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Comment

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This chapter is a valuable contribution to the literature on the too-often unacknowledged growth in explicit and implicit government guarantee programs. While the Federal Government did not originally provide explicit "full faith and credit" backing of Fannie Mae and Freddie Mac debt, its implicit support was, as Lucas and McDonald (henceforth, LM) point out, widely acknowledged and visibly apparent in the yields at which the two firms were able to issue their bonds. More recently, of course, that guarantee became explicit.

Lucas and McDonald estimate the ex-ante present value in 2005 of the combined guarantee to the two firms at around $65 billion over twenty years. This is a considerable amount; moreover, as a mean, it is actually a conservative estimate of the government's potential exposure. A value-at-risk estimate focusing on bad- or worst-case scenarios obviously would be multiples of this value. When comparing this implicit guarantee with some of the others discussed in this volume, it is good to remember that the risks of some programs have been assessed by worst-case scenarios and others by midpoint estimates. By either standard, Freddie-Fannie guarantees must be ranked among the more important contingent government obligations, and a careful demonstration of this point is by itself an important contribution of the chapter.

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An even more important contribution of the model is the capability it provides for sensitivity analysis. Lucas and McDonald build behavioral assumptions regarding funding and asset management policy into their model. Among the more interesting features of their model is the flexibility they allow for the response of asset volatility to financial distress, the bankruptcy trigger, and the response of liabilities to target leverage. They find that the value of the guarantee is quite sensitive to some of these parameters, particularly the ones that link asset volatility to the financial status of the firm. This sort of sensitivity analysis allows one to determine which sorts of behaviors provide the greatest potential for growth in government exposure and therefore to progress from passive risk measurement to active risk management.

Comparing the LM approach to other valuation studies based on yield spreads highlights its advantages and disadvantages. Valuation using yield spreads revalues outstanding debt using an estimate of the yield at which it would sell in the absence of the implied Federal guarantee. The predicted drop in the value of debt when it is priced at a nonguaranteed yield is the estimated value of the guarantee. The advantage of this approach compared to structural models like that of LM is that we can tie our valuation down to more or less observable market statistics—the yields at which government-sponsored enterprise (GSE) debt actually sells and the yields at which otherwise comparable corporate debt sells. Passmore (2005) estimated that the implied federal guarantee reduced Freddie and Fannie debt yields by about 40 basis points, corresponding to a guarantee value of around $150 billion. This approach to valuing the impact of the guarantee is far simpler than the option-pricing approach used in LM. But that relative simplicity comes at a high price, since it is essentially a point estimate, and sheds limited light on the exposure of potential losses to changes in underlying economic conditions.

Lucas and McDonald's more structural option-pricing model forces them to take a stand on harder issues. For example, they need to specify jump and diffusion parameters, decide how to model the bankruptcy trigger, and how to model firm behavior if it enters financial distress. Any of these parameters are hard to estimate and inevitably are subject to second-guessing and imprecision. But there is an advantage to this approach as well, for to truly understand the risk and the value of the government's exposure we *need* to take a stand on these issues. If we learned anything from the Federal Savings and Loan Insurance Corporation (FSLIC) debacle it is that sensitivity analysis is crucial, and that value is highly subject to behavioral assumptions, and in particular, to moral hazard.

While these valuation approaches differ considerably, it would have been nice if LM's base-case estimates (about $65 billion) had turned out closer to those derived from yield spreads (about $150 billion in Passmore's study).

Lucas and McDonald note that part of this difference may be related to a feature that can only be captured in a multiperiod model such as theirs. In their model, a firm with a government guarantee may optimally choose not to default in some states that an uninsured firm would declare bankruptcy. The insured firm is less apt to default because it has an incentive to preserve the value of the government's future guarantees. This policy makes the value of the next-period guarantee to the firm greater than the cost to the government.

In any case, these differences may be less extreme than they appear. Lucas and McDonald note that their guarantee value translates to a yield spread of about 20 to 30 basis points, compared to 40 basis points in Passmore. Part of the difference seems to be due to Passmore's higher growth assumptions. More importantly, part of the yield spread may reflect the special status and the higher liquidity of GSE debt rather than default risk. Moreover, Passmore notes that the yield spreads as well as other determinants of guarantee value vary over time and that his estimates vary considerably across parameter combinations, so perhaps these differences are within shouting distance.[1] Nevertheless, even most of the LM sensitivity-analysis estimates are lower than those derived from than the seemingly simpler yield-spread approach, so it may be worth considering whether there is some reason that the option pricing method seems to result in lower valuations.

Of course in a mechanical sense, LM could always find parameters for which their valuation would match almost any other estimate, for example, by increasing volatility inputs, jump risk, funding policy, or the sensitivity of asset volatility to financial distress. But their parameter choices do not strike me as particularly conservative. In particular, the quadrupling of asset volatility in periods of financial distress (when assets fall below 1.01 times liabilities) seems sufficiently aggressive.

Another possibility worth some consideration is that the LM estimates of asset volatility may be low. All option pricing models are driven by asset volatility, which LM infer from the volatility of equity. But neither Fannie nor Freddie have been particularly transparent. Lucas and McDonald note that little information was available on their interest-rate hedging activities or efficacy. The firms released "fair value balance sheets" accounting for the market value of their extensive derivatives positions only quarterly (Freddie) or annually (Fannie), and even then, outside observers had to rely on their

1. Passmore obtains his estimate through a "simulation analysis" in which several inputs to the valuation formula such as growth rates, yield spreads, equity risk premia, and so on are allowed to take on multiple values. Therefore, he allows for a range of estimates. Note, however, that his simulation is of a very different nature than that conducted in LM, which employs Monte Carlo analysis driven by stochastic evolution in asset value. Passmore's approach does not specify a stochastic process for asset returns, and therefore does not answer questions about the sensitivity of guarantee value to changes in parameters such as asset volatility, nor does it provide a probability distribution of potential losses.

valuations, without any meaningful guidance as to their methodologies. This would be hard enough if one could have trusted their commitment to meaningful disclosure, but both firms had very troubling histories of earnings management, particularly earnings smoothing, which at the least, cast doubt on any such commitment.

What if opacity and aggressive earnings-smoothing practices significantly reduced firm-specific information? Specifically, what if lack of transparency meant that the market had only limited information about these firms? If so, stock price volatility may have reflected the value impact of *revealed* information, but not the full volatility of actual performance, most of which was not publicly observable. Morck, Yeung, and Yu (2000) note that opacity can lead to a reduction in the firm-specific component of returns. Jin and Myers (2006) extend this empirically, and further show that opacity is associated with crashes.[2] Either implication—higher volatility or crash risk—would increase LM estimates if opacity is an issue for the GSEs.

Can we test this hypothesis? Freddie Mac actually provides us with an interesting experiment. Before 1993, it was effectively a pure pass-through firm. Figure 6C.1 shows that in this period it held only one mortgage in portfolio for every ten mortgages that were securitized and passed through. In contrast, even in the pre-1993 period, Fannie maintained a large portfolio of retained mortgages, financed by issuing debt. After 1993, however, Freddie's retained portfolio rapidly caught up to Fannie's. Before 1993, therefore, Freddie Mac should have exhibited a different risk profile than Fannie Mae, but not after.

To compare the stock market risk of the two firms, I estimated the following two-index regression for each firm. Each regression is estimated year-by-year using daily data. The coefficient on the Standard & Poor's (S&P) 500 measures broad stock market exposure while the coefficient on the return on the seven-year Treasury bond measures interest rate risk (which could result from imperfect hedging). Firm-specific risk is reflected in the regression residual, e, and more particularly, its standard error.

$$R_i = a + b\,R_{\text{S\&P}} + c\,R_{\text{7-year T-bond}} + e. \tag{1}$$

Among the questions we can address with these regressions are the following:

- Do factor exposures (especially the T-bond betas) of Freddie (compared to those of Fannie) increase after 1993?
- Does Freddie's residual standard deviation (compared to Fannie's) change after 1993 when it becomes equally "opaque"?

2. In the Jin-Myers model, the firm may hide an accumulating barrage of negative information until it is no longer feasible to do so. At that point, all is revealed to the market at once, which results in a stock-price crash. This seems like a reasonable fear for Freddie and Fannie in light of their past accounting practices.

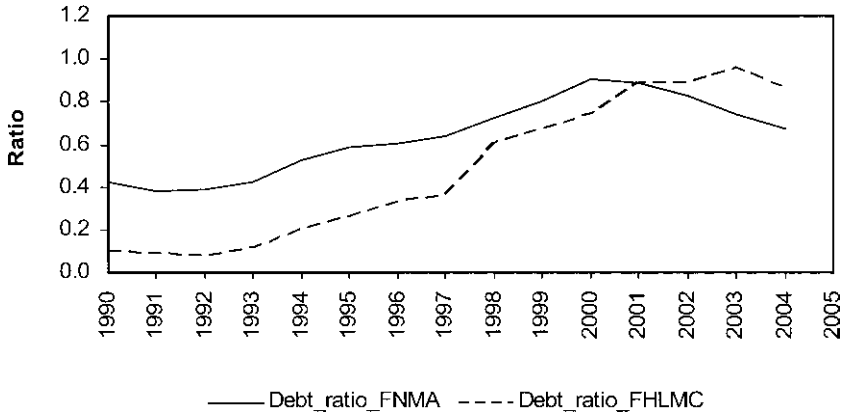

Fig. 6C.1 Ratio of debt outstanding to off balance sheet mortgages securitized and sold as mortgage-backed securities

Source: Data obtained from Lucas and McDonald (2006).

Figures 6C.2 and 6C.3 show the S&P 500 and T-bond betas for Fannie and Freddie. While there is considerable variation in annual values, the overlap in the values for the two firms is remarkable. There clearly is no break in the relationship between the two firms in 1993, or for that matter, at any other point in the sample. Figure 6C.4 shows the standard errors of the regressions for each firm in each year. Again, there is nothing that distinguishes one firm from the other. Given the almost identical values for both coefficients and the residual standard deviations, it is not surprising that plots (not presented here to save space) of *R*-squares or of correlation coefficients between raw returns and regression residuals are also effectively identical for both firms.

These figures are interesting mostly for what they do *not* show. Until 1993, Fannie and Freddie followed significantly different risk-management models. Freddie Mac bundled and sold virtually all mortgages as mortgage-backed securities, retaining only credit risk in return for a guarantee fee. In contrast, Fannie Mae held a considerable fraction of mortgages in portfolio, thereby adding interest rate risk from imperfect hedging strategies into the mix. Despite this, the stock return behavior of the two firms as presented in figures 6C.2 through 6C.4 are virtually identical in both the pre- and post-1993 periods.

One might conclude from these figures that the market simply disregarded the fact that Fannie had to be riskier in the earlier period. Perhaps in the absence of daily information about the efficacy of the hedging program, there was no news to which Fannie's stock price might react. There would then be little else to differentiate the performance of the firms. If so, the nearly identical regression results in the two periods is consistent with opacity and stock

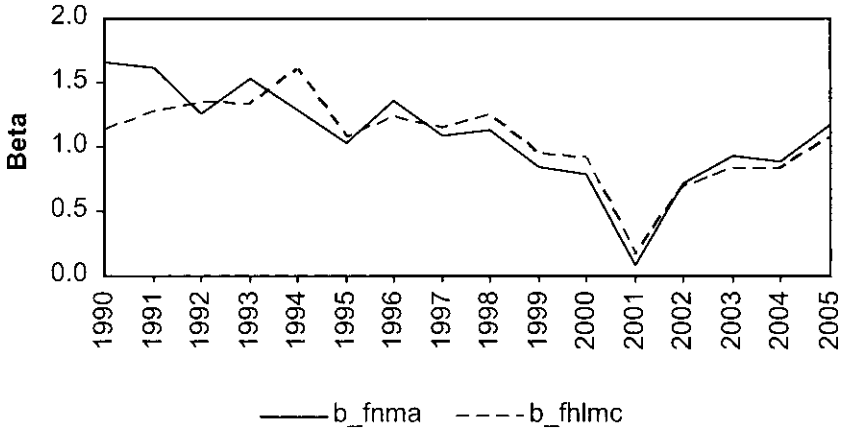

Fig. 6C.2 Coefficient on S&P 500 return in the following regression: $R_i = a + b\,R_{\text{S\&P}} + c\,R_{\text{7-year T-bond}} + e$
Note: Regression estimated year-by-year using daily return data.

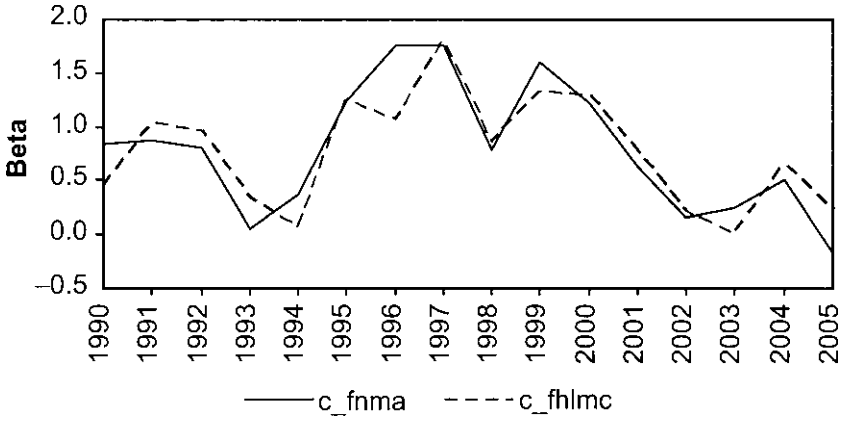

Fig. 6C.3 Coefficient on T-bond return in the following regression: $R_i = a + b\,R_{\text{S\&P}} + c\,R_{\text{7-year T-bond}} + e$
Note: Regression estimated year-by-year using daily return data.

price volatility that does not reflect all potential risks. This would be bad news, for it would suggest that equity (and therefore asset) volatility for the purpose of the LM valuation exercise should be greater than that obtained from stock price returns or short-term implied volatilities.

On the other hand, the residual standard errors in figure 6C.4 do not seem abnormally low compared to typical firms, nor did Freddie's fall after 1993 when it adopted an arguably less transparent business model. Under the common interpretation that residual returns proxy for firm-specific information, there is no support for opacity there. The likely impact of opacity is not

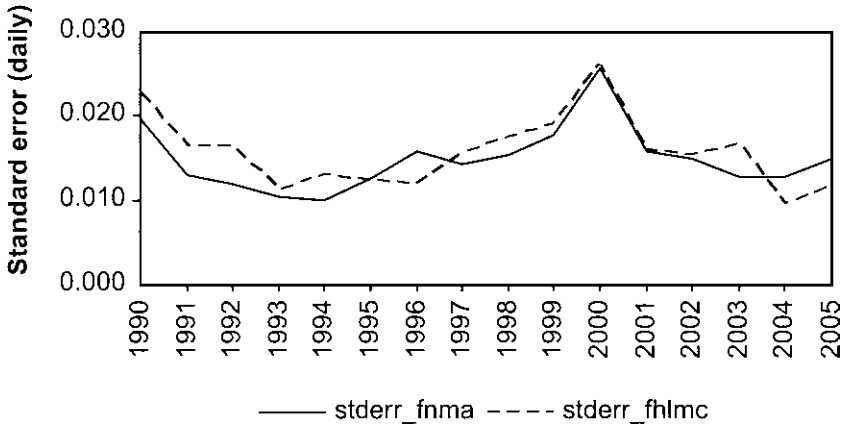

Fig. 6C.4 Standard deviation of residual return in the following regression: $R_i = a + b\,R_{\text{S\&P}} + c\,R_{\text{7-year T-bond}} + e$

Note: Regression estimated year-by-year using daily return data.

easily resolvable, but might at least suggest that the LM valuation numbers be taken as conservative. This interpretation also is consistent with the fact that they are somewhat lower than Passmore's midrange estimates.

In the end, however, this may not be the most important question. As noted previously, risk management is as important as risk measurement; to my mind, the true value of the LM model is as a tool for sensitivity analysis. One needs a structural model like theirs to see where the government's exposures lie, and particularly, what factors may drive potentially rapid changes in that exposure.

While it is not the focus of their chapter, their model does offer the opportunity to think about an interesting question: what would happen to the value of the guarantee if Freddie and Fannie were forced to follow Freddie's portfolio strategy of pre-1993? There is no inherent reason that either firm needs to hold significant amounts of mortgages in portfolio, or that doing so strengthens its competitive position. Freddie held few mortgages in portfolio until 1993, and its market share actually *declined* slightly after 1994 when it adopted Fannie's portfolio model.

In a real sense, both firms have acted as a bundle of two distinct business lines: one is plain-vanilla securitization, but the other is as an implicit hedge fund in which mortgages are held in portfolio and hedged with positions in callable bonds and derivatives. While there may be good reasons for the government to support the first activity in the interest of potential spillovers to mortgage rates and the housing market, there is no reason to subsidize the second. Certainly, a limit on portfolio size would be the easiest way to limit and manage the government's exposure to interest rate risk (but not credit risk, since that attaches to securitized as well as held mortgages). Since there

seems to be little economic rationale for the portfolio activities, the only cost to imposing such limits would most likely be to the shareholders, who would forfeit the value of much of their unpaid-for subsidy.

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