HOMEOWNER MOBILITY AND MORTGAGE INTEREST RATES
NEW EVIDENCE FROM THE 1990s

By

John M. Quigley

January 2001
Homeowner Mobility and Mortgage Interest Rates*

New Evidence from the 1990s

by

John M. Quigley
University of California
Berkeley

Abstract

When interest rates vary, the value to a homeowner of a mortgage at a fixed-interest rate varies as well. In particular, if mortgages are not fully assumable, then when interest rates increase, the value of a pre-existing mortgage contract increases as well. Thus, homeowners have an incentive to postpone moving in response to other economic incentives. Similarly, when interest rates decrease, households who had previously postponed moving now have this disincentive removed. The only empirical evidence on the magnitude of this effect is based upon the period of unusual volatility and increasing interest rates in the late 1970s.

This paper investigates the importance of these mortgage contracts upon mobility during a more typical environment, the early 1990s, when much lower interest rates declined further. Thus, it investigates the implications for mobility of a decline in the "lock in" effect of mortgage contracts. The paper uses the same data source and methodology which had been used previously to analyze the effects of high interest rates in 1979–82 upon homeowner mobility.

January 2001

*A previous version of this paper was presented at the Lusk Center Research Symposium on Real Estate, University of Southern California, January 2001. Research assistance on this project has been provided by Karyen Chu, and financial assistance was provided by Freddie Mac.
I. Introduction

Household mobility has important effects upon the efficiency of the broader economy. For example, inter-regional household mobility provides a powerful mechanism for promoting labor market efficiency in the U.S. Similarly, intra-urban household mobility is the principal mechanism enforcing allocative efficiency in the local public sector.

The potential of household and worker mobility to alleviate inter-regional disparities and to enhance the efficiency of the local public sector is limited by information and transactions costs. The out-of-pocket costs of searching and moving are substantial (Weinberg, Friedman, and Mayo, 1981), and there is an extensive literature documenting the non-pecuniary costs of relocating (e.g., Dynarski, 1985).

About two thirds of U.S. households are homeowners. For these households, the cost of mortgage finance may be the largest component of transactions costs. Homeowner mobility may require the payment of penalties under existing mortgage contracts, as well as application fees and up-front payments associated with new mortgages. Among these financial costs, those associated with interest rate variations are likely to be the largest. In periods of increasing interest rates, holders of fixed-rate non-assumable mortgages will have strong
incentives to postpone residential moves that would require incurring new mortgage debt.

Some systematic evidence is available on the quantitative importance of the lock-in effect of favorable mortgage terms upon homeowner behavior. One study (Quigley, 1987) relates variations in interest rates to individual household decisions to relocate for consumption or for labor market motives. In that study, variations in mortgage contract terms among homeowners -- coupon rates, times to maturity, and monthly payments -- were used to value homeowner mortgages during periods of high interest rates (1979, 1980, and 1981). The results revealed highly significant and large effects of variations in the terms of existing mortgage contracts upon the mobility of decisions of homeowners. Subsequently, Potepan (1989) presented a model focused on housing consumption in which homeowning households choose between moving to satisfy their consumption goals or investing in home renovations. His analysis suggested that the lock-in effect arising from the ownership of mortgages on favorable terms is important in influencing homeowners’ choices between moving and investing in home improvements. During periods of high interest rates, homeowners are more likely to choose to renovate existing dwellings rather than to move dwellings better suited to their changing housing demands.
Both of these studies analyzed the effects of interest rate variations upon homeowner behavior during an unusual period of high and volatile interest rates. Quigley’s analysis is based upon the Panel Study of Income Dynamics (PSID) for the period 1979-1981; Potepan’s analysis is based upon PSID data for 1979. By way of comparison, mortgage yields on new purchases increased by 67 percent, from 9 to 15 percentage points, during the 1977-1982 period which spans these empirical studies.

This paper provides new evidence on the effect of mortgage contract terms on homeowner mobility, from a time period in which interest rates have varied within a more typical range. We analyze household behavior during the 1991-92 period, using the same data source, the Panel Study on Income Dynamics, which was analyzed during the 1979-81 period. The years 1991 and 1992 were chosen because this is the only period in which the requisite data were reported at the household level in the PSID sample survey. In contrast to the period analyzed previously, this was an era of falling interest rates. Mortgage yields on new purchases declined by almost 30 percent, from 10 to a little over 7 percentage points, during the 1990-1993 period which spans this analysis. Thus, any incentive to delay residential moves due to unfavorable mortgage terms declined during this period of analysis. Figure 1 reports the course of mortgage interest rates during the past three decades and highlights

3
Figure 1

The Course of Mortgage Interest Rates, 1963-1996
differences in the interest rate environment during the periods covered by these empirical analyses.

Section II below sets out the basic model and the statistical methodology used to estimate it. Section III reports the statistical analysis and the results. Section IV is a brief conclusion.

The rich set of results may be summarized briefly. We find strong evidence that certain demographic factors and market conditions -- changes in the head of household, an increase in family size, appreciation in house values -- affect family mobility prospects. The evidence about the importance of mortgage contracts upon mobility is more ambiguous. In fact, in a simple proportional hazards framework, there is little evidence of a relationship in these more recent data.

However, when the model is extended to investigate non proportional responses -- that is, when the mobility response to changes in mortgage conditions is allowed to vary with the household's current length of tenure -- a systematic pattern emerges. For households who have lived in their current dwellings for more than a decade, possession of a mortgage under favorable terms substantially reduces the probability of household mobility. These effects are small relative to demographic influences upon household mobility however.
II. Mortgage Terms and Household Mobility

Households make labor market adjustments by changing jobs, often necessitating residential moves. Homeowning households make adjustments in housing consumption through renovations or by moving to accommodations which more closely reflect their incomes and tastes. Absent transactions costs, households would adjust to variations in labor market conditions or housing preferences immediately, changing dwellings in response to investment or consumption incentives.

The financial conditions underlying home mortgages may represent substantial transactions costs. Beyond prepayment penalties, households may incur losses whenever they hold mortgages whose coupon interest rates are higher than those charged for new mortgages of equivalent maturities. If mortgage contracts were assumable and if their financial terms were fully capitalized into house prices, then current homeowners could always realize the financial advantages of favorable mortgage terms upon selling the house. Neither of these conditions holds; most mortgage contracts specify that they are not assumable by third parties, and empirical evidence suggests (e.g., Durning and Quigley, 1985) that, even if assumable, the favorable financial terms in mortgage contracts are only incompletely capitalized into the selling prices of houses.
The financial advantage arising from ownership of a mortgage at contract interest rate $i$, when the interest rate charged on new first mortgages is $r$, depends upon the monthly payment $P$ for debt service and the term to maturity $\eta$. With fixed-rate, level-payment mortgages, the present discounted value (PDV) of a mortgage on favorable terms ($i<r$) is merely

$$PDV(P,i,\eta,r) = \sum_{j=1}^{\eta} \frac{P}{(1+i)^j} - \sum_{j=1}^{\eta} \frac{P}{(1+r)^j}$$

$$PDV(P,i,\eta,r) = B - \sum_{j=1}^{\eta} \frac{P}{(1+r)^j}$$

$$= g[Y]$$

where $B$ is the unpaid balance of the mortgage at time $j=1$ and $Y$ is a vector of contractual terms and interest rates, $Y(P,B,i,r,\eta)$.

Of course, the financial incentives summarized by the $g[ ]$ function are not the only reason, or even the most important reason, why mobility rates vary across homeowners. Housing demand and residential mobility vary with a wide range of sociodemographic characteristics of households (Quigley and Weinberg, 1977). Let the vector $X$ represent that set of
sociodemographic characteristics while \( Y \) represents the vector of contractual and interest rate determinants \((P, B, i, r, \eta)\).

Let \( T \) be a continuous random variable which measures the duration of household tenure, i.e., the elapsed time since an individual household last moved. Define

\[
(2) \quad F(t) = \text{prob}(T \geq t)
\]

as the survivor function and

\[
(3) \quad f(t) = \frac{-dF(t)}{dt}
\]

as the probability density function of \( t \).

The conditional hazard function, specifying the instantaneous probability of household move at \( T = t \), conditional upon survival to time \( T \):

\[
(4) \quad h(t) = \frac{-d \ln F(t)}{dt} = \frac{f(t)}{F(t)}.
\]

Now, assume that the hazard rate of mobility is separable and proportional
where \( h_0 \) is the baseline hazard, a function of duration alone.

The factor \( \pi \) varies with the sociodemographic characteristics of households \( X \) and the contractual and interest rate terms \( Y \).

Assume further \( \pi \) is separable in the form

\[
\pi(X,Y) = \exp(\beta_1 X + \beta_2 g[Y])
\]

where the \( \beta \)'s are parameters.

More generally, it may be reasonable to presume that the importance of mortgage terms and interest rates is not independent of tenure time. For example, if households’ attachment to neighborhoods increases over time (see Dynarski, 1985), then the same increase in the transactions costs of moving may affect the mobility incentives of households (and their hazards of moving) quite differently depending upon length of tenure. The proportionality assumption can be tested in a straightforward manner, e.g., by assuming

\[
\pi(X,Y,t) = t^{\beta_3 g[Y]} \exp(\beta_1 X + \beta_2 g[Y] + \beta_3 g[Y])
\]

by testing the hypothesis that \( \beta_3 = 0 \).
Equations (5) and (6) define the Cox proportional hazard model (see Cox and Oakes, 1985):

(8) \[ h(t, X, Y) = h_0(t)\exp(\beta_1 X + \beta_2 g(Y)) \] .

Similarly, equations (5) and (7) define the Cox non proportional hazard model

(9) \[ h(t, X, Y) = h_0(t)\exp(\beta_1 X + \beta_2 g[Y] + \beta_3 g[Y]\log t) \] .

This specification was used previously to evaluate the effects of mortgage terms upon homeowner mobility using the PSID for 1979-1981. From the raw data, it was possible to compute the \( Y \) vector for about half of the homeowners surveyed in the PSID. In addition to the \( g[Y] \) variable measuring the value of mortgage terms, the empirical analysis included controls for nine sociodemographic characteristics of households \( (X) \).

The results of this investigation are reproduced exactly in Table 1. Note that in each of the three samples the coefficient \( \beta_2 \) is highly significant. \( \beta_2 \) is reported in the first line of Table 1. The significance of the coefficient \( \beta_3 \) is more ambiguous. \( \beta_3 \) is reported as the coefficient of "Z" in Table 1. Of the three replications, one is highly significant \( (t = 2.3) \),
### Table 1

**Hazard Rate Models of Household Mobility**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Proportional</th>
<th></th>
<th></th>
<th>Nonproportional</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Present Value of Mortgage</td>
<td>-0.572</td>
<td>-1.125</td>
<td>-0.582</td>
<td>-1.370</td>
<td>-0.910</td>
<td>-1.280</td>
</tr>
<tr>
<td>Premium (×10,000)</td>
<td>(5.06)</td>
<td>(4.78)</td>
<td>(3.96)</td>
<td>(2.27)</td>
<td>(3.42)</td>
<td>(2.36)</td>
</tr>
<tr>
<td>Increase in Family Size (number)</td>
<td>0.402</td>
<td>0.558</td>
<td>0.841</td>
<td>0.342</td>
<td>0.577</td>
<td>0.831</td>
</tr>
<tr>
<td>Decrease in Family Size (number)</td>
<td>(2.53)</td>
<td>(2.46)</td>
<td>(3.47)</td>
<td>(2.26)</td>
<td>(2.60)</td>
<td>(3.44)</td>
</tr>
<tr>
<td>Income of Family (×100,000)</td>
<td>0.172</td>
<td>0.140</td>
<td>-0.069</td>
<td>0.027</td>
<td>0.134</td>
<td>-0.786</td>
</tr>
<tr>
<td>Age of Family Head (×100)</td>
<td>-8.988</td>
<td>-7.508</td>
<td>-7.521</td>
<td>-0.093</td>
<td>-7.293</td>
<td>-7.453</td>
</tr>
<tr>
<td>Education of Family</td>
<td>0.155</td>
<td>0.096</td>
<td>0.073</td>
<td>0.116</td>
<td>0.097</td>
<td>0.068</td>
</tr>
<tr>
<td>Head (years)</td>
<td>(3.92)</td>
<td>(1.72)</td>
<td>(1.43)</td>
<td>(3.26)</td>
<td>(1.78)</td>
<td>(1.32)</td>
</tr>
<tr>
<td>Size of Family (number)</td>
<td>-0.101</td>
<td>0.040</td>
<td>0.075</td>
<td>-0.010</td>
<td>(0.022)</td>
<td>0.076</td>
</tr>
<tr>
<td>Black Household (1 = yes)</td>
<td>-0.319</td>
<td>0.328</td>
<td>-0.904</td>
<td>-0.319</td>
<td>0.231</td>
<td>-0.903</td>
</tr>
<tr>
<td>Other Non-White Household (1 = yes)</td>
<td>(2.06)</td>
<td>(0.27)</td>
<td>(0.52)</td>
<td>(2.90)</td>
<td>(0.37)</td>
<td>(0.52)</td>
</tr>
<tr>
<td>Change in Family Head (1 = yes)</td>
<td>1.374</td>
<td>1.227</td>
<td></td>
<td>1.451</td>
<td>1.212</td>
<td></td>
</tr>
<tr>
<td>Z (×10,000)</td>
<td>b</td>
<td>(2.04)</td>
<td>(2.91)</td>
<td>b</td>
<td>(2.13)</td>
<td>(2.87)</td>
</tr>
<tr>
<td>Likelihood Ratio (Chi-square)</td>
<td>316.32</td>
<td>212.57</td>
<td>182.23</td>
<td>394.00</td>
<td>260.82</td>
<td>228.29</td>
</tr>
<tr>
<td>Observations</td>
<td>1768</td>
<td>1092</td>
<td>1142</td>
<td>1768</td>
<td>1092</td>
<td>1142</td>
</tr>
<tr>
<td>Number of Moves</td>
<td>134</td>
<td>58</td>
<td>71</td>
<td>134</td>
<td>58</td>
<td>71</td>
</tr>
</tbody>
</table>

---

*a* Asymptotic *t*-ratios are in parentheses.

*b* No variation in sample.

*c* Z is defined as the present value of the mortgage premium times the logarithm of years of tenure.

one is clearly insignificant ($t = 1.3$), and one is marginal ($t = 1.7$).

These results suggest that mortgage terms and interest rates significantly affect the propensity of homeowners to move in any year. It also seems that there are no strong grounds for distinguishing between the proportional and non-proportional representation of interest rate effects.

With the advantage of a decade of hindsight, several aspects of these published results seem problematic. First, we may expect the effects of the present value of financial terms upon household mobility to be asymmetric. If the $g$ function is positive, indicating that the present value of maintaining an existing mortgage is large relative to acquiring a new mortgage at current market conditions, households will have economic incentives to postpone or forego residential moves. However, if the $g$ function is negative, households will have economic incentives to refinance, not necessarily to move. This suggests that the coefficient $\beta_2$ associated with $g$ in the hazard model should be negative when $g$ is positive, but could be zero when $g$ is negative.

Indeed, if we observe that $g$ is negative for some household, we may wonder why it has chosen not to refinance an existing mortgage. For some households, the transactions costs may simply exceed the economic gains from refinance. However,
we may observe that other households do not refinance because they cannot do so, for example, because their incomes have declined. Those households who could no longer qualify for mortgages on their current properties may act quite rationally in maintaining their existing mortgage finance. In fact, for these reasons we may expect some households to be less mobile when the value of g is negative.

Finally, the results presented in Table 1 are based upon observing household behavior during three one-year intervals in the estimation of the hazard of mobility. Presumably, a more efficient estimation strategy would have entailed observing each household during a single three-year interval in estimating the conditional hazard of household mobility.

These problematic aspects of previous research can be addressed by extending the analysis, using the same data source, but more recent observations on behavior.

III. New Results from the 1990s

As noted above, it is possible to extend this analysis to the years 1991 and 1992 by relying upon the PSID survey for 1990-1992. During those three years, the PSID survey asked household respondents to indicate their remaining mortgage balances and the remaining term to maturity of their mortgages.
The survey also asked households to indicate their gross monthly payments and the portion of payments reserved for insurance and property taxes.

Computation of the present value of homeowner mortgages was undertaken for 1990 and 1991 and was related to homeowner mobility during the subsequent years 1991 and 1992. Thus, the 1992 sample refers to moving behavior observed in 1992 based upon mortgage valuation in 1991.

Despite the care taken in verifying data by PSID researchers, it was necessary to exclude a substantial fraction of the sample of homeowners from the statistical analysis. Homeowners were eliminated from the analysis sample based upon five general criteria.

First, households were eliminated if all raw data required to calculate the PDV in equation (1) were not available for the previous year as well as the current year. A total of 346 households out of 4,871 homeowners in 1991 were eliminated, and 519 out of 5,079 households in 1992 were eliminated according to this criteria.

Second, households were eliminated if the homeowner was unable to provide its remaining mortgage principal, its monthly mortgage payment, or its property tax bill. In these circumstances the PSID staff member made "imputations." Removal
of these undocumented imputations reduced the analysis sample by 864 homeowners in 1991 and by 805 households in 1992.

Third, households were eliminated if their computed mortgage interest rates were unreasonable. The PSID survey did not ask homeowners directly for their mortgage interest rates. Interest rates were computed from the remaining mortgage balance and the remaining term, the gross monthly payments and the portion of that payment used to pay insurance or property taxes. Households were excluded from the analysis if their mortgage interest rate, so computed, lay outside the range of 2 to 20 percent. A total of 444 households were eliminated according to this criterion in 1991, and 441 households were eliminated in 1992.

Fourth, non-moving households were eliminated if the interest rates computed for them during adjoining years differed by more than ten percentage points. A total of 240 households were eliminated in 1991 according to this criterion. The sample in 1992 was reduced by 256 by applying this criterion.

Finally, households were eliminated if it was not possible to establish the year they had moved into their current dwelling. The length of tenure for each household was computed by linking longitudinal records for each household back to 1968, the first year of the survey. Each year, households were asked if they had moved in the previous year. Missing values to these
responses sometimes resulted in ambiguities about households’ tenure. A total of 240 households were eliminated from the 1991 sample, and 396 were eliminated from the 1992 sample through application of this criterion.

Altogether, the application of these criteria reduced the homeowner samples available for analysis by about half. The analysis sample for 1991 included 2,562 of the 4,871 homeowner households, about 53 percent. For 1992, the analysis sample included 2,662 homeowners, about 53 percent of the sample of 5,079 homeowners in the PSID.

Table 2 summarizes the reasons for excluding households from the samples for 1991 and 1992. We present hazard models based upon these data. The analysis sample consists of observations on all those households observed during the two year period 1991-92, on all those households observed in 1991 but not included in the sample in 1992, and on all those households observed in 1992 but not included in the sample in 1991.

Table 3 summarizes the average differences in each year between the homeowner sample in the PSID and the subsample used for the statistical analysis. Households in the analysis sample have slightly higher incomes and educational levels than other homeowners in the PSID. They own more expensive houses and have
Table 2
Homeowner Sample Sizes and Exclusions in PSID, 1991-1992,
And Exclusions from Analysis Sample

<table>
<thead>
<tr>
<th></th>
<th>1991 Sample</th>
<th>1992 Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Sample Sizes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Total number of homeowners</td>
<td>4871</td>
<td>5079</td>
</tr>
<tr>
<td>2. Total number of exclusions</td>
<td>2309</td>
<td>2417</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analysis sample</td>
<td>2562</td>
<td>2662</td>
</tr>
<tr>
<td>B. Type of Exclusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Data unavailable for previous year</td>
<td>346</td>
<td>519</td>
</tr>
<tr>
<td>2. Imputation of mortgage principal, mortgage payment, or property taxes</td>
<td>864</td>
<td>805</td>
</tr>
<tr>
<td>3. Unreasonable interest rate computation for previous year</td>
<td>444</td>
<td>441</td>
</tr>
<tr>
<td>4. Non moving households with unreasonable changes in interest rate, or interest rate not computable</td>
<td>240</td>
<td>256</td>
</tr>
<tr>
<td>5. Years of tenure unknown</td>
<td>415</td>
<td>396</td>
</tr>
<tr>
<td>Total Exclusions</td>
<td>2309</td>
<td>2417</td>
</tr>
</tbody>
</table>

Note: The sample for any year consists of contemporaneous demographic information and mortgage valuations as of the end of the previous year.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortgage Premium (dollars)</td>
<td>-$108</td>
<td>-$568</td>
<td>-$1,212</td>
<td>-$2,255</td>
</tr>
<tr>
<td>Remaining Principal (dollars)</td>
<td>$29,823</td>
<td>$35,334</td>
<td>$31,238</td>
<td>$35,057</td>
</tr>
<tr>
<td>House Value (dollars)</td>
<td>$83,931</td>
<td>$99,791</td>
<td>$84,761</td>
<td>$96,761</td>
</tr>
<tr>
<td>Premium/House Value (percent)</td>
<td>-1.04</td>
<td>-0.93</td>
<td>-2.02</td>
<td>-2.75</td>
</tr>
<tr>
<td>Annual Mortgage Payment (dollars)</td>
<td>$4,302</td>
<td>$4,818</td>
<td>$4,519</td>
<td>$4,841</td>
</tr>
<tr>
<td>Remaining Mortgage Term (years)</td>
<td>11.98</td>
<td>11.91</td>
<td>11.89</td>
<td>11.55</td>
</tr>
<tr>
<td>Length of Tenure at Residence (years)</td>
<td>11.22</td>
<td>12.41</td>
<td>11.21</td>
<td>12.56</td>
</tr>
<tr>
<td>Increase in Family Size (number)</td>
<td>0.15</td>
<td>0.10</td>
<td>0.19</td>
<td>0.09</td>
</tr>
<tr>
<td>Decrease in Family Size (number)</td>
<td>0.12</td>
<td>0.10</td>
<td>0.12</td>
<td>0.11</td>
</tr>
<tr>
<td>Family Income (dollars)</td>
<td>$44,221</td>
<td>$48,714</td>
<td>$45,545</td>
<td>$49,252</td>
</tr>
<tr>
<td>Age of Head (years)</td>
<td>47.76</td>
<td>48.44</td>
<td>48.07</td>
<td>48.75</td>
</tr>
<tr>
<td>Education of Head (years)</td>
<td>11.92 *</td>
<td>12.70 *</td>
<td>12.09</td>
<td>12.58</td>
</tr>
<tr>
<td>Size of Family (number)</td>
<td>3.07</td>
<td>2.93</td>
<td>3.05</td>
<td>2.95</td>
</tr>
<tr>
<td>House Value Appreciation (one year, in dollars)</td>
<td>$7,377</td>
<td>$9,216</td>
<td>$3,826</td>
<td>$4,587</td>
</tr>
<tr>
<td>Loan/Value Ratio (percent)</td>
<td>36.56</td>
<td>33.58</td>
<td>37.23</td>
<td>34.16</td>
</tr>
<tr>
<td>Payment/Income (percent)</td>
<td>11.45</td>
<td>8.82</td>
<td>10.69</td>
<td>9.03</td>
</tr>
<tr>
<td>Black Households (percent)</td>
<td>20.20</td>
<td>17.83</td>
<td>20.10</td>
<td>20.18</td>
</tr>
<tr>
<td>Other Nonwhite Households (percent)</td>
<td>5.81</td>
<td>1.49</td>
<td>6.40</td>
<td>1.72</td>
</tr>
<tr>
<td>Moving Households (percent)</td>
<td>9.69</td>
<td>4.79</td>
<td>8.29</td>
<td>4.14</td>
</tr>
<tr>
<td>Number of observations</td>
<td>4,871</td>
<td>2,086</td>
<td>5,079</td>
<td>2,662</td>
</tr>
</tbody>
</table>

* Years of Education is estimated from categories reported in 1991. Years of Education is measured directly in 1992.
somewhat higher outstanding mortgage balances. The average mortgage premium is negative (suggesting that, in the absence of prepayment fees or transactions costs, the average household would be better off refinancing its mortgage). The average premium is somewhat larger in absolute terms for the analysis samples than for homeowners in general, and it is a larger fraction of the average outstanding mortgage balance. It is about the same as a fraction of house values. The number is more negative in 1992 than 1991, presumably reflecting the decline in interest rates during the period.

Of course, the analysis sample includes a substantial fraction of households -- about forty percent -- who have no mortgages at all. For those households, the mortgage premium is zero (and is unaffected by interest rates). Table 3 indicates the distribution of mortgage premia, and shows a substantial mass point at zero.

Table 5 reports the results of a series of hazard models that include household demographics as well as the financial variables whose distribution is summarized in Table 4. These demographic variables are the same as those defined in Quigley’s study using the PSID data from a decade earlier. The pattern of these coefficients is similar to those estimated from the earlier data reported in Table 1. Increases in family size are significantly related to household mobility, but decreases in
### Table 4
Distribution of Mortgage Premium

#### A. Premium in Dollars

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; -$10,000</td>
<td>155</td>
<td>7.43%</td>
<td>306</td>
<td>11.94%</td>
</tr>
<tr>
<td>-$10,000 to -$5,000</td>
<td>144</td>
<td>6.91%</td>
<td>244</td>
<td>9.52%</td>
</tr>
<tr>
<td>-$5,000 to -$2,500</td>
<td>154</td>
<td>7.39%</td>
<td>160</td>
<td>6.25%</td>
</tr>
<tr>
<td>-$2,500 to -$1,000</td>
<td>112</td>
<td>5.37%</td>
<td>148</td>
<td>5.78%</td>
</tr>
<tr>
<td>-$1,000 to $0.01</td>
<td>96</td>
<td>4.60%</td>
<td>93</td>
<td>3.63%</td>
</tr>
<tr>
<td>$0</td>
<td>898</td>
<td>43.07%</td>
<td>1091</td>
<td>42.58%</td>
</tr>
<tr>
<td>$0.01 to $1,000</td>
<td>107</td>
<td>5.13%</td>
<td>100</td>
<td>3.90%</td>
</tr>
<tr>
<td>$1,000 to $2,500</td>
<td>83</td>
<td>3.98%</td>
<td>112</td>
<td>4.37%</td>
</tr>
<tr>
<td>$2,500 to $5,000</td>
<td>111</td>
<td>5.32%</td>
<td>111</td>
<td>4.33%</td>
</tr>
<tr>
<td>$5,000 to $10,000</td>
<td>110</td>
<td>5.28%</td>
<td>109</td>
<td>4.25%</td>
</tr>
<tr>
<td>&gt;$10,000</td>
<td>115</td>
<td>5.52%</td>
<td>88</td>
<td>3.43%</td>
</tr>
</tbody>
</table>

Total Observations 2,085 100.00% 2,562 100.00%

#### B. Premium/Value

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;=-0.25</td>
<td>35</td>
<td>1.68%</td>
<td>79</td>
<td>3.08%</td>
</tr>
<tr>
<td>-0.25 to -0.10</td>
<td>153</td>
<td>7.34%</td>
<td>272</td>
<td>10.62%</td>
</tr>
<tr>
<td>-0.10 to -0.05</td>
<td>155</td>
<td>7.43%</td>
<td>240</td>
<td>9.37%</td>
</tr>
<tr>
<td>-0.05 to -0.0001</td>
<td>318</td>
<td>15.25%</td>
<td>360</td>
<td>14.05%</td>
</tr>
<tr>
<td>0</td>
<td>898</td>
<td>43.07%</td>
<td>1091</td>
<td>42.58%</td>
</tr>
<tr>
<td>0.0001 to 0.05</td>
<td>292</td>
<td>14.00%</td>
<td>321</td>
<td>12.53%</td>
</tr>
<tr>
<td>0.05 to 0.10</td>
<td>115</td>
<td>5.52%</td>
<td>105</td>
<td>4.10%</td>
</tr>
<tr>
<td>0.10 to 0.25</td>
<td>100</td>
<td>4.80%</td>
<td>78</td>
<td>3.04%</td>
</tr>
<tr>
<td>&gt;0.25</td>
<td>19</td>
<td>0.91%</td>
<td>16</td>
<td>0.62%</td>
</tr>
</tbody>
</table>

Total Observations 2,085 100.00% 2,562 100.00%

Note: Mortgage Premium is defined in equation (1) as the PDV of the mortgage at the contract rate minus the PDV at the current rate for new mortgages.
<table>
<thead>
<tr>
<th>Covariate</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortgage Premium (x 10^4)</td>
<td>0.009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(x 10^4)</td>
<td>(1.52)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premium/House Value</td>
<td></td>
<td>0.487</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.704)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premium*Dummy for positive (x 10^4)</td>
<td></td>
<td>0.067</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.59)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premium*Dummy for negative (x 10^4)</td>
<td></td>
<td>0.112</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(1.22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Premium/Value)*(Dummy for pos)</td>
<td></td>
<td></td>
<td>0.637</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.58)</td>
<td></td>
</tr>
<tr>
<td>(Premium/Value)*(Dummy for neg)</td>
<td></td>
<td></td>
<td>0.388</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(0.72)</td>
<td></td>
</tr>
<tr>
<td>Increase in Family Size (number)</td>
<td>0.662 *</td>
<td>0.662 *</td>
<td>0.661 *</td>
<td>0.663 *</td>
</tr>
<tr>
<td></td>
<td>(9.80)</td>
<td>(9.81)</td>
<td>(9.76)</td>
<td>(9.85)</td>
</tr>
<tr>
<td>Decrease in Family Size (number)</td>
<td>0.097</td>
<td>0.094</td>
<td>0.095</td>
<td>0.095</td>
</tr>
<tr>
<td></td>
<td>(0.62)</td>
<td>(0.60)</td>
<td>(0.61)</td>
<td>(0.61)</td>
</tr>
<tr>
<td>Family Income (1,000's of dollars)</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td>(0.51)</td>
<td>(0.49)</td>
<td>(0.57)</td>
<td>(0.47)</td>
</tr>
<tr>
<td>Age of Head (years)</td>
<td>-0.016 *</td>
<td>-0.016 *</td>
<td>-0.016 *</td>
<td>-0.016 *</td>
</tr>
<tr>
<td></td>
<td>(2.24)</td>
<td>(2.23)</td>
<td>(2.26)</td>
<td>(2.18)</td>
</tr>
<tr>
<td>Education of Head (years)</td>
<td>0.055 **</td>
<td>0.054 **</td>
<td>0.056 **</td>
<td>0.054 **</td>
</tr>
<tr>
<td></td>
<td>(1.66)</td>
<td>(1.65)</td>
<td>(1.67)</td>
<td>(1.65)</td>
</tr>
<tr>
<td>Family Size (number)</td>
<td>0.012</td>
<td>0.012</td>
<td>0.013</td>
<td>0.012</td>
</tr>
<tr>
<td></td>
<td>(0.27)</td>
<td>(0.27)</td>
<td>(0.28)</td>
<td>(0.27)</td>
</tr>
<tr>
<td>Black Household (1=yes)</td>
<td>-0.366 **</td>
<td>-0.364 **</td>
<td>-0.365 **</td>
<td>-0.366 **</td>
</tr>
<tr>
<td></td>
<td>(1.72)</td>
<td>(1.70)</td>
<td>(1.71)</td>
<td>(1.71)</td>
</tr>
<tr>
<td>Other NonWhite Household (1=yes)</td>
<td>0.081</td>
<td>0.078</td>
<td>0.086</td>
<td>0.072</td>
</tr>
<tr>
<td></td>
<td>(0.19)</td>
<td>(0.19)</td>
<td>(0.20)</td>
<td>(0.17)</td>
</tr>
<tr>
<td>New Family Head</td>
<td>1.330 *</td>
<td>1.336 *</td>
<td>1.331 *</td>
<td>1.336 *</td>
</tr>
<tr>
<td></td>
<td>(6.53)</td>
<td>(6.57)</td>
<td>(6.54)</td>
<td>(6.59)</td>
</tr>
<tr>
<td>Chi-Square</td>
<td>273.62</td>
<td>269.83</td>
<td>274.88</td>
<td>271.67</td>
</tr>
</tbody>
</table>

* Significant at the 5% level
** Significant at the 10% level
family size have no statistically significant impact. Younger households and those with more education are more likely to move in any given year. Neither the level of income nor the size of the family is significantly related to household mobility. There is some evidence that, holding other factors constant, black homeowners are less likely to move than whites.

Although the Chi squared statistic indicates that each of the models reported in Table 5 is highly significant, there is no credible evidence at all that mortgage financial terms affected household mobility during this period of declining interest rates.

Table 6 reports the results from an expanded set of variables hypothesized to affect household mobility. First, in Models E through H we delete the four demographic variables which are clearly insignificant in the results reported in Table 5: decrease in family size; household income; family size; and the dummy variable signifying other non white households. Second, following Keil (1994) we include a measure of the one-year house price appreciation experienced by each household. This is computed from the self-assessed house values reported for each homeowner. Third, following Wu (1997) we include measures of the current loan-to-value ratio for each household as well as its monthly housing payment-to-income ratio. Wu argues that these two variables are proxies which identify those
Table 6
Expanded Hazard Models of Household Mobility
(asymptotic t-ratios in parentheses)

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Model E</th>
<th>Model F</th>
<th>Model G</th>
<th>Model H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortgage Premium (x 10^4)</td>
<td>0.084</td>
<td>0.391</td>
<td>0.065</td>
<td>0.327</td>
</tr>
<tr>
<td></td>
<td>(1.49)</td>
<td>(0.54)</td>
<td>(0.63)</td>
<td>(0.23)</td>
</tr>
<tr>
<td>Premium/House Value (x 10^4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premium*Dummy for positive (x 10^4)</td>
<td></td>
<td></td>
<td></td>
<td>0.105</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(1.19)</td>
</tr>
<tr>
<td>(Premium/Value)*(Dummy for pos)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Premium/Value)*(Dummy for neg)</td>
<td></td>
<td></td>
<td></td>
<td>0.430</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.35)</td>
</tr>
<tr>
<td>Increase in Family Size (number)</td>
<td>0.675 *</td>
<td>0.674 *</td>
<td>0.675 *</td>
<td>0.674 *</td>
</tr>
<tr>
<td></td>
<td>(9.80)</td>
<td>(9.80)</td>
<td>(9.78)</td>
<td>(9.78)</td>
</tr>
<tr>
<td>Age of Head (years)</td>
<td>-0.015 **</td>
<td>-0.015 **</td>
<td>-0.015 **</td>
<td>-0.015 **</td>
</tr>
<tr>
<td></td>
<td>(1.91)</td>
<td>(1.87)</td>
<td>(1.90)</td>
<td>(1.87)</td>
</tr>
<tr>
<td>Education of Head (years)</td>
<td>0.057 **</td>
<td>0.056 **</td>
<td>0.058 **</td>
<td>0.056 **</td>
</tr>
<tr>
<td></td>
<td>(1.78)</td>
<td>(1.76)</td>
<td>(1.78)</td>
<td>(1.76)</td>
</tr>
<tr>
<td>Black Household (1=yes)</td>
<td>-0.338</td>
<td>-0.337</td>
<td>-0.337</td>
<td>-0.336</td>
</tr>
<tr>
<td></td>
<td>(1.57)</td>
<td>(1.57)</td>
<td>(1.57)</td>
<td>(1.56)</td>
</tr>
<tr>
<td>New Family Head (1=yes)</td>
<td>1.365 *</td>
<td>1.374 *</td>
<td>1.364 *</td>
<td>1.373 *</td>
</tr>
<tr>
<td></td>
<td>(6.71)</td>
<td>(6.74)</td>
<td>(6.68)</td>
<td>(6.70)</td>
</tr>
<tr>
<td>House Value Appreciation (x 10^4)</td>
<td>0.020 *</td>
<td>0.021 *</td>
<td>0.021 *</td>
<td>0.021 *</td>
</tr>
<tr>
<td></td>
<td>(2.09)</td>
<td>(2.13)</td>
<td>(2.17)</td>
<td>(2.13)</td>
</tr>
<tr>
<td>Loan to Value Ratio (fraction)</td>
<td>0.037</td>
<td>0.057</td>
<td>0.049</td>
<td>0.063</td>
</tr>
<tr>
<td></td>
<td>(0.14)</td>
<td>(0.22)</td>
<td>(0.19)</td>
<td>(0.22)</td>
</tr>
<tr>
<td>Payment to Income Ratio (fraction)</td>
<td>-0.081</td>
<td>-0.129</td>
<td>-0.057</td>
<td>-0.129</td>
</tr>
<tr>
<td></td>
<td>(0.15)</td>
<td>(0.21)</td>
<td>(0.11)</td>
<td>(0.21)</td>
</tr>
<tr>
<td>Chi-Square</td>
<td>287.8</td>
<td>285.27</td>
<td>289.67</td>
<td>285.54</td>
</tr>
</tbody>
</table>

* Significant at the 5% level
** Significant at the 10% level
constrained households who cannot refinance in response to interest rate declines.

The Chi squared statistics reported in Table 6 are larger than for the previous models, reflecting the increased statistical significance of the results. There is strong evidence that household mobility decisions are related to increases in family size, the existence of a new head of household, the age, education, and race of the head of household, and is sensitive to recent appreciation in housing prices. There is no indication that mobility decisions are responsive to loan-to-value ratios or to payment-to-income ratios.

Importantly, in these more complex proportional hazard models there is very little evidence that mobility is responsive to the contractual terms of the mortgages held by these homeowners.

Table 7 presents models which relax the assumption of proportionality in the relationship between mortgage terms and household mobility. Allowing for a non proportional relationship between the valuation of mortgage terms and household mobility significantly increases the statistical power of the models. Moreover, the coefficient on the non proportionality term is consistently negative and is of the same order of magnitude as the coefficient on the proportionality
Table 7
Expanded Non-Proportional Hazard Models of Mobility
(asymptotic t-ratios in parentheses)

<table>
<thead>
<tr>
<th>Covariate</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>A. Proportional Component</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mortgage Premium</td>
<td>0.157</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>((x \times 10^4))</td>
<td>(2.07)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premium/House Value</td>
<td></td>
<td>1.864</td>
<td>**</td>
<td></td>
</tr>
<tr>
<td>((x \times 10^4))</td>
<td></td>
<td>(1.74)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premium*Dummy for positive</td>
<td>0.077</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>((x \times 10^4))</td>
<td></td>
<td>(0.56)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Premium*Dummy for negative</td>
<td>0.341</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>((x \times 10^4))</td>
<td></td>
<td>(1.45)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Premium/Value)*(Dummy for pos)</td>
<td></td>
<td></td>
<td>9.700</td>
<td>(0.36)</td>
</tr>
<tr>
<td>(Premium/Value)*(Dummy for neg)</td>
<td></td>
<td></td>
<td>3.096</td>
<td>(1.43)</td>
</tr>
<tr>
<td>Increase in Family Size</td>
<td>0.678</td>
<td>0.676</td>
<td>0.676</td>
<td>0.676</td>
</tr>
<tr>
<td>(number)</td>
<td>(9.87)</td>
<td>(9.91)</td>
<td>(9.77)</td>
<td>(9.78)</td>
</tr>
<tr>
<td>Age of Head</td>
<td>-0.015</td>
<td>**</td>
<td>-0.015</td>
<td>**</td>
</tr>
<tr>
<td>(years)</td>
<td>(1.88)</td>
<td>(1.84)</td>
<td>(1.80)</td>
<td>(1.63)</td>
</tr>
<tr>
<td>Education of Head</td>
<td>0.058</td>
<td>**</td>
<td>0.060</td>
<td>**</td>
</tr>
<tr>
<td>(years)</td>
<td>(1.81)</td>
<td>(1.82)</td>
<td>(1.82)</td>
<td>(1.61)</td>
</tr>
<tr>
<td>Black Household</td>
<td>-0.347</td>
<td>-0.369</td>
<td>**</td>
<td>-0.345</td>
</tr>
<tr>
<td>((1=\text{yes}))</td>
<td>(1.63)</td>
<td>(1.72)</td>
<td>(1.62)</td>
<td>(1.65)</td>
</tr>
<tr>
<td>New Family Head</td>
<td>1.370</td>
<td>*</td>
<td>1.360</td>
<td>*</td>
</tr>
<tr>
<td>((1=\text{yes}))</td>
<td>(6.73)</td>
<td>(6.79)</td>
<td>(6.73)</td>
<td>(6.68)</td>
</tr>
<tr>
<td>House Value Appreciation (in $)</td>
<td>0.019</td>
<td>**</td>
<td>0.021</td>
<td>**</td>
</tr>
<tr>
<td>((x \times 10^4))</td>
<td>(1.96)</td>
<td>(2.15)</td>
<td>(2.29)</td>
<td>(2.18)</td>
</tr>
<tr>
<td>Loan to Value Ratio</td>
<td>0.029</td>
<td></td>
<td>0.052</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.11)</td>
<td>(0.12)</td>
<td>(0.20)</td>
<td>(0.30)</td>
</tr>
<tr>
<td>Payment to Income Ratio</td>
<td>-0.111</td>
<td>-0.197</td>
<td>-0.071</td>
<td>-0.218</td>
</tr>
<tr>
<td></td>
<td>(0.19)</td>
<td>(0.35)</td>
<td>(0.13)</td>
<td>(0.39)</td>
</tr>
</tbody>
</table>

**B. Non-Proportional Component**

| Premium*In tenure                  | -0.067  |         |         |         |
| \((x \times 10^4)\)                | (1.13)  |         |         |         |
| Premium*Dummy for positive*In tenure|         | -0.021  |         |         |
| \((x \times 10^4)\)                |         | (0.21)  |         |         |
| Premium*Dummy for negative*In tenure|         | -0.164  |         |         |
| \((x \times 10^4)\)                |         | (1.23)  |         |         |
| (Prem/Val)*In tenure               | -1.173  | **      |         |         |
|                                   | (1.70)  |         |         |         |
| (Prem/Val)*Dummy for positive*In tenure |         | -0.582  |         |         |
|                                   | (0.40)  |         |         |         |
| (Prem/Val)*Dummy for negative*In tenure |         | -1.738  | **      |         |
|                                   | (1.68)  |         |         |         |

Chi-Square 296.99 296.99 296.99 296.99

* Significant at the 5% level
** Significant at the 10% level
term. This suggests that, after only a few years of tenure, the possession of a mortgage on terms more favorable than the current market does cause households to postpone moving decisions.

The models in Table 7 are similar to those reported in Table 6 but with the addition of terms reflecting non proportionality. The coefficients of the demographic variables are essentially unchanged. However, the coefficients of the variables reflecting mortgage conditions are larger, and their t ratios are higher. When the model is amended to permit a non proportional response, the estimated effect of mortgage conditions upon mobility is larger, and the response is in the direction predicted by economic theory. The possession of mortgages on favorable terms does not affect mobility decisions, but its effect varies with the length of household tenure in its dwelling.

IV. Implications and Conclusions

The reanalysis of homeowner behavior from the Panel Study of Income Dynamics provides additional evidence on the effects of interest rate changes on the valuation of homeowners' mortgages and the implications of these values for homeowner mobility. The more recent period analyzed, 1991-1992, was one
of less volatility than the earlier period analyzed, 1979-1981 -- and perhaps because of this -- the statistical link is not as strong.

Nevertheless, when the effect of favorable mortgage terms on mobility behavior is allowed to vary with households’ length of tenure, the results are quite consistent. After a few years of living at the same address, households become less likely to move as the value of their mortgages is larger relative to the cost of a new mortgage at current interest rates.

This result persists when value of the mortgage premium is measured in dollars or as a fraction of the value of the house. This general result is found in simple models (not reported here) that measure only the effects of mortgage terms upon mobility patterns and also in more complex models that measure household demographics as well.

The magnitude of these effects can be simulated using the statistical models reported in Section III. Table 8 reports the sensitivity of cumulative mobility rates using Model J, the preferred specification. The column marked “base case” reports the cumulative mobility rate estimated from Model J assuming that a household of the sample average demographic characteristics takes out a level-payment 30-year mortgage to finance 80 percent of the purchase price of the average house, obtaining a 7 percent mortgage. For years 13 (the mean tenure
Table 8  
Effects of Mortgage Interest Rate Changes on Cumulative Homeowner Mobility Rates  
(from Model J)

<table>
<thead>
<tr>
<th>Years of Tenure</th>
<th>Increased Rates</th>
<th>Base Case</th>
<th>Decreased Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8%</td>
<td>9%</td>
<td>10%</td>
</tr>
<tr>
<td>12</td>
<td>51.67%</td>
<td>51.67%</td>
<td>51.67%</td>
</tr>
<tr>
<td>13</td>
<td>52.95%</td>
<td>52.90%</td>
<td>52.85%</td>
</tr>
<tr>
<td>14</td>
<td>55.32%</td>
<td>55.17%</td>
<td>55.04%</td>
</tr>
<tr>
<td>15</td>
<td>57.13%</td>
<td>56.91%</td>
<td>56.72%</td>
</tr>
<tr>
<td>16</td>
<td>57.64%</td>
<td>57.41%</td>
<td>57.20%</td>
</tr>
<tr>
<td>17</td>
<td>58.68%</td>
<td>58.42%</td>
<td>58.18%</td>
</tr>
<tr>
<td>18</td>
<td>61.36%</td>
<td>61.01%</td>
<td>60.71%</td>
</tr>
<tr>
<td>19</td>
<td>61.86%</td>
<td>61.50%</td>
<td>61.18%</td>
</tr>
<tr>
<td>20</td>
<td>61.86%</td>
<td>61.50%</td>
<td>61.18%</td>
</tr>
<tr>
<td>21</td>
<td>62.32%</td>
<td>61.95%</td>
<td>61.63%</td>
</tr>
<tr>
<td>22</td>
<td>64.11%</td>
<td>63.72%</td>
<td>63.37%</td>
</tr>
<tr>
<td>23</td>
<td>65.06%</td>
<td>64.66%</td>
<td>64.30%</td>
</tr>
<tr>
<td>24</td>
<td>66.18%</td>
<td>65.77%</td>
<td>65.41%</td>
</tr>
<tr>
<td>25</td>
<td>66.18%</td>
<td>65.77%</td>
<td>65.41%</td>
</tr>
<tr>
<td>26</td>
<td>67.83%</td>
<td>67.43%</td>
<td>67.07%</td>
</tr>
<tr>
<td>27</td>
<td>69.30%</td>
<td>68.92%</td>
<td>68.56%</td>
</tr>
<tr>
<td>28</td>
<td>69.30%</td>
<td>68.92%</td>
<td>68.56%</td>
</tr>
<tr>
<td>30</td>
<td>69.84%</td>
<td>69.46%</td>
<td>69.11%</td>
</tr>
</tbody>
</table>
of homeowners) through 30, the base case reports the cumulative changes in mobility arising from one additional year of age.

The other columns in Table 8 report the cumulative mobility rates, assuming that interest rates change in year 13 and then remain unchanged. The stream of payments remaining for 17 years is valued using the new interest rate. The mortgage premium $P_i$ associated with the new interest rate $r$ for each remaining year of tenure, $i=13, 14, \ldots, 30$ is calculated as

\begin{equation}
(10) \quad P_i = C_i - \sum_{j=1}^{30} \frac{D}{(1+r)^{i-j}}
\end{equation}

where $C_i$ is the unpaid mortgage principal remaining at year $j$, and $D$ is the annual mortgage payment. In Table 8, $P$ is expressed as a fraction of the house value, and the coefficients of Model J are used to estimate mobility rates.

As indicated in Table 8, the differences in mobility rates are small. They are entirely negligible, however. They suggest that a 6 percentage point swing in interest rates is associated with about a 3 percentage point change in cumulative mobility rates over the remaining life of the mortgage. Figure 2 illustrates these mobility responses graphically.

Overall, the quantitative results confirm previous work suggesting that there are effects of interest rate changes on homeowner mobility in the housing market. Increased interest rates do inhibit the mobility of the holders of residential
Cumulative Mobility Rate arising from Changes in Mortgage Interest Rates

Figure 2

Based on Model X-N
mortgages. However, under current conditions, where interest rate changes are moderate and mortgage interest rates are low, these mobility differences are quite small.
REFERENCES


