Residential Loan Renegotiation: Theory and Evidence

Abstract. If loan renegotiations are not uncommon, this alternative should be modeled into the contingent claims framework of mortgage pricing. There is no direct evidence on the frequency of loan renegotiation, however. A simple model of default indicates that renegotiation should occur more frequently in conventional loans versus FHA loans and in states with higher foreclosure costs versus those with lower costs. Since empirical tests using delinquency and foreclosure placement rates demonstrate no such behavioral difference, we conclude loan renegotiation does not occur frequently enough to warrant its consideration in mortgage pricing models. The rarity of circumstances under which renegotiation is mutually beneficial may account for this finding.

Introduction

Residential loans that become delinquent are subject to foreclosure proceedings by the mortgagor. It is no surprise that (residential) mortgage delinquency and foreclosure rates move in a synchronous fashion. There is, however, no legal or rigid institutional barriers that prevent loan renegotiation. Rather than foreclosing or even commencing the foreclosure process, a lender has the option of altering the terms on a loan. Lenders may renegotiate the interest rate, the maturity of the loan, or even forgive all or a portion of the delinquent interest. In fact, mortgage insurers such as the FHA and private companies (PMI) encourage lenders to renegotiate the terms of loans if the workout will prevent a costly foreclosure process. Despite this official position, we show in this paper that the provisions of mortgage insurance contracts severely limit the circumstances under which renegotiation is mutually beneficial to the lender and mortgagor. Regardless of mortgage insurance, a renegotiation may be in the interest of the mortgagor if a default and foreclosure lead to large costs such as the loss of a good credit rating.

Whether or not residential loans are renegotiated on a less than negligible basis is important for models of mortgage prices. Pricing models have been employed to establish the value of loans (Foster and Van Order, 1985; Hendershott and Van Order, 1987; Titman and Torous, 1989), the value of mortgage-backed securities such as pass-throughs (Brennan and Schwartz, 1985; Schwartz and Torous, 1992), and the options associated with mortgages (default and prepayment) (Cunningham and Hendershott, 1984; Epperson, Kau, Keenan and Muller, 1985; Geske, 1979). Pricing models for mortgages and mortgage options generally rely on a form of contingent claims approach. In the traditional model it is assumed that the mortgagor faces three options at each payment date: 1) make the payment (and pay for the option to default or prepay in the future);

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2) prepay the loan; or 3) default and put the house to the lender. However, if a fourth option is available, namely renegotiation of the loan, then these pricing models may have missed an important factor. If renegotiation occurs, and costly default and foreclosure costs are thereby avoided, then such mortgage pricing models should include the renegotiation alternative. The pricing models may then include a likely value for a renegotiated loan.

On the other hand, if, for lack of economic incentives or institutional barriers, renegotiation does not occur in significant volume, then current mortgage models are likely to be adequate and need not be further complicated by including this alternative. We endeavor to answer the following question in this paper. Does residential loan renegotiation occur with sufficient frequency that the mortgage pricing models should include an accurate estimate of the wealth transfer that would result? We begin in the next section by presenting a model of loan renegotiation. As well as establishing the conditions under which renegotiation is most likely to occur, the model also provides implications for the design of an empirical test used to determine if renegotiation occurs on other than a negligible basis. The model is designed with somewhat limited data availability in mind. Part three presents the data and the empirical test and part four is a concluding section.

A Model for Loan Renegotiation
In this section we accomplish two things. First, we develop a simple model of loan renegotiation. The model establishes the parameters for which loan renegotiation makes economic sense and is likely to occur. We show this is seldom the case when mortgage insurance, especially FHA insurance, is in force. Second, the model has implications for the way in which to empirically answer the question: Does loan renegotiation occur in more than insignificant amounts? There are simply no direct data available on loan renegotiations. No government agency or trade association collects such data on a regular basis. So, unless microdata are collected from individual lenders, evidence on the extent of loan renegotiation will not be available. However, the model developed here has implications about how evidence on loan renegotiation can be obtained from available data on delinquency and the rate at which loans are placed into foreclosure.

To see this, first note the following definitions. Let:

\[ B = \text{mortgage balance}; \]
\[ M = \text{market value of the mortgage (with reference to the current market interest rate)}; \]
\[ M' = \text{market value of the mortgage after renegotiation}; \]
\[ H = \text{market value of the house}; \]
\[ F = \text{foregone interest}; \]
\[ K = \text{carrying costs of REO (hazard insurance, property taxes, etc)}; \]
\[ A = \text{attorney fees for foreclosure}; \]
\[ L = \text{other legal fees and court costs for foreclosure}; \]
\[ D = F, K, A \text{ and } L \text{ above taken together and labeled default costs for convenience}; \]
\[ \beta = \text{coverage ratio under private mortgage insurance (PMI)}; \]
\[ C = \text{credit costs to the borrower as a result of default}; \]
\[ I = \text{indemnity received by lender from insurance}. \]

For borrowers, the renegotiated mortgage value must be less than the potential loss from default,

\[ M' < H + C. \tag{2} \]

Thus the range of mutually agreeable values for the renegotiated mortgage is

\[ H - D + I < M' < H + C. \tag{3} \]

Now, consider three insurance schemes: no insurance, FHA insurance, and private mortgage insurance. Differing incentives to renegotiate, depending on the presence or absence of insurance, provide one way to empirically test for loan renegotiation.

**No Insurance**
Without insurance \((I = 0)\), equation (3) becomes:

\[ H - D < M' < H + C. \tag{4} \]

The larger this range, the larger the potential benefit from renegotiation and the more likely it is to occur. Specifically, higher default costs to the lender, \(D\), and higher credit costs to the borrower, \(C\), raise the likelihood of renegotiation. One interesting and counter-intuitive result is that the value of the mortgage, \(M\), drops out indicating that a change in market rates relative to the contract rate has no effect on the incentive to renegotiate.²

**FHA Insurance**
With FHA insurance the indemnity is

\[ I = B + D - H. \]

Substituting into (3) the range of possible renegotiation values becomes

\[ B < M' < H + C. \tag{5} \]

However, it is unlikely for this condition to be satisfied. Since renegotiation eases payment terms, it reduces market value \((M' < M)\). If interest rates have risen, we have \(M < B\) and renegotiation cannot get us into the required range. (Lenders always prefer to collect the mortgage balance through insurance, rather than to renegotiate.)
If interest rates have fallen, borrowers can refinance the mortgage. This reduces mortgage market value to the balance \( M - B \), again leaving no room for renegotiation. Thus, barring some unusual circumstance in which renegotiation is easier than financing, condition (5) will not be satisfied. FHA insurance effectively removes the incentive to renegotiate.

**Private Mortgage Insurance**

With private mortgage insurance, the indemnity is a function of the lender's exposure:

\[ E = B + D \]

Because PMI is a coinsurance relationship, the indemnity is a function of the size of the loss and the coverage ratio, \( \beta \). Specifically, the indemnity is:

\[ I = \text{Min} [E - H, \beta E] \]

Using these relations in equation (3) the possible ranges for renegotiation become:

\[ B < M < H + C \text{ if } E - H < \beta E \]  \hspace{1cm} (6)

or,

\[ H - D + \beta E < M < H + C \text{ if } E - H > \beta E \]  \hspace{1cm} (7)

Equation (6) is the same as (5). This condition cannot be satisfied for the reasons given under the discussion of FHA insurance. For renegotiation to happen under condition (7), we need

\[ H - D + \beta E < H + C \]

which means

\[ E < (D + C) / \beta \]  \hspace{1cm} (8)

At the same time, this condition only applies when

\[ E - H > \beta E \]

that is, when

\[ HR(1 - \beta) < E \]  \hspace{1cm} (9)

Condition (9) only holds when the amount of the exposure exceeds the value of the house. For there to exist an exposure range such that both (8) and (9) hold, it must be true that

\[ HR(1 - \beta) < (D + C) / \beta \]

**Exhibit 1**

<table>
<thead>
<tr>
<th>Consequences for Renegotiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>FHA Insurance</td>
</tr>
<tr>
<td>PMI insurance</td>
</tr>
<tr>
<td>Uninsured loans</td>
</tr>
</tbody>
</table>

Some manipulation shows this is equivalent to

\[ \beta < (C + D) / (H + D) \]

With PMI the possibility of renegotiation does not even exist unless the coverage ratio is less than the proportion of default costs to house price plus default costs. Even then, it only can occur when the exposure is in a certain range greater than the value of the house.

Exhibit 1 summarizes the consequences of the three insurance regimes for loan renegotiations. Since only uninsured conventional mortgages appear likely to be renegotiated, we would expect significantly more renegotiation with conventional than FHA loans. Also, from equation (4), renegotiation is more likely to occur with conventional loans when default costs, \( D \), are higher. So, the empirical implications of this model are that: 1) between conventional and FHA loans, renegotiation should occur more frequently with the former, and 2) for conventional loans, renegotiation should occur more frequently where default costs are higher.

**Data and Empirical Test**

Non-performing mortgage loans go through several stages of delinquency and foreclosure. Generally, loans are delinquent thirty, sixty, ninety days. Because of state laws or provisions in the mortgage contract, few, if any, loans can be or are foreclosed prior to the ninety-day delinquency period. Loans may be delinquent more than ninety days before being placed into foreclosure. The lender's decision to place a loan into foreclosure is indicative of an intent not to renegotiate a loan. That is, considering the non-performing loan process whereby the loan moves from thirty-, sixty-, ninety-day delinquency and then is followed by the loan being placed into foreclosure; if renegotiation takes place in any of these stages it is likely to occur at the point it is being placed into foreclosure by the lender. For this reason, we take the rate at which loans are placed in foreclosure as an inverse proxy for the rate of renegotiation. This proxy is used because, while there are no data on loan renegotiation, there are data on delinquencies and foreclosures.

The Mortgage Bankers Association collects data from lenders on delinquency and the rate at which loans are placed into foreclosure for conventional and FHA-insured loans by state. The importance of the state data is that there is a large variation in foreclosure costs, \( D \), among the states. The variation is due to different laws that regulate the foreclosure process. Clauretie and Herzog (1990) have shown that the costs are higher in states that require a judicial process (as opposed to a power of sale process) and allow a
We also entered a variable that measured the change in mortgage interest rates over a three-year period so as to capture any effect of a change in the value of mortgages on foreclosure rates. Consistent with our model, this variable failed to explain any foreclosure behavior. Thus we omit it from the results.

Next, we investigated the possibility that a structural shift may have occurred over the period of the test. One reason for this is the lesser extent to which mortgages were securitized prior to the 1980s. In 1972, slightly less than 10% of mortgage debt was securitized. By 1984 that percentage rose to nearly 25%, and by 1990 had reached one-third. We speculate that investor-held loans are much less likely to be subject to renegotiation by the originator (lender) of those loans. A Chow-test indicated that there was a shift in the structure around 1984 (1984.3 F-Value = 3.931, Prob = .005). Exhibit 3 shows the results of testing the equations over the earlier period, 1972.4–1984.3.

It indicates that fewer delinquent loans were foreclosed in the earlier period suggesting more of an incentive to renegotiate (or cure) loans. Regardless of the cause of the shift in the structure of the model, it is clear that loan renegotiation presently does not occur in such a frequency that models of mortgage pricing need consider this alternative.

Conclusion

The alternative to renegotiate a delinquent loan can be important for pricing mortgages and the default option on a mortgage. If the economic incentives are present and sufficient to encourage renegotiations on other than an insignificant basis, this alternative...
### OLS Estimates of Foreclosures as a Function of Ninety-Day Delinquent Loans 1972 IV–1983 III

<table>
<thead>
<tr>
<th>Variable</th>
<th>Conventional All States</th>
<th>FHA All States</th>
<th>Conventional Judicial States</th>
<th>Conventional Power-of-Sale States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>0.0186</td>
<td>0.038</td>
<td>0.016</td>
<td>0.022</td>
</tr>
<tr>
<td>$ND_{t}$</td>
<td>(1.14)**</td>
<td>(1.84)*</td>
<td>(3.19)**</td>
<td>(4.45)**</td>
</tr>
<tr>
<td>$ND_{t-1}$</td>
<td>(10.07)**</td>
<td>(6.27)**</td>
<td>(5.51)**</td>
<td>(7.94)**</td>
</tr>
<tr>
<td>$ND_{t-2}$</td>
<td>(5.71)**</td>
<td>(4.92)**</td>
<td>(6.44)**</td>
<td>(7.79)**</td>
</tr>
<tr>
<td>$ND_{t-3}$</td>
<td>(7.54)**</td>
<td>(5.32)**</td>
<td>(6.69)**</td>
<td>(5.35)**</td>
</tr>
<tr>
<td>$ND_{t-4}$</td>
<td>0.04</td>
<td>0.089</td>
<td>0.112</td>
<td>0.173</td>
</tr>
<tr>
<td>AR(1)</td>
<td>(1.26)</td>
<td>(4.41)**</td>
<td>(3.04)**</td>
<td>(4.22)**</td>
</tr>
<tr>
<td>$AR(1)$</td>
<td>0.027</td>
<td>0.422</td>
<td>0.179</td>
<td>0.109</td>
</tr>
<tr>
<td>D–W</td>
<td>0.930</td>
<td>0.751</td>
<td>0.851</td>
<td>0.871</td>
</tr>
<tr>
<td>Sum of Coefficients</td>
<td>1.800</td>
<td>1.87</td>
<td>1.94</td>
<td>1.57</td>
</tr>
</tbody>
</table>

*Significant at the .1 level
**Significant at the .01 level

The independent variable is new loans ninety or more days delinquent in a quarter because some loans ninety days or more delinquent in a given quarter can remain so classified for several quarters, especially in states where a lengthy judicial procedure is required. This would lead to misleadingly low coefficients. New delinquent loans in the ninety-day or more category is defined as $D_{t-1} - D_{t-2} + F$, where $D_t$ is the (stock) percentage of delinquent loans in quarter $t$.

This does not mean all delinquent loans will eventually be foreclosed. Even after being placed into foreclosure, many mortgagors may cure their loans.

More powerful tests could be undertaken if more detailed data were available. For example, one could test uninsured versus insured loans, or portfolio versus non-portfolio loans. However, given available data, it appears that the most effective way to find two samples, one of which contains insured loans while the other does not, is to consider conventional versus FHA loans. Data on portfolio loans only are not available.

There were eighteen states with a judicial procedure and twenty-seven with a power of sale procedure. Only forty-five states were included because the earlier MBA data merged some of the states with a small number of responses (such as Montana and North Dakota).

A three-year period was selected because previous studies have indicated that defaults peak three to four years subsequent to origination.

### References


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