

Interest Rates and the Foreclosure Process: an Agency Problem in FHA Mortgage Insurance

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Abstract

The current structure of Federal Housing Administration mortgage insurance creates an incentive conflict when market interest rates diverge from mortgage contract rates. If the market rate exceeds the contract rate (at which FHA reimburses lenders), insured lenders have an incentive to expedite the foreclosure process and reinvest the indemnity at the higher market rate. Conversely, lenders' incentive is to slow claims when market rates are relatively low. Consistent with this effect, empirical evidence suggests the speed of processing claims accelerates and the size of claims declines when interest rates have risen.

Unlike private mortgage insurance that establishes a coinsurance relationship with the lender, Federal Housing Administration (FHA) insurance provides full coverage of all losses including foregone interest on defaulted loans. The foregone interest component of the indemnity is at the original mortgage contract rate. This arrangement offers lenders an opportunity to exploit changes in interest rates. Specifically, lenders have an incentive to expedite (slow) the foreclosure process when the market rate is above (below) the contract rate. If the market rate is above the contract rate, the lender will expedite the process (within the constraints of the legal requirements) and reinvest the indemnity at a higher rate. Conversely, if the market rate falls below the contract rate, the lender is better off by slowing the process (again, within the constraints of legal parameters) because the loan balance earns the higher contract rate. Evidence presented below shows that this behavior can be costly to the FHA. A 10 percent decrease in interest rates (say from 10 percent to 9 percent) costs the FHA an estimated \$1,151 per claim.

Numerous examples of agency problems exist in financial contracting (see Jensen and Meckling [1976]). In real estate contracts in particular, examples

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of agency problems include borrower maintenance of property facing foreclosure, covenants included in mortgages (Smith, 1982), and terms of shopping center leases (Benjamin, Boyle, and Sirmans, 1990).

Similarly, agency problems associated with insurance contracts have been noted (see Mayers and Smith, 1981). Mulherin and Muller (1988) pose an incentive conflict whereby lenders have no motivation to expend costly effort to make repairs on foreclosed properties. Mulherin and Muller (1987) note the possibility that lenders may encourage default (rather than continued performance through a workout) on a fully insured mortgage that is in danger of default. As is true of the present study, the incentive conflict results from a divergence of the market and contract rate. They conclude that a rise in the market rate will lead to more defaults as lenders seek to improve the quality of their loan portfolios. They conclude a rise in rates is, therefore, costly to the FHA. In the current study the conclusion is different since the focus is on the post-default incentive conflict. That is, given a default and a rise in rates, the lender has an incentive to foreclose as quickly as possible. A quick foreclosure minimizes the total claim including carrying costs such as property taxes, hazard insurance, maintenance expenses, and so forth. A fall in rates proves costly in our model.

This article proceeds as follows. The next section discusses the effects of the incentive conflict on the speed of the foreclosure process and the per claim loss for FHA loans. Next, data and methodology are presented. Empirical results are then followed by conclusions.

Lender's Incentives: FHA Insurance

Consider a lender holding a defaulted mortgage loan. After the foreclosure process the lender will submit a claim to the FHA for losses. (In a few cases the lender can assign the loan to the FHA which will, in turn, attempt a workout with the borrower.) Those losses will consist of two parts: foregone interest on the loan balance and property carrying costs such as taxes, insurance, and maintenance expenses. Initially, the lender will not have made expenditures for carrying costs so if the contract rate is above the market rate, there is an incentive to delay the foreclosure process. As carrying costs occur, the lender must meet these out of pocket and get reimbursed at a later date without interest, reducing this incentive to delay. Appendix A demonstrates that the strength of this incentive to delay is negatively related to the market rate of interest. Alternatively, the probability of completing a claim within a given period of time is positively related to the market rate. That is, as the market rate declines below the contract rate, lenders slow the foreclosure process and put the carrying costs to the FHA. By extension, our model has implications for FHA claim costs. A lengthy foreclosure process creates heavy carrying costs so that the FHA claim cost will be negatively related to the market rate. Appendix B derives this effect mathematically.

The theory underlying this article generates testable hypotheses about the effect of interest rate divergence on the probability of completing a claim in a

given period of time (speed of processing a foreclosure), and the final cost of the claim.

Specifically, the following null hypotheses are tested:

1. The foreclosure processing speed is independent of market interest rates, and
 2. The final claim cost to the FHA is independent of market interest rates.
- Rejection of the null hypotheses constitutes support for the theory.

Data and Research Methods

Foreclosure Process Speed

The data used to study foreclosure process speed come from the National Delinquency Survey prepared by the Mortgage Bankers Association (MBA). This survey is performed quarterly and, in 1989, the 300 reporters included mortgage bankers, savings and loan associations, and life insurers. These reporters held over 13 million one-to-four family residential mortgages totaling \$622 billion in debt. The survey reports on loans that are delinquent: 30, 60, and 90 days as well as the number of loans that are placed in foreclosure during the quarter. An end-of-quarter inventory of loans still in the foreclosure process is also included. Data analyzed in this study are from the fourth quarter of 1972 through the fourth quarter of 1989.

This survey includes originators who hold loans in their portfolios and those who sell loans to secondary market investors. Falling interest rates do not offer the latter an opportunity to invest at above-market rates by delaying claims. Nevertheless, the speed with which they may process a foreclosure would still rise or fall with market rates. Originator/servicers must guarantee the timely payment of delinquent payments to the investor. Only after a foreclosure are they reimbursed by the FHA for these sums. Thus, a higher market rate increases the opportunity cost on the funds that they advance during the delinquency and foreclosure process, presumably increasing the speed of foreclosure. To the extent that the magnitude of the response of the two classes of originators differs, and since the proportion of originators that are portfolio lenders versus originator/sellers is unknown, the presence of the latter in the sample will contribute to the noise term in our empirical test. However, their behavior will not be in conflict to portfolio lenders regarding changes in the market rate of interest.

Foreclosure speed is measured by estimating the probability that a claim will be processed in a given quarter. The following data are from the MBA survey:

I_t = percent of total loans in foreclosure at the end of the quarter,

S_t = percent of loans for which a foreclosure was started during the quarter.

From this the percent of loans leaving foreclosure status (claims processed or completed) in that quarter can be calculated,

$$P_t = I_{t-1} + S_t - I_t.$$

The process rate, PR is the ratio of completions to the average percent of loans in the inventory of foreclosed loans during the quarter

$$PR_t = P_t / ([I_t + I_{t-1}] / 2)$$

This is the dependent variable in the test of foreclosure process speed. It can also be interpreted as the probability that the foreclosure process for any given loan will be completed during that quarter.

Cost per Claim

The data used to study the FHA's cost per claim consist of a very large sample of loans terminated from 1970 through 1988 for which the FHA has computed the loss. The loss is defined as the amount of the claim less the value of the property. Since the amount of the claim includes property carrying costs such as property and liability insurance, property taxes, and other escrow items, the loss will be positively related to the length of time between delinquency and claim. For each loan the contract rate, c , and the date of the claim is identified. Given the (FHA) market rate at the time of the claim, m , an interest rate relative, $(m - c)/c$, is computed for each loan. The state in which each loan was originated is also identified.

Empirical Results

Foreclosure Process Speed

The effect of the interest rate relative on foreclosure process speed is tested by estimating the following equation:

$$PR = \alpha + \beta_1(m - c)/c + \beta_2 D + \Theta e_{t-1} + e_t \quad (1)$$

The market rate of interest, m , is known for each quarter. However, because no individual loans in the survey are identified, a precise interest rate relative cannot be calculated. From extensive previous research [see von Furstenberg and Green (1974), von Furstenberg (1970), U. S. Government (1962, 1963, 1963)] it is known that the bulk of defaulted loans do so within three to five years of origination. The relationship is tested using alternative interest rate relatives over this range. The best results were obtained by using a lag of 12 quarters.

In explaining the process speed on loans that have defaulted, there is no need to include any variables that explain defaults themselves such as property price inflation or other macroeconomic variables such as unemployment. The test reduces to a simple explanation of the relationship between the process rate and the interest rate relative.

Institutional considerations, such as foreclosure laws, limit the maximum possible speed of foreclosure. That is, instantaneous processing is not possible. As a result, the hypothesized linear relationship is likely to break down for periods of large interest rate divergence. A dummy variable is included ($D = 1$) for any quarter when $(m - c)/c$ is greater than .5. This occurred in the 12 quarters from 1979 IV through 1982 III. In addition, a first order

moving average term appears to control the serial correlation in the residuals. The estimation results are:

$$PR = .041 + 0.63(m-c)/c - .46D + .48e_{t-1} + e_t \quad (2)$$

(30.47)* (8.05)* (7.97)* (3.54)*

$$\overline{R^2} = .58, f\text{-value} = 31.50*, D.W. = 1.81, n = 68.$$

*significant at the .01 level.

As expected, the interest rate relative coefficient is strongly positive and statistically significant. If mortgage interest rates have risen 10 percent (for example, from 10 percent to 11 percent) the probability of processing a claim increases by 6.3 percent ($\Delta PR = 0.63 \times .1 = .063$), for example from .38 (the sample mean) to .443.

Consider the effect of this on the average speed of the foreclosure process. Suppose the passage of a defaulted loan from delinquency to completed FHA claim follows a Poisson process. The parameter of the Poisson distribution, λ , is the probability that the claim process on that mortgage will be completed that quarter. That is, the dependent variable in regression (1) is an estimate of λ for that quarter. The expected time until completion when completion follows a Poisson process is $1/\lambda$ (see Winkler and Hayes, 1975, p. 254). At the sample mean ($\lambda = PR_t = .38$) that implies that the average time between placement in foreclosure to claim is 2.63 ($1/.38$) quarters or 34.2 weeks. A 10 percent increase in the current market rate over those prevailing three years earlier would increase the completion rate to .443, reducing the average time to 2.26 ($1/.443$) quarters or 29.3 weeks. The average processing time for claims is reduced by almost five weeks. Next, from FHA claim data it is confirmed that the change in processing time implied by these estimates is reasonable.

Cost per Claim

The FHA data are used to test the hypothesized negative relation between claim size and interest rates. Specifically, the following equation is estimated:

$$L = \alpha + \beta_1(m-c)/c + \beta_2LV + \beta_3(H_t - H_0)/H_0 + \beta_4PS + \beta_5SRR + e_t. \quad (3)$$

where,

L = the dollar loss on the claim,

LV = the original loan-to-value ratio,

$(H_t - H_0)/H_0$ = the percentage change in house prices in the state of origination from the date of loan origination to the date of claim,

PS = dummy variable equal to one if the state allows a power-of-sale foreclosure,

SRR = dummy variable equal to one if a state allows a statutory right of redemption.

Here, the exact interest relative can be employed because the contract rate and date of claim are known for each loan. A measure of house price appreciation is included because it is expected to affect the size of the claim in addition to the processing speed. Dummy variables reflecting foreclosure laws are also included. A power-of-sale provision is expected to reduce losses and a statutory right of redemption is expected to increase them. The power-of-sale provision allows a quicker and less expensive foreclosure. A lengthy right of redemption discourages bidding at the sale of the property and raises claims.¹

By controlling for differences in state laws which regulate the speed or the cost of the foreclosure process and about which lenders have no control, the cost imposed by the incentive conflict and a divergence of interest rates can be isolated. An ordinary least squares test of equation (3) results in the following:

$$L = 23,324 - 11,505 (m - c)/c - 2.675 LV - 450.8 (H_t - H_0)/H_0 \\ (38.9)^* \quad (75.1)^* \quad (4.10)^* \quad (40.54)^* \\ + 4,343 SRR - 3,229 PS + e_t \\ (49.61)^* \quad (23.23)^* \quad (4)$$

$\bar{R}^2 = .14$, F-value = 2,916*, $n = 88,651$, and * indicates significance at the .01 level.

All variables have the expected sign and are statistically significant at the .01 level. Consistent with the evidence related to the speed of the foreclosure process, higher interest rates are found to lead to smaller claims. Here, a 10 percent increase in interest rates results in an estimated saving of \$1,151 per claim (.10 x \$11,505). Compared to the 4.9 week average acceleration in claim procedure implied by the previous results, this implies a cost of \$234.89 ($1,151/4.9$) per week or \$12,215 per year. This latter figure accords remarkably well with the direct estimates of real estate operating costs. In 1984, the midpoint of the FHA claim data, the FHA estimate of the national average housing expense (monthly principal, interest, insurance, real estate taxes, maintenance and utilities) was \$856, or \$10,272 annually.

Conclusion

In this article the authors argue that the current structure of FHA mortgage insurance offers lenders the option to vary the foreclosure process speed to exploit a divergence in interest rates. Empirical evidence suggests the lenders' speed of processing claims accelerates and the size of the claim falls when interest rates have risen. The estimates indicate that exercise of the option following a 10 percent increase in rates saves the FHA \$1,151 per claim. The reverse would be true for a fall in rates.

¹ A more detailed discussion and confirmation of the effects of foreclosure laws on insurance claims can be found in Clauretie and Herzog (1990).

The FHA could reduce their losses resulting from the incentive conflict in several ways. One is to limit the time a lender may take to submit a claim subsequent to delinquency. This might require a federal override of foreclosure laws where such laws hinder an expeditious foreclosure and lenders can use them to their benefit. Or, the FHA could reimburse the lender at the lower of the contract rate or the market rate. It is clear that in addition to facing default risk the FHA also faces interest rate risk.

References

1. Benjamin, John, Glenn Boyle, and C. F. Sirmans, 1990, Retail Leasing: The Determinants of Shopping Center Rents, *American Real Estate and Urban Economics Association Journal*, 18:, forthcoming.
2. Campbell, T.S. and J.K Dietrich, 1983, The Determinants of Default on Insured Conventional Residential Mortgage Loans, *Journal of Finance*, 38:1569-81.
3. Clauretie, Terrence M. and Thomas Herzog, The Effect of State Foreclosure Laws on Loan Losses, *Journal of Money, Credit and Banking*, 22:221-33.
4. Jensen, Michael C. and William H. Meckling, 1976, Theory of the Firm: Managerial Behavior, Agency Costs and Capital Structure, *Journal of Financial Economics*, 3:305-60.
5. Mayers, David and Clifford W. Smith, Jr., 1981, Contractual Provisions, Organizational Structure and Conflict Control in Insurance Markets, *Journal of Business*, 54:407-34.
6. Mulherin, J. Harold and Walter J. Muller, 1987, Volatile Interest Rates and the Divergence of Incentives in Mortgage Contracts, *Journal of Law, Economics and Organization*, 3:99-115.
7. Mulherin, J. Harold and Walter J. Muller, 1988, Resolution of Incentive Conflicts in the Mortgage Industry, *Journal of Real Estate Finance and Economics*, 1:35-46.
8. Smith, Clifford W., Jr., 1982, Pricing Mortgage Originations, *AREUEA Journal*, 10:313-30.
9. von Furstenberg, George M., and R. Jeffery Green, 1974, Home Mortgage Delinquencies: A Cohort Analysis, *Journal of Finance*, 29:1545-48.
10. von Furstenberg, George M. 1970, Interstate Differences in Mortgage Lending Risks: An Analysis of the Causes, *Journal of Financial and Quantitative Analysis*, 5:229-42.
11. United States Government, 1963, Federal Housing Administration *FHA Experience with Mortgage Foreclosures and Property Acquisitions*.
12. , 1963, Housing and Home Finance Agency *Mortgage Foreclosures in Six Metropolitan Areas*.
13. , 1962, Veterans Administration *Report of Loan Service and Claims Study*.
14. Varian, Hal R., 1978, *Microeconomic Analysis*, (New York, NY: W. W. Norton and Company, Inc.).

15. Winkler, Robert L. and William L. Hayes, 1975, *Statistics: Probability, Inference and Decision*, Second Edition (New York, NY: Holt, Rinehart and Winston).

Appendix

A. Probability of Filing a Claim (the incentive to delay a claim)

The insurance indemnity to be received in period T is,

$$B(1+c)^T + \sum_{j=1}^T R_j$$

where B = book value of the mortgage at time of delinquency, c = contractual interest rate on the mortgage, T = time from delinquency to settlement of insurance claim, R_j = real estate operating expenses incurred during period j. The present value of the costs incurred while waiting for a settlement are,

$$B + \sum_{j=1}^T R_j (1+m)^{-j},$$

where m = current market interest rate (assumed constant until time T).

Thus, the present value of the net monetary benefit derived from waiting until T to settle the insurance claim is,

$$\pi(T) = B \left[\frac{1+c}{1+m} \right]^T - B + \sum_{j=1}^T R_j [(1+m)^{-T} - (1+m)^{-j}], \quad (1)$$

One could maximize this benefit with respect to T to find a precise optimal holding time. These results are not reported here for two reasons. First, it turns out that for some parameter values (for example, when real estate operating costs are extremely low, the loan balance is very high, or both interest rates are high), it appears optimal to wait forever to file a claim. This suggests the model as formulated disregards certain non-monetary costs to delay. Second, when a finite optimum does exist, either because of the nature of the parameter values or because of an ad hoc introduction of these non-monetary costs, the comparative statics of the resulting equilibrium are consistent with those reported here. (This analysis is available from the authors upon request.)

The first derivative of this benefit with respect to T is,

$$\frac{d\pi}{dT} = B \left[\frac{1+c}{1+m} \right]^T \ln \left[\frac{1+c}{1+m} \right] - \sum_{j=1}^T R_j (1+m)^{-T} [\ln(1+m)]. \quad (2)$$

This derivative quantifies the lender's incentive to delay a claim.

To see how this incentive to delay is affected by the exogenous variables, the cross derivatives are analyzed.

Equation (2) can be written:

$$\frac{d\pi}{dT} = (1+m)^{-T} \ln(1+m) \left[\left(\frac{\ln(1+c)}{\ln(1+m)} - 1 \right) B(1+c)^T - \sum_{j=1}^T R_j \right]$$

Taking derivatives of this produces:

$$\frac{d^2\pi}{dTdc} = (1+m)^{-T} \ln(1+m)$$

$$\left\{ \frac{1}{\ln(1+m)} B(1+c)^{T-1} + \left(\frac{\ln(1+c)}{\ln(1+m)} - 1 \right) BT(1+c)^{T-1} \right\} > 0$$

$$\frac{d^2\pi}{dTdB} = (1+m)^{-T} \ln(1+m) \left(\frac{\ln(1+c)}{\ln(1+m)} - 1 \right) (1+c)^T > 0$$

$$\frac{d^2\pi}{dTdR_j} = (1+m)^{-T} \ln(1+m)(-1) < 0$$

The inequalities follow immediately as long as $c > m$ so that

$$\left(\frac{\ln(1+c)}{\ln(1+m)} - 1 \right) > 0.$$

Equation (2) can also be written as

$$\begin{aligned} \frac{d\pi}{dT} = & B(1+c)^T [\ln(1+c)] (1+m)^{-T} \\ & - (1+m)^{-T} [\ln(1+m)] \left[B(1+c)^T + \sum_{j=1}^T R_j \right], \end{aligned}$$

so that

$$\begin{aligned} \frac{d^2\pi}{dTdm} = & B(1+c)^T [\ln(1+c)] (-T)(1+m)^{-(T+1)} \\ & - [(-T)(1+m)^{-(T+1)} \ln(1+m) + (1+m)^{-T}(1+m)^{-1}] \left[B(1+c)^T + \sum_{j=1}^T R_j \right]. \end{aligned}$$

This is clearly negative if $(1+m)^{-(T+1)} [-T \ln(1+m) + 1] > 0$, that is if $T \ln(1+m) < 1$. If interest rates are on the order of 10 percent per year, this bound becomes $T < \frac{1}{.095} = 10.5$ years, a number far greater than any plausible delay in processing a claim. The large negative magnitude of the first term makes the actual bound on T even more extreme.

To summarize the results,

$$\pi_{TM} < 0, \pi_{TC} > 0, \pi_{TB} > 0, \pi_{TR} < 0.$$

The authors postulate that the probability of a claim being filed during any given period is inversely related to the marginal profit from delay. Thus if PR denotes the probability a claim is filed, the model predicts

$$PR_M > 0, PR_C < 0, PR_B < 0, PR_R > 0.$$

B. Cost of Claims

If the claim were settled immediately upon default, the claim paid by the insurer would be B . Thus the total claim on the insurer is

$$C = B + \pi(T).$$

As a result, the impact of the exogenous variables on cost can be studied by considering the partial derivatives of π . Note that partial and total derivatives have the same sign. If lenders maximize π , it is known from the envelope theorem of optimization (see Varian, 1978, pp. 267-269)

$$d\pi = \pi_E dE + \pi_T (dT/dE) dE = \pi_E dE$$

where E is any exogenous variable. Recall $\pi_T = 0$ at the optimal T .

If non-monetary costs prevent lenders from maximizing π , $\pi_T > 0$. An examination of the first partials of π shows that it happens that $\text{sign}(\pi_E) = \text{sign}(dT/dE)$ so that solving the above equation yields $\text{sign}(d\pi/dE) = \text{sign}(\pi_E)$ in this case too.

To evaluate the partial derivatives, rewrite (1) to get

$$\pi(T) = \left[B(1+c)^T + \sum_{j=1}^T R_j \right] (1+m)^{-T} - B - \sum_{j=1}^T R_j (1+m)^{-j} \quad (3)$$

Thus

$$\begin{aligned} \frac{d\pi}{dm} &= (-T) \left[B(1+c)^T + \sum_{j=1}^T R_j \right] (1+m)^{-T-1} - \sum_{j=1}^T (-j) R_j (1+m)^{-j-1} \\ &< (-T) \left(\frac{1}{1+m} \right) \left[B(1+c)^T + \sum_{j=1}^T R_j \right] (1+m)^{-T} \\ &\quad - (-T) \left(\frac{1}{1+m} \right) \sum_{j=1}^T R_j (1+m)^{-j} \\ &= (-T) \left[\frac{1}{1+m} \right] (\pi + B) < 0. \end{aligned}$$

The final inequality follows since $\pi > 0$ in the relevant range. Taking other derivatives of (3) one has

$$\frac{d\pi}{dc} = TB(1+c)^{T-1}(1+m)^{-T} > 0$$

$$\frac{d\pi}{dB} = \left[\frac{1+c}{1+m} \right]^T - 1 \Rightarrow 1 + \frac{d\pi}{dB} = \left[\frac{1+c}{1+m} \right]^T > 0$$

$$\frac{d\pi}{dR_j} = (1+m)^{-T} - (1+m)^{-j} < 0 \text{ for all } j < T.$$

It follows that

$$C_M = \pi_M < 0, C_C = \pi_C > 0, C_B = 1 + \pi_B > 0, C_R = \pi_R < 0.$$

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