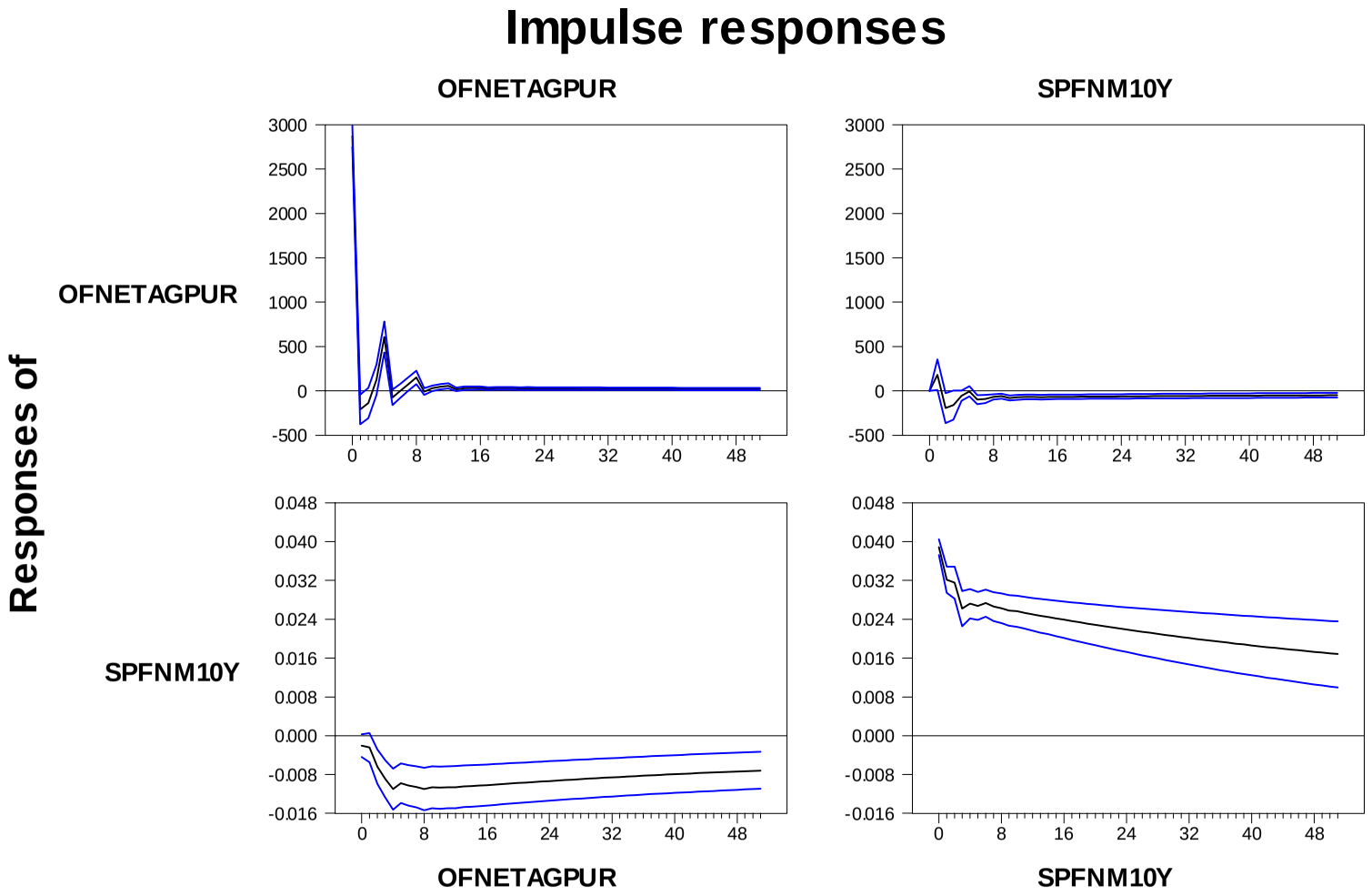


FIGURE 8: FREDDIE MAC 5 YEAR MATURITY YIELD SPREAD

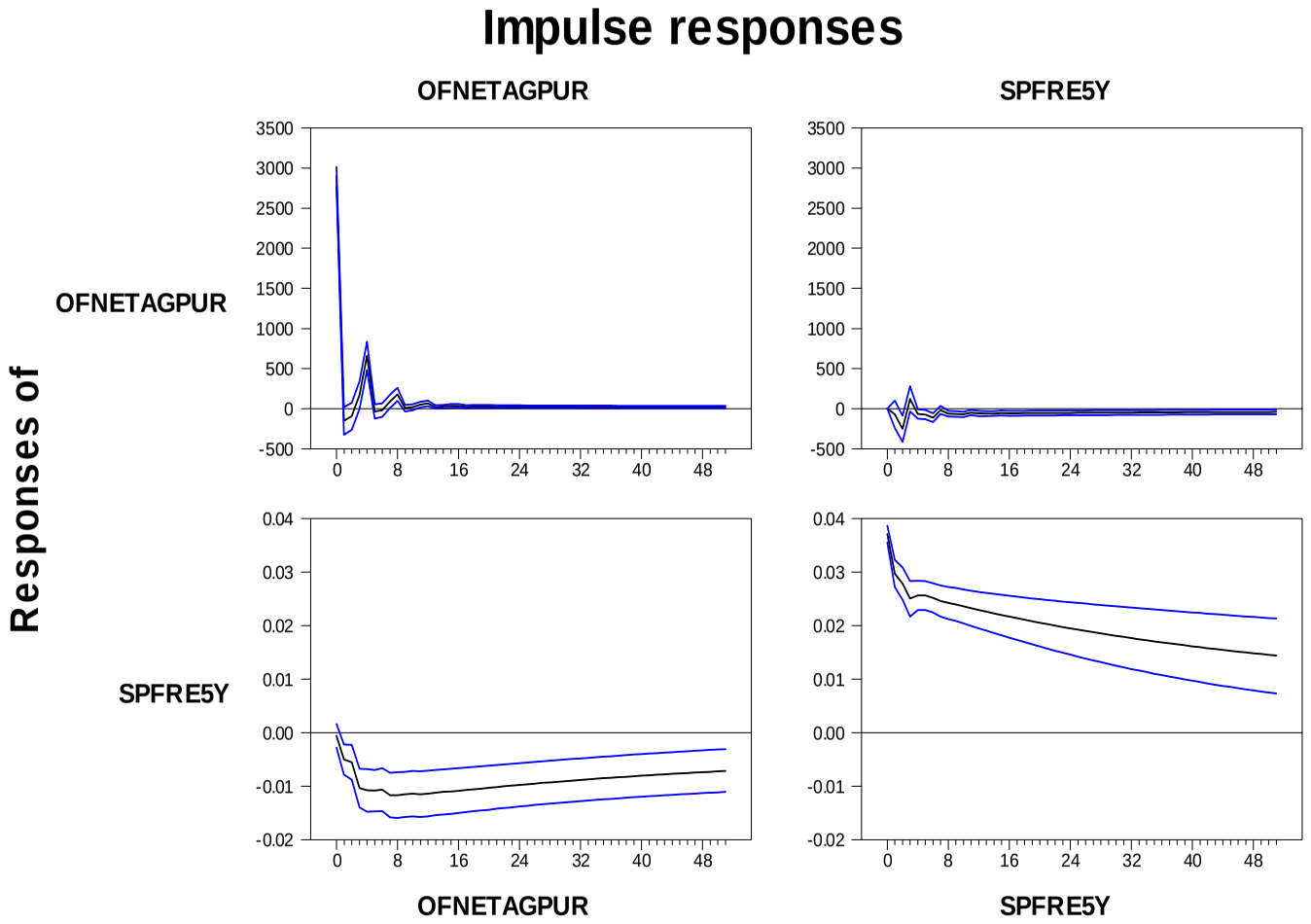


FIGURE 9: FREDDIE MAC 10 YEAR MATURITY YIELD SPREAD